

Thinking & Acting Like a Designer: How design thinking supports innovation in K-12 education

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IDEO

Annette Diefenthaler
Laura Moorhead
Sandy Speicher
Charla Bear
Deirdre Cerminaro

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Foreword

Each of us carries unique images of school reaching back to some of our earliest memories. We recall our teachers and classmates, the various school spaces, the playgrounds. The images often have common –and enduring– features: the seats in rows or circled around tables, the teacher’s desk, the boards, the examples of student work hung around the walls. Looking more deeply, we would find similarly well-established hierarchies and relationships among teachers, students, school leaders, parents and the wider community. But the ‘vestigial thinking’ that has sustained old models tied to past priorities is being quickly eroded and supplanted by new narratives of change.

A confluence of socio-economic developments has prepared the setting. No doubt technology has profoundly altered the ways individuals communicate, interact, work and access information on a global scale. Political and economic turbulence impose uncertainty in the world, yet in education, disruption also presents opportunities. The design thinking approach, as applied to education, is particularly well-suited to respond to the dynamics of disruption and challenge faced by all stakeholders today. The possibilities are far reaching. As educators and change-makers establish priorities according to the various needs and contexts globally, teaching, curricula, assessment and learning itself are open to re-imagining and redesign.

With the education environment, in all its elements, poised at an inflection point, design thinking brings flexibility and pragmatism to the process of responding to local, even individual needs and goals. The WISE IDEO report shows how the design thinking mindset can expand our notions of schools and school systems beyond entrenched models. Design thinking can encourage a culture of teacher collaboration that can be leveraged for improved outcomes across subjects and learning environments. As students’ experiences dramatically expand, they face new dynamics and emerging realities that require new skills to navigate for success. These include the capacity to reflect on one’s own learning process, and, with the support of peers, teachers and parents, to explore unique ways forward. We know that when students are more involved in designing their learning environments and discovering their own priorities, they are more engaged, motivated and ultimately successful.

The WISE IDEO report invites all stakeholders to seize opportunities to reflect, share experiences, and to keep experimenting. While we can’t claim to know the future and its jobs, design thinking can inspire and empower observant, proactive educators in all settings to anticipate new constellations of needed skills and expertise. For all committed to education as empowerment, design thinking is a valuable approach, providing hopeful and exciting perspectives, and throwing open the gates to possibility.

Stavros N. Yiannouka
CEO
WISE

Epigraph



Charlie Shryock has become a leader in his own school and community, and beyond, sharing design thinking practices with others. Photo: IDEO

Like most teachers, English teacher Charles (a.k.a. Charlie) Shryock occasionally had to miss a day with his students at Bishop McNamara High School in Maryland. For his students, this never seemed to go well. According to Marguerite Roza, a professor at the University of Washington, an absent teacher is often “a lost day for most kids, regardless of the qualifications of the sub” (Kronholz, 2013, p. 18).

Concerned about the challenge substitute teachers face in trying to engage students effectively, Shryock (2016) had an idea: what if students had a chance to work on their passion projects when their full-time teachers were absent? Shryock believed his passion project idea would be a more engaging, valuable use of student’s time. A nudge from another teacher encouraged him to share the idea during a Teachers Guild design challenge called “How might we create rituals and routines that establish a culture of innovation in our classrooms and schools?”

Despite Shryock’s initial nervousness to publicly share his idea, which he called the SubHack, it resonated with many peers in the community. West Contra Costa Unified School District, a district thousands of miles away, selected SubHack for implementation at its schools, where nearly three-quarters of students are socioeconomically disadvantaged and struggle to

stay motivated. Employees from Google for Education pitched in to help refine SubHack, and a pilot group in the district went on to test what educators found to be a promising solution to re-engage their students (Gonzalez, 2016).

We've seen this program inspire students to be critical thinkers and problem solvers while developing their reading and writing skills. It empowered them to take initiative in personalizing their learning, which had the result of boosting excitement about coming to school.

Susan Gonzalez

teacher

West Contra Costa Unified

(2016)

Positive feedback from SubHack gave Shryock the confidence to continue his efforts. He went on to be appointed the director of faculty development for his school and infuses the process and mindsets of design thinking into sessions with teachers and other programs, providing a new, compelling pathway for teacher leadership.

Charlie Shryock is thinking and acting like a designer.



Mercy has gained the confidence that even at a young age, she can make change to make her community a better place to live in. Photo courtesy of Global Minimum

Disturbed by the prevalence of wildlife poaching in Kenya, student Mercy Sigey and two classmates entered the *Innovate Kenya* competition in 2013 with the idea of developing a motion sensor to detect human intruders.

The girls, who call themselves the ‘A Team,’ built a prototype with mentorship help (Pasulka, 2014).

Since it was too dangerous to test their first prototypes in the wild, Mercy and her teammates asked their younger brothers to play the parts of the lions in order to test the sensor. The team continued to use its experimental mindset to further test and develop the device, which received national attention (Escalino, 2014).

At a young age, I make change to make my community a better place to live in... I discovered the world has so much to offer, therefore we should all leave our comfort zones, spread our wings and make the world a better place.

Mercy Sigey
2013 Innovate Kenya finalist
(2016)

Mercy is thinking and acting like a designer.



Innova Schools in Peru are built with the aspiration of transforming the country by closing the academic achievement gap. Photo: IDEO

Peru's education system has been struggling for decades. Qualified teachers are hard to find, and so is affordable and available land for new schools. With Innova schools, Peruvian entrepreneur Carlos Rodriguez-Pastor and educator Jorge Yzusqui Chessman set out to create a new school model within a complex set of constraints. As the schools would serve low and middle class families, student fees needed to stay under \$130 per month, but still generate a profit. Since the schools were intended to spread across the entire country, the model needed to be scalable while providing a world-class education for students.

Working collaboratively, an interdisciplinary team from innovation and design firm IDEO developed a curriculum strategy, buildings, teaching methods, operational and technology plans, and an underlying financial model all at the same time. All key design decisions were driven by a human-centered strategy, based on what the team learned from educators, parents, and students, and about the specific context in Peru. For example, it quickly became apparent that while many teachers lacked the qualifications to teach at an internationally competitive level, they felt a deep desire to support the aspirations of young people, and were eager to improve themselves. Therefore, the team identified peer-to-peer learning and blended-learning approaches as an appealing solution: For part of the day, classrooms of thirty students work collaboratively on projects, while teachers guide their learning. For the rest of the day, students work in self-directed ways, independently and at their own pace using digital tools such as Khan Academy for math learning

(Weller, 2015). When students use technology, one teacher can supervise two classes. This frees up the other teacher for professional development or lesson planning, which is supported by the “Teacher Resource Center”, a database co-designed with teachers and filled with more than 20,000 lesson plans.

By leveraging existing technology platforms, efficiently planning modular spaces, and building in time for teacher preparation and training, the design of Innova stretches limited resources and keeps costs down, allowing the school to remain affordable. The design also leverages economies of scale in building a network, such as a shared data system and centralized tools.

The Innova school system was created by a team thinking and acting like designers.

Preface

In 2003, two life-changing events happened for me. The first was when U.S. President George W. Bush declared war on Iraq. At the time I was teaching in the Visual Communications department at Washington University in St. Louis, and students were noticeably silent about what seemed to be a historic decision. Other faculty members were quick to point out that in “their day”, the student body would be protesting war, objecting to what was clearly an inhumane decision. I sat with a class of juniors the next morning, ready to talk through what this news meant to them and their lives. I was surprised when they expressed the desire to get on with the task at hand—the typography review that was scheduled to happen that morning. Unrelenting, I asked that we put aside these assignments and talk. Through this discussion, I learned so much about the psyche of this generation. They didn’t want to be at war. They didn’t want people dying. But they understood that there was much that they didn’t know. They knew enough to know that the decision to go to war was incredibly complex. They followed the news, they saw the pictures—and because they had so much exposure to the complex reality, they felt overwhelmed with how to reconcile it with their role in the world.

This discussion forced me to reflect. Some of the smartest students in the country were attending Washington University. And yet they felt unprepared to handle the world’s complex problems. These students were studying design; in my mind, design wasn’t just about the beauty of the graphics or the intelligence of communication, it was about realizing the role one has in making the decisions that shape our world—our enjoyment, our ease, our experience, and most of all, our understandings. I realized our education system wasn’t preparing our youth to navigate this world we had created for them. And that this was a problem design could do something about.

In one of those fortuitous moments of coincidence or destiny, Meredith Davis came to speak at Washington University that year. This was my second life-changing event of the year. Meredith is a middle school teacher turned graphic design professor who has dedicated her career to exploring the relationship between design and learning. She talked about design as a process for learning—not just that students learn design, but for students to use design processes to learn academic subjects like physics, chemistry, literature, and math. She highlighted project-based and problem-based learning pedagogical approaches. Her talk helped me understand that there was a basis for my intuitions in both practice and research. That set me on the path of continuing the work of understanding how design and designers can help our systems of education progress.

In the years following, I discovered Piaget and constructivism, Seymour Papert and his theories of constructionism, Dewey and his progressive ideas about fostering student-centered, self-directed learning, and of course, David Kelley and IDEO’s work around design thinking. And over the past ten years, through my work at IDEO and with many of our partners, I have learned about the complex nuance of innovation in education—how deeply we all want our children to thrive, and how unclear that path to get there is.

Education is among the most challenging issues we face. Despite the many competing agendas and perspectives on teaching and learning solutions, we should continue asking questions about the design of our schools, the cultures we build, and the ways we foster learning itself.

As the world becomes increasingly complex, our young people need our help developing the skills and mindsets to navigate their ever-changing world. They also need to know that they are not passive observers, but have a role in shaping that world. And as we face the complexity of our failing systems, we need to know that anyone – including us – have a role in designing a better future. Thinking and acting like a designer is an approach available to all of us in creating innovative, human-centered solutions to the problems we face in all facets of our lives.

The past decade has seen a growing interest in the process and mindsets of design thinking. Scholars continue to examine design thinking as an applied discipline through qualitative and quantitative research. Practitioners look for ways to incorporate it into their work in K-12 settings with efforts to formalize the approach and encourage students to take it out of the classroom and into their daily lives. Since 2006, interest in the term (reflected in worldwide searches via Google Trends) has increased nearly 100 percent.

This interest and subsequent effort to formalize and document design thinking, however, comes with some confusion, concern, and even controversy over what design thinking and its approach means, and its potential for impact. We embrace this tension and see great value in efforts, notably those of organizations such as WISE, to both clarify and share design thinking globally through publications and events that bring together differing views of this approach to innovation.

We come to this investigation largely through our work with practitioners, and we acknowledge their long march of innovative work over many years. Often educators report that they already practice some form of design thinking. For them, the approach is common sense, because it reflects the value they place in empathy and openness. But knowing how to act on that value system in a creative way to produce positive change across an organization, from the individual to the systemic structure, is not necessarily in the core toolkit of educators. Not yet, anyway. This publication – a review that straddles research and practice – aims to simply offer teachers, administrators, non-profit leaders, policymakers, or parents more tools to bring design thinking from common sense to common practice – and ultimately to better prepare all students for the future.

We are excited to continue this effort with you.

Sandy Speicher

*Partner & Managing Director, Education, IDEO
Lecturer, Hasso Plattner Institute of Design and
Graduate School of Education, Stanford University*

Executive Summary

The needs of the twenty-first century demand new approaches to learning.

Today, student success requires skills for collaboration, creativity, critical thinking, and problem solving, and these skills are increasingly becoming a focus in both K-12 and higher education settings. But twenty-first century learning needs to be much more if we are to expect young people to both navigate an unknown and complex future and meet the challenges that accompany it.

We need change-makers, people who will redefine problems, inspire new ideas, take informed risks, and never stop learning. Change-makers implement and evolve solutions that aim to better the individual and the whole, be it a classroom, a school, a community, or a society. This is the approach of a designer and the focus of this publication.

Design touches all aspects of our world. As this publication shows, designers work to impact the human experience, and they generally do this with particular mindsets that encourage looking at challenges as opportunities for design. Four mindsets typically guide the behavior of a designer: human-centered, collaborative, optimistic, and experimental. Designers also often act in a particular way, following a process that helps them generate and evolve ideas, beginning with problem-defining and empathy, using synthesis and prototyping to develop strategic ideas, and ending with implementation.

Taken together, how designers think and act make for design thinking, a human-centered approach to creative thinking and problem solving. Thinking and acting as a designer and, in turn, employing design thinking are powerful ways to encourage people to become change-makers in education.

Over the past two decades, interest in using design thinking in K-12 settings has grown dramatically. In spite of this growth, insufficient attention has been given to the importance of design thinking as a component of an educator's professional toolkit. Minimal guidance has been offered on how to support design thinking in education and on what guidelines, best practices, and professional development are needed for successful implementation. Through a consideration of current research and practice, this publication is intended to contribute toward filling that gap with three principal objectives:

- Showcase best and forward-looking practices and new ideas of design thinking in K-12 education
- Provide recommendations and potential implications to inform practitioners interested in applying design thinking to their K-12 educational settings
- Identify provocative questions that will drive further research

This publication draws from efforts in a variety of countries, including Bhutan, Britain, Colombia, India, Kenya, Portugal, Sierra Leone, Taiwan, and the United States. It also examines the following themes through vignettes culled from longer case studies, and concludes with a series of recommendations for policy makers, practitioners, and academic researchers. Among the publication's key takeaways are the following:

1. Design thinking is used to fundamentally reimagine school models and systems.

When design thinking is used to create new schools and school models, it encourages design teams to bring an experimental mindset to that endeavour. This includes questioning assumptions about what school is or should be in favor of what it could be in order to best meet students' needs. Another key component of this approach is working collaboratively with communities to be culturally sensitive and inclusive of students, teachers, administrators, parents, and other stakeholders. Finally, schools and school models that are created using design thinking are adaptable and modular to respond to ongoing shifts as well as different contexts — not just on one site, but increasingly at scale.

2. Design thinking supports change in school culture by transforming how educators work together.

Educators who practice design thinking become agents of change by developing optimistic and action-oriented mindsets. Teachers and administrators are using design thinking to collaborate in new ways on both curriculum and school-level challenges. School leaders are inspiring change by starting with a bias for action and small, iterative experiments. They also recognize the need for constant evolution through innovation, and understand their critical role in setting permissions and empowering others to innovate.

3. Design thinking supports student development of twenty-first century skills.

Through design challenges, students are learning to activate their creativity and to believe in their power to change the world around them. Design thinking experiences, both in and outside of school, help students develop twenty-first century skills. This publication shows examples of schools that immerse students in design thinking as a way to connect academic subjects to real-world, project-based, hands-on learning experiences.

Moving forward, recommended trajectories to advance design thinking in education through both research and practice include the following efforts:

- Define and assess an array of learning outcomes to better understand the impact of design thinking in education. This requires creating and experimenting with various qualitative and quantitative approaches and includes assessing impacts across multiple institutions and countries. As assessment in K-12 settings presents particular challenges, creative ways of determining impact and success are needed.
- Include design thinking in education at the primary/secondary level, and to involve stakeholders within the ecosystem. K-12 teachers, as well as parents and administrators, need to have a better understanding of what design thinking is and can be in their education systems. This requires including design thinking in teacher training and professional development, and necessitates that schools of education recognize it as a valuable pedagogy worthy of inclusion in their curricula.
- Address the larger issue of formalizing guidelines and best practices in a way that can scale across school systems and countries while maintaining the empathic, active, and experiential approach of design thinking. How might we scale design thinking in a way that drives educational policy and practice at the national level?

Whether readers of this publication are teachers, administrators, parents, students, nonprofit leaders, or policymakers, the goal is to encourage conversations about how design thinking can drive education innovation to better prepare all students for the future. As such, this publication is written for readers with varying levels of familiarity with design thinking, from encountering it here for the first time, already using it in daily practice, or audaciously applying it to systemic challenges.

Introduction

The background of the page is a complex, abstract geometric pattern composed of numerous irregular polygons in various shades of blue and teal. The colors range from light, almost white-blue to deep, dark navy blue, creating a sense of depth and texture. The polygons are arranged in a way that suggests a low-poly or crystalline structure, with sharp angles and varying sizes of shapes. The overall effect is a modern, digital aesthetic.

No matter how old you are, the world is much different today than when you were a child. It has become more complex, interconnected, and more technology-driven. Change is happening quickly, and these changes are constantly revealing new, wicked problems that require new, creative solutions. In such a dynamic reality, the needs of students are shifting rapidly, and will continue to shift with each new generation. It is imperative to prepare today's students not only to manage the breakneck pace of change, but to thrive and lead through change.

We need to foster a generation of change-makers.

This is no easy feat. Schools are juggling many priorities, including mounting pressures to constantly increase test scores and prove growth. Employers and schools are increasingly looking beyond academic subjects and recognizing the importance of so-called twenty-first century skills such as creativity, critical thinking, collaboration, and communication. Character, its components, and how it is developed is increasingly becoming a priority in schools. Educators globally are focusing on personalization and questioning the one-size-fits-all model of schooling. Education itself is also facing many challenges of change.

Educators looking for ways to improve learning outcomes for students have found success through student-centered approaches from the broad category of project- and problem-based learning. When students are given open-ended questions centered around real-world challenges, they are invited to inquire more deeply, find their own unique answers to these questions, and recognize the diversity of “right answers” that might exist with certain types of problems.

Design thinking is an approach educators are increasingly turning to as inspiration for structuring projects and fostering these change-making skills. Design thinking is both a mindset and an approach for generating creative alternatives through anthropological techniques that draw on human behavior, needs, and preferences.

This publication first considers design thinking's similarities to, and differences from, other learning approaches, and highlights the John Dewey-inspired undercurrent that unites them. It looks to existing K-12 settings for vignettes that illustrate how design thinking is fostering innovation skills and building creative confidence in students and educators, inspiring them to create the kinds of changes they would like to see in the world.

But if fostering ‘change-maker’ skills is a top priority, we will need to better design schools to support it. The focus on academics, performance, and standardization create a culture in which students and teachers may call into question their own creative abilities, in essence disempowering them from the very skills needed—the ability to design positive changes in a complex system.

While the current interest in design thinking by researchers and educators is exciting and important, the body of valuable design thinking research is varied, often based on a small number of participants, and not necessarily reproducible. Research inequalities can confound practitioners' best efforts to bring design thinking into K-12 settings.

Design thinking programs have flourished at the university level. In 2005, IDEO founder David Kelley launched the Hasso Plattner Institute of Design at Stanford University, better known as the d.school, with a mission to help the next generation become more creative problem solvers. Other universities embedding design thinking include the Weatherhead School of Management (Case Western Reserve University, 2011), Leadership and Design Thinking (Harvard University, 2017), La Paris-Est d.school (École des Ponts, Paris, 2014), Mastering Innovation and Design Thinking (Massachusetts Institute of Technology, MIT, 2013), Saïd Business School (Kimbell, 2011), REDlab (Goldman, Stanford, 2009), Fox School of Business (Temple University, 2011), HPI School of Design Thinking (University of Potsdam, Germany, 2007), and Rotman DesignWorks and Rotman School of Management (University of Toronto, 2005, 2011). Graduates of these programs have gone on to found public and private schools, develop trainings, create resources, engage in research, and initiate student-centered movements, all grounded in design thinking.

Nonprofit organizations and government agencies also contribute to an ecosystem of support for the interest around design thinking (Hasso Plattner Institute of Design at Stanford University and IDEO, 2013), increasing creativity among students and educators, the development of innovative learning tools, and new visions for the future of school (IDEO, 2010). The MENA (Middle East and North Africa) Design Research Center in Lebanon, ReinventED Lab in Charlottesville, Virginia, and Prometheus Education in Shenzhen, China, have all launched design thinking practices for educators, students, and institutions. Simultaneously, large school operators, such as Dubai-based Global Education Management System (GEMS), have made design thinking a central theme of efforts to increase student innovation (Teach Middle East, 2015).

Policymakers are also increasingly taking interest in integrating design thinking into national and regional education priorities. Australian schools are in the process of implementing an updated national “Design and Technologies” curriculum that encourages students in years 9 and 10 to use “design thinking to produce designed solutions to identified needs or opportunities of relevance to individuals and regional and global communities” (Australian Curriculum, 2016). Singapore is also emphasizing design thinking to meet the growing demands of a global marketplace. For instance, Singapore’s Economic Strategies Committee recommended incorporating design capabilities into its “workforce by accelerating the introduction of design thinking programmes and modules (from pre-tertiary to post-graduate level), at local educational institutions” (Koh, Chai, Wong, & Hong, 2015). These efforts build on a long history of design-based teaching and learning in K-12 settings, notably the Design as a Catalyst for Learning by the National Endowment for the Arts in the United States and Design in General Education by Royal College of Art (sponsored by the Schools Council and the Department of Education and Science in the United Kingdom).

What this publication offers

In the literature about design thinking and its role in K-12 education, insufficient attention has been given to how designers think and act, the mindsets that comprise design thinking, and how the approach can change how adults work together in such systems. This publication focuses these on topics through a review based on both research and current applications of design thinking in K-12 settings.

Our analysis is grounded in a series of vignettes from larger case studies involving design thinking in learning and educational settings. By examining three dimensions of how design thinking is being done and integrated into education, and considering what might shift in education when people think and act like designers, our aim is to make sense of complex contexts and generate guidelines to inform educational policy, practice, and the experience of learning.

The central question that guides this publication is:

How do the processes and mindsets of design thinking help to answer questions about how schools are designed, how educators can work together, and how students might contribute and benefit?

Our hypothesis is that design thinking creates the greatest impact when both the process and mindset are practiced in developing new curricula, school cultures, and education systems.

We address three areas reflected in the following questions.

- If students are learning differently and educators are working differently...
how do our schools and systems need to change?
- If we are teaching students differently...
how do educators need to work differently?
- If we want our students to be change-makers...
how and what do we need to teach differently?

In the spirit of design thinking and to deepen our hypothesis, we interviewed two dozen educators, academics, designers, and thought leaders. We used this data to triangulate findings from the case studies and identified particular outcomes and themes that highlight why and how we believe design thinking can help equip students around the world to create a better future. Even though the small sample size prevents us from generalizing our findings to the larger population of learners and educators, we still hope the stories featured will spark lively and enriching discussions.

In Chapter 1, we explore how designers think and act, and identify a particular mindset that may encourage problem-solving success; then, in Chapter 2, we consider design thinking as a way to reimagine education systems. In the third chapter, we look at how the approach can change how adults work together in such systems. We close with inspiration from young learners practicing design thinking and a forward-looking call for further research.

This publication is intended to help practitioners make sense of the current excitement around design thinking, and to offer inspiring examples of others implementing design thinking throughout the world, hoping to aid efforts to perhaps implement it in their own K-12 settings.

Ultimately, this publication supports the efforts of educators who are committed to critical reflection and open to innovative approaches for meeting the constantly evolving and varied needs of students. We hope to answer, at least in part, the call for making the strategies used in design thinking more explicit and accessible to practitioners as a way to better student learning (Anderson et al., 2014, p. 6).

Chapter 1

Thinking & Acting Like a Designer



In 2009, Andrew was a ninth grade student at Henry Ford Academies in Dearborn, Michigan. Andrew had just taken Foundations of Innovation, an introductory course on design thinking, where the first project was to redesign a nametag for someone else. Redesigning a nametag is a simple task, but during a debrief conversation, Andrew shared that designing a nametag for a classmate helped him realize he could make something that would make someone else happy. He shared that he learned that he could be a leader – that he could make someone else’s experience better by listening to their needs and interests and making something meaningful from it. Andrew was then asked, “Based on this project, what’s something else you’d like to redesign?” After taking a moment to look around, he said: “Well, the state of the economy of Michigan could use some help. And the school cafeteria. I’d like to redesign the school cafeteria.”

Simply put, a designer is someone who works to change or make something for the better. Certainly, the word summons multiple connotations, some more constrained than others. You might first think about fashion design or interior design, or the design of web sites. These kinds of designers seek to create experiences that people will enjoy – whether it is helping to make something appear more beautiful, more efficient, or more engaging. Search online for images of the word “designer” and traditional, if not stereotypical, pictures emerge: sleek young adults in bright, airy offices filled with colorful swatches and pencils, clean drawings, and black-and-white schematics. Nothing suggests students, teachers, and staff members from a K-12 learning environment.

But if we allow ourselves to break out of this limited view of the designer, we can open up the reach and value of design for education.

Broadening the definition of design

The effort to broaden the definition of design is not new. A look across the research literature provides insightful context: Twenty-five years ago, Richard Buchanan offered a nuanced and promising definition that largely prefaced today’s view of designers as those who explore “concrete integrations of knowledge” and, in turn, “combine theory with practice for new productive purposes” and to solve problems (1992, p. 6). Buchanan argued that there is “no area of contemporary life where design [...] is not a significant factor in shaping human experience” (1992, p. 8). Design’s remarkable suppleness and expansive reach, he wrote, makes it “amenable to radically different interpretations in philosophy as well as in practice” (Buchanan, 1992, p. 18).

Scholars and practitioners have further extended design’s reach (Cross, 2001; Lawson & Dorst, 2010), with Cardon and Leonard arguing that “design is not a function to be accomplished, but rather a living process,” something to be applied to any level or situation (2010, p. 3-4). As part of this extension, researchers are concerned with what constitutes a designer’s mindset, or ethos (Cross, 2001; Lawson & Dorst, 2009; Brooks, 2010; Brown, 2009; Dorst, 2010; Martin, 2010; Suri & Hendrix, 2010).

During the 1970s, the notion of “wicked problems” (Schön, 1992, p. 132; Rittel & Weber, 1973) as the work, plight, and thrill of the designer gained traction. Wicked problems are amorphous, complex, and ever-changing, often difficult or impossible to solve. Wicked problems lack obvious start and end points (Kunz and Rittel, 1970; Rittel & Weber, 1973) and resist clear markers of success (Coyne, 2005, p. 6). Horst Rittel identified them as “that class of problems which are ill-formulated, where the information is confusing, where there are many decision makers and clients with conflicting values, and where the ramifications in the whole system are confusing” (Churchman, 1967, p. 141–42). Problems such as inequality, poverty, health, and famine are all examples of wicked problems, and we are aware of many of these types of problems today.

The phrase “wicked problems” has become a touchstone for people interested in addressing complex challenges — challenges so big they require an empathetic mix of creativity, critical thinking, communication, and collaboration that breaks outside the more traditional problem-solution box. As Shelley Goldman and Zaza Kabayadondo note, the phrase “wicked problems” offers “a new language” and, ultimately, the need for a novel albeit inchoate approach for addressing complex challenges (2017, p. 6).

Because of the social nature of wicked problems, an umbrella term for an approach to addressing them has taken hold, having likely emerged in 1935 and gaining currency in the 1980s through the empathic methods used in industrial design (Goldman & Kabayadondo, 2017; Lawson, 2005; Rowe, 1987). That approach is known as *design thinking*.

The emergence of design thinking

Perhaps not surprisingly, scholars and practitioners offer varying, often contradictory definitions of design thinking (see opposite page). In this publication, we define design thinking as **an approach for generating creative alternatives through anthropological techniques that draw on human behavior, needs, and preferences** (Brown, 2008). As a human-centered approach to creative thinking and problem solving, design thinking is embedded in deep social engagements and structures. It is rooted in mindsets and creative processes for finding opportunities to understand people and develop innovative solutions to meet their needs (IDEO, 2010; Goldman & Kabayadondo, 2017).

Stanford professor and researcher Bernard Roth wrote that design thinking has already “been successfully applied in medicine, law, business, engineering, the physical and social sciences, the arts, and of course, in education” (2017, p. xvii). Others point to its value in health-care systems (Duncan and Breslin, 2009), strategy and management (Brown & Katz, 2009; Martin, 2010), operations and organizational studies (Romme, 2003), and social innovation (Brown & Wyatt, 2010).

Design thinking is...

...an approach to learning that focuses on developing children's creative confidence.

— Maureen Carroll
(2010)

...not well understood, either by the public or those who claim to practice it. [...] Three main accounts are identified: design thinking as a cognitive style, as a general theory of design, and as a resource for organizations.

— Lucy Kimbell
associate fellow
Saïd Business School, University of Oxford &
director of consultancy
Fieldstudio, London
(2011)

...abductive in nature. It is primarily concerned with the process of visualizing what might be, some desired future state, and creating a blueprint for realizing that intention.

— Jeanne Liedtka
Professor
University of Virginia's Darden Graduate School of Business &
former chief learning officer
at United Technologies Corporation
(Martin & Christensen, 2013)

...to have a bias toward action and empathy toward who you are designing for ... [and] to not have a fear of failure.

— Bernie Roth
founder and academic Director
Hasso Plattner Institute of Design at Stanford University
(Dong, 2015)

...a creative way to solve problems.

— Paige Talbot
Innovation Manager
Commonwealth Bank of Australia
(2016)

...a method of problem-solving that relies on a complex of skills, processes, and mindsets that help people generate novel solutions to problems. [...] can result in new objects, ideas, narratives, or systems. [...] brings to life new kinds of inquiry for teachers, learners, and classrooms.

— Shelley Goldman
director of the Research on Education and Design Lab (REDLab)
at Stanford University &
Zaza Kabayadono, co-director
of the Design Thinking Initiative at Smith College
(2017)

For decades, researchers have worked to define *design thinking* (Kimbell, 2010; Anderson et al., 2014) and document its various expressions (Melles et al., 2015; Johansson-Sköldberg, Woodilla, & Cetinkaya, 2013; Kimbell, 2011; Lindberg, Noweski, & Meinel, 2010). Scholars cite designing among the most difficult cognitive traits to understand and teach, with practitioners needing to adjust to multiple real-world variables while reflecting on their own attitudes, cultures, values, and interests (Cross, 2005; Lawson & Dorst, 2003, pp. 10, 12).

Goldman and Kabayadondo explain that the current “excitement over design thinking lies in the proposition that anyone can learn to do it” (2017, p. 3). Combined with the wicked problems that teaching and learning in K-12 settings present, it is hardly surprising that educators are increasingly interested in how they might apply the approach of design thinking to their work.

With the growing interest in design thinking come increasing calls from researchers and practitioners for greater empirical evidence of its value (Badke-Schaub et al., 2010, p. 48). As Nigel Cross wrote, while “the amount of research in design activity has grown substantially since the mid-1980s, the total amount still is not particularly great, and the results of that research are varied, often based on single or small numbers of subjects, and usually untested by repeat studies” (2001, p. 81). Nearly two decades later, Cross’s criticism still holds.

In documenting efforts to “‘scientize’ design” during the Modernist movement of the twentieth century, Cross predicted “the re-emergence of design-science concerns in the 2000s” (2001, p. 49). His prediction may be playing out now, in today’s continuation of the industrial-era model, despite ongoing pushback from designers and scholars. As Donald Grant wrote, “Most opinion among design methodologists and among designers holds that the act of designing itself is not and will not ever be a scientific activity; that is, that designing is itself a nonscientific or a-scientific activity” (1979). That said, Grant noted, as Cross reiterated decades later, “the study of designing may be a scientific activity; that is, design as an activity may be the subject of scientific investigation” (Grant, 1979; Cross, 2001).

Certainly, the impulse to scientize through quantification and assessment is not limited to design and design thinking. We also find the impulse in education. Yet as Meredith Davis and Deborah Littlejohn point out, such “[p]ositivist philosophy, which holds that reality can be observed by controlling variables and that the goal of research is objective prediction, may not be the best approach for evaluating all outcomes in the constantly changing learning conditions of K-12 schools” (2017, p. 32). As such, we situate design thinking in the context of this tension, at the positivist-constructionist axis (or crosshairs, depending on one’s perspective).

Scholars note design thinking’s fifty-year “status as ‘emergent’” (Goldman and Kabayadondo, 2017, p. 13). Proponents of design-based approaches to learning offer “compelling stories of student accomplishment”; yet, empirical research confirming these approaches as responsible for such positive outcomes remains lacking, particularly in terms of what is needed to “drive educational policy and practice at the national level” (Davis & Littlejohn, 2017, p. 21).

While we accept this assessment and see value in gathering greater empirical evidence, this publication contributes qualitative findings to discussions about how design thinking can support innovation in K-12 learning, with potential impact for educational policy and practice.

The design process

An approach for generating creative alternatives through anthropological techniques that favor human behavior, needs, and preferences (Brown, 2008), design thinking is inherently rooted in human-centered design principles (HCD). These principles are applicable and transferrable to fields outside design and encourage people to reach beyond their comfort zones (Sanders & Stappers, 2008; Brown & Katz, 2009; Hasso Plattner, Meinel, & Leifer, 2012). Lindberg et al. explain that “design thinking allows multi-professional teams to develop a mutual understanding due to its strong emphasis on team-based learning regarding both the problem and its potential solutions” (Lindberg, Noweski, & Meinel, 2010, p. 35). The approach encourages people to “disregard the ‘drawers’” that they have internalized through their academic and professional training (Lindberg et al., 2010, p. 35), allowing them to tap more freely into their creativity and innovation (Kelley & Kelley, 2013).

The design process refers to a set of stages that designers go through, beginning with problem-defining and empathy and ending with implementation.

Like a recipe, the design process is a set of codified steps. However, it is important to note that the process does not always need to be followed in a linear order, and can and should be adapted to different situations.

The Design Thinking for Educators toolkit, which adapts the process specifically for educators, outlines five phases: discovery, interpretation, ideation, experimentation, and evolution (IDEO, 2012) (see Illustration 1). At each stage of the design process specific methods (such as observation, interviews, role playing, and storytelling) provide actionable how-to steps to discover needs and design solutions.

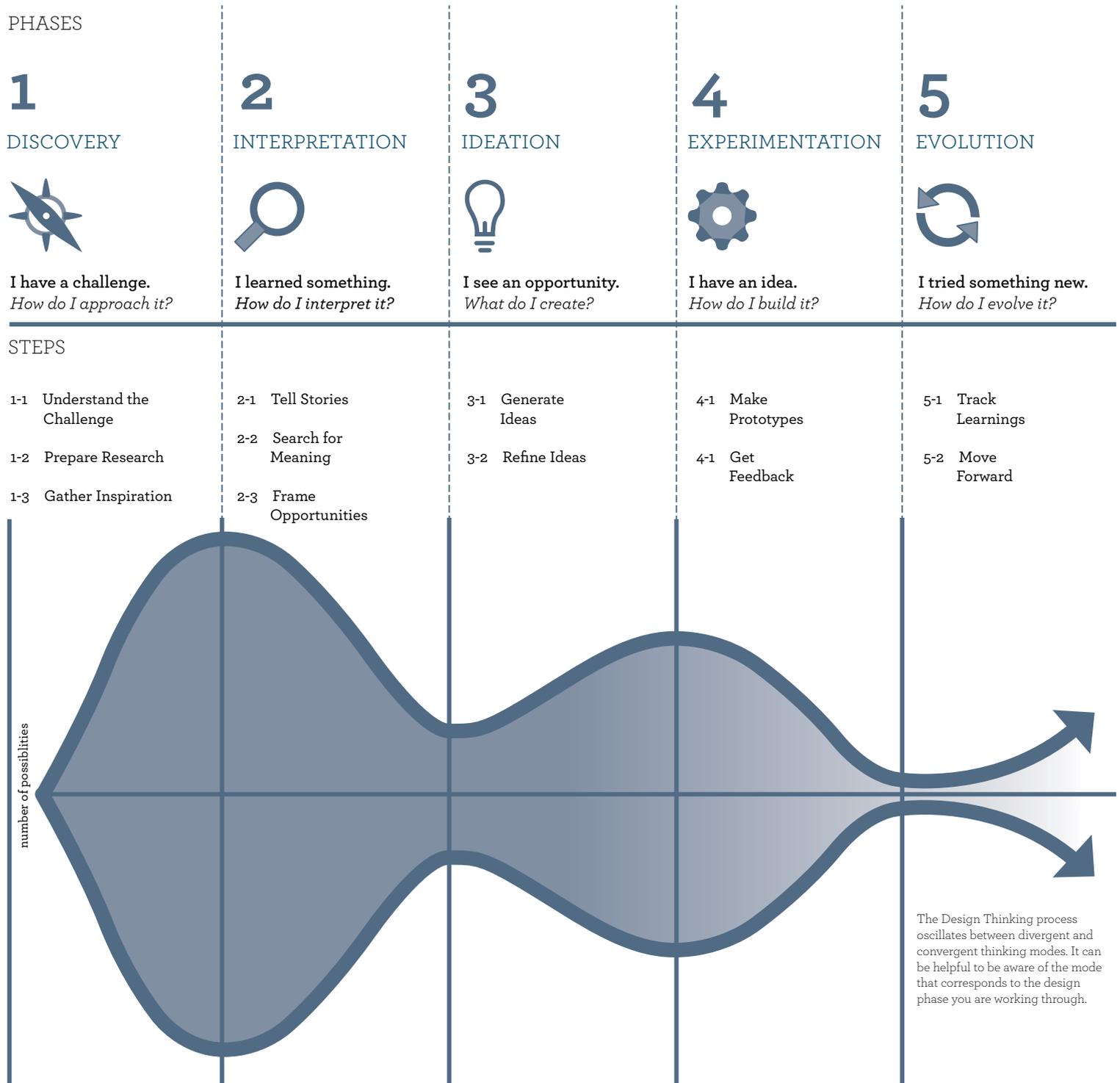


Illustration 1

Discovery is finding inspiration through empathy.

Creating meaningful solutions for students, parents, and educators begins with a deep understanding of their needs. Discovery is the process of observing and listening to users, in order to open up to new opportunities and get inspired to create new ideas. With the right preparation, this first step is eye-opening and provides a good understanding of the design challenge at hand.

Interpretation is uncovering patterns and insights.

Interpretation transforms stories from the discovery phase into meaningful, human-centered insights. Observations, field visits, or just a simple conversation can be great inspiration—but finding meaning in that and turning it into actionable opportunities for design is not an easy task. Interpretation involves storytelling, as well as sorting and condensing thoughts until there is a compelling point of view and clear direction for ideation.

Ideation is generating ideas.

Ideation is often done through structured brainstorming. Brainstorming encourages thinking expansively and without constraints—it is often the wild ideas that spark visionary thoughts. With careful preparation and a clear set of rules, a brainstorm session can yield hundreds of fresh ideas.

Experimentation is fast, iterative learning by doing.

While the goal of ideation is to generate many ideas, experimentation brings the most promising ideas to life. By building prototypes, ideas become tangible, and can be shared with others. When prototypes are early and rough, direct feedback can help further improve and refine an idea. Experimentation requires a bias to action—half-baked ideas are encouraged.

Evolution is refining a concept over time.

Evolution is the implementation stage of the design process. It involves planning next steps, communicating the idea to people who can help realize it, and documenting the process. With more feedback, ideas will continue to change and develop over time. Even subtle signs of progress are important to celebrate.

Other books, toolkits, articles, and resources describe the design process in different terms and numbers of steps. However, most descriptions include phases for learning, coming up with ideas, experimentation, and iteration. Other steps may include problem-defining, testing, and evaluation (Hasso Plattner Institute of Design at Stanford University, 2010; The K12 Lab Wiki, 2009). ‘Mind maps’ can be a helpful visual tool to encourage creativity in this process. As David Kelley explained,

When I want to do something analytical, I make a list. When I’m trying to come up with ideas or strategize, I make a mind map. Mind maps are organic and allow me to free associate. They are great for asking questions and revealing connections between seemingly unrelated ideas. I start in the center with the issue or problem I am working on and then as I move farther away I get better and better ideas as I force myself to follow the branches on the map and in my mind. The cool thing is that you allow yourself to follow your inner thoughts, which is different than making a list where you are trying to be complete and deal with data. (Bloomberg Businessweek, 2006).

The designer's mindset

To fully understand design thinking, both as a term and an approach to problem solving, considering the mindset of the designer is just as important, if not more, than understanding the design process. As Jane Fulton Suri and Michael Hendrix wrote, “effective design thinking entails more than applying design methods. To produce the best outcomes, organizations need to develop — and trust — people’s design sensibilities” (2010, p. 59). These sensibilities comprise the designer’s mindset, a set of beliefs and attitudes characterized by seeing challenges as opportunities for design (Brown, 2008, p. 87). When honed collectively, the designer’s mindset can give rise to a shared culture of practice through collaborative learning (Lave and Wenger, 1991, p. 95).

The importance of mindset may not be surprising to educators. Scholars suggest that mindsets often guide our behavior, both individually and in groups (Brooks, Brooks, & Goldstein, 2012). Consider, for instance, Carol Dweck’s growth mindset, the belief that talents can be developed through “hard work, good strategies, and input from others.” The contrasting view, a “fixed mindset,” is the belief that talents are inborn. Creativity, like most skills, can be learned and improved with practice. Dweck’s findings showed that students who believe intelligence can be developed (“a growth mindset”) performed better than those who considered intelligence set (“a fixed mindset”) (2006).

Dweck’s mindset is compatible with Tom and David Kelley’s creative confidence, which undergirds both the designer’s mindset and design thinking (2013). Creative confidence is “the natural human ability to come up with breakthrough ideas and the courage to act on them” (Schawbel, 2013). The outcome of practicing design thinking is a renewed belief in one’s creative abilities (Kelley & Kelley, 2013).

Though the world often divides people into creative and non-creative categories, research shows that people share an innate capacity to be creative and expand their knowledge (Dweck, 2006; Kelley & Kelley, 2013). Goldman et al. define “catalyzing social and epistemic mindshifts” as “epistemological viewpoints that help learners evolve their orientations to problem-solving” (2012). It is likely that embracing a designer’s mindset is reliant on such a mindshift (Goldman et al., 2012).

Four mindsets typically guide the behavior of a designer and offer the potential for encouraging a mindshift to design thinking: human-centered, collaborative, optimistic, and experimental (IDEO, 2010). By no means are these mindsets exclusive to design thinkers, and of course there are other mindsets on which design thinkers rely. A variety of problem-based approaches employ them, as well.



A human-centered mindset is a belief that meaningful and innovative solutions are rooted in empathy (Brown, 2008, p. 87).

Being human-centered is foundational to the mindset of designers (Brown, 2008). It creates inspiration for ideas and informs which solutions best meet people’s needs. A human-centered mindset starts with deeply listening, observing people in context, and going through experiences firsthand, to build empathy and understanding for the people who should benefit from the design effort (IDEO, 2010).

Buchanan called human-centered design “the major tenet of new design thinking: the central place of human beings in our work” (2001, p. 37). While many argue that all design is inherently human-centered, Buchanan helps clarify the need for explicitness:

We tend to discuss the principles of form and composition, the principles of aesthetics, the principles of usability, the principles of market economics and business operations, or the mechanical and technological principles that underpin products. In short, we are better able to discuss the principles of the various methods that are employed in design thinking than the first principles of design, the principles on which our work is ultimately grounded and justified. (Buchanan, 2001, pp. 36–37).

This human-centered design mindset likely resonates with educators, as education is an inherently human-centered pursuit. Though motivations vary from person to person and country to country, surveys show that most teachers enter the profession because of a passion for working with young people (Association of Teachers and Lecturers, 2015; Ashiedu & Scott-Ladd, 2012). But despite their human-centered intentions, many educators find staying focused on people a challenge within the system: educators are often constrained by the lack of resources, pressured by government bureaucracy, and often must satisfy stakeholders with diverging expectations (Cohen, 1988).

A human-centered approach brings people back to the center. This includes, of course, listening for the needs of students, but also teachers, administrators, and parents. Using a human-centered mindset to understand individual students’ experiences is especially meaningful as educators realize the benefits of personalized learning (U.S. Department of Education, 2010). “Tailoring learning for each student’s strengths, needs and interests — including enabling student voice and choice in what, how, when and where they learn — provides flexibility and supports to ensure mastery of the highest standards possible” (Abel, 2016).

Spotlight: Shadowing a student

One demonstration of human-centeredness in education came from the Shadow a Student Challenge (<http://shadowastudent.org/>), launched in February 2016 in a partnership of the Hewlett Foundation, IDEO, and the K12 Lab at the Stanford d.school. School leaders were invited to invest a day walking in a student's shoes, including sitting in student desks, fully participating in classes, and carrying backpacks full of textbooks. While the program targeted administrators in the U.S., it quickly spread to an approximately 30 countries, with more than 1500 school leaders taking the challenge. Many reported having gained a new level of understanding for what students experience in their schools.

I was struggling in math class...it felt like my own experience in HS math where I struggled as well. I named the struggle I was having...; it didn't matter that I was the principal, the students helped me figure out the problem. This reminded me of two things: I love school and learning, and we have nice kids.

— Eric Juli

Design Lab Early College High School
Cleveland, Ohio, USA

We take for granted what our kids know and feel. I was surprised at how little time we give them to reflect and create.

— Sean Gaillard

principal of John F. Kennedy High School
Winston-Salem, North Carolina, USA



Adrian Advincula, Principal of Irving Elementary School, Montana, USA, found that shadowing a student for a day provided him “insight in the positive and negative perceptions of our school through a child’s eyes”. Photo courtesy of Adrian Advincula



A collaborative mindset is an attitude that more minds are better than one (Brown, 2009).

A collaborative mindset starts with seeing the value in others' contributions to improve one's practice or solutions. This can include gathering a core team with diverse perspectives or including stakeholders, such as students, in the design process. Multidisciplinary teams frequently come up with more and better solutions than just one person working in isolation (IDEO, 2012).

Collaboration, however, does not mean including every person in a system in the same way. Often, a core team of two to five individuals can drive a design thinking process forward and intentionally include others at strategic moments. This may mean including people who tend to not have a voice in strategic decisions but have valuable insights to share, such as custodians, lunch service staff, or after-school providers (IDEO, 2010).

Many educators name collaboration as an aspiration for themselves and their students, but say they struggle to find the time and opportunity within constrained school schedules. Research supports the value of this practice; for example, educators in Shanghai – whose students outperformed all other nations in the two most recent PISA (Programme for International Student Assessment) exams – attribute much of their success to their collaboration, especially when it comes to exploring and spreading new ideas and practices (Tan, 2013).



An optimistic mindset is the belief in your own agency to create a different outcome.

Optimism is especially important to help educators see themselves as designers. First, it bolsters belief in themselves. Second, optimism can give educators hope that, even though many ideas may have failed in the past, solutions to seemingly intractable problems do exist.

Research suggests academic optimism may be one of the most important characteristics that impacts the overall teaching environment in schools (Beard, Hoy, & Hoy, 2010), leading not only to successful teaching and learning, but also to lower rates of teacher burnout (Lilly, 2006).



An experimental mindset is an attitude about learning through iteration and failure.

Experimentation as a way of learning and advancing an idea is a key part of the designer’s toolkit. An experimental mindset means being willing to “learn through failure” by trying small things early in order to learn from feedback, even when that feedback shows more work is needed.

More often than not, those experiments prove that you didn’t know what you thought you knew. And that through the process you’ve learned something unexpected. My advice to people who feel uncomfortable with the idea of failure is, don’t think of it as failure, think of it as designing experiments through which you’re going to learn.

— Tim Brown
CEO
IDEO
(Amorim, 2015)

Experimentation is different from piloting, which involves a carefully detailed plan to test an already evolved idea. Experimentation involves creating several low-fidelity prototypes, often called rapid prototyping, which is faster and more iterative than piloting, with ideas or practices changing and improving with every iteration.

Experimentation as “learning by design” is not new in education (Ball and Cohen, 1999; Borko, 2004; Edelson, 2002; Elmore and Burney, 1999; Garet et al., 2001). Kohler et al. wrote that such experimentation provides teachers both with opportunities to try out new ideas, tools and subject matter and with contexts to reflect on their learning (2011, p. 152). The use of prototyping is relatively common in STEM education (Brophy, Klein, Portsmore, & Rogers, 2008), though less-so elsewhere. The current maker movement is encouraging the use of prototyping in other places in education (Blikstein & Krannich, 2013; Martin, 2015).

Both experimentation and prototyping can be challenging for teachers to embrace in the classroom. More often than not, teachers feel they are expected to plan in detail and know the answers to avoid what parents might perceive as “experimenting on their kids”. But experimentation serves as an effective mechanism for avoiding the risk of implementing the wrong idea; it is also an important mindset for students to learn as they prepare for their own future.

Design thinking in the context of educational practices and pedagogies

Dewey’s vision for education (1915), particularly his concern that young people and their learning actively involve problem-solving in the world outside the classroom, is immense. It offers a constant thread in problem-based learning, enquiry-based learning, and project-based learning. Efforts to apply design thinking in educational settings typically reference back to Buchanan’s (1992) rooting of design thinking in the philosophy of Dewey (Goldman & Kabayadondo, 2017; Estrada and Goldman, 2017; Melles et al., 2015, pp. 190–191). As such, overlap among the various approaches exists (Holland, 2016; Anderson, 2013; Scheer, Noweski, & Meinel, 2012). Yet, as Melles et al. suggested, the capacity of design thinking “to complement existing pedagogies and provide inspiration for change and innovation” is a strength (2015, p. 15).

A great deal has been written about problem-based learning (PBL), inquiry-based learning (IPL), and project-based learning. We encourage practitioners to focus on how design thinking complements these existing pedagogies; yet we recognize interest in clarifying differences. Thus, we consider several distinctions between design thinking and these pedagogies.

Design thinking is wedded to “thinking and doing,” and it is framed by how designers think and act (Brown & Katz, 2009). It employs “designerly strategies” (Melles et al., 2015, p. 193) to a broad spectrum of problem solving. Second, design thinking approaches problem solving through a discovery process that is not “problem specific” or necessarily linear. It encourages observing and listening to people as a way to locate new opportunities and inspiration for creativity and innovation (see Illustration 1). Design thinking is also rooted in addressing challenges based in the real world. While the word ‘problem’ is often used with design thinking, the approach is more ‘challenge’-based and accepting of multiple outcomes or solutions. PBL and IPL, however, favor starting with a specific problem. Design thinking taps into all participants’ skills as potential leaders and facilitators. Both PBL and EPL tend to put the teacher or educator at the center of problem solving, serving as the facilitator asking and framing challenges, questions, and forms of resolution. This engages a hierarchal structure that design thinking works to avoid (IDEO, 2010). Project-based learning stands apart from PBL and IPL for its “scenario-driven, prototyping strategies of design education” (Davis & Littlejohn, 2017, p. 22) and is perhaps most similar to design thinking. Project-based learning also differs from PBL and IPL in that it tends to be multidisciplinary, longer lasting (i.e., weeks or months), based on a framework (i.e., a step-based process), and produces an end product or performance grounded in the real world and authentic tasks (Larmer, 2015). These traits are similar to design thinking. However, the mindsets that underlie design thinking (i.e., empathy and optimism) (discussed below) are not necessarily part of project-based learning (Wise, 2017, p. 110).

The changing ethos of design thinking

In comparing approaches of design thinking, we note a consistency rooted in the work of Buchanan (1992), with an anchor to Dewey (1915). For Goldman and Kabayadondo, extending design thinking to K-12 education highlights Dewey's expansive "vision of schooling as a transformative space for creative and collaborative inquiry" (2016, p. 4).

Kimbell documented the changing ethos of design thinking, from a cognitive style (problem solving), to a general theory of design (taming wicked problems), to an organizational resource (innovation) (2011, p. 297) (see Table 1). We see design thinking as a fluid approach and find value in combining different ways of describing and applying it (i.e., solving wicked problems through innovation).

Kimbell noted the term's recent emphasis on "the intangible work done by designers" (2011, p. 289), which further contributes to its ambiguous nature. Badke-Schaub et al. expressed concern that design thinking could be "a paradigm on its way from dilution to meaninglessness" (2010, p. 39). Researchers point to IDEO and Roger Martin, dean of the Rotman School of Management in Toronto, for the change in definition (Kimbell, 2011; Melles et al., 2015), with some criticizing popular accounts of design thinking for ignoring extensive research on how designers work (Kimbell, 2011; Badke-Schaub et al., 2010; Cross, 2010; Dorst, 2010; Tonkinwise, 2010). Such criticism highlights the approach's tenuous balance between academic scholars and practitioners. The embrace of design thinking by university innovation labs, business schools, nonprofits, and now K-12 settings have likely further contributed to both the popularity and "dilution" of the term (Kimbell, 2011; Badke-Schaub et al., 2010, p. 39).

	Design thinking as cognitive style	Design thinking as a general theory of design	Design thinking as an organization resource	Design thinking as a resource to education settings
Focus	individual designers	design as a field or discipline	businesses and other organizations in need of innovation	K-12 settings, universities, and colleges in need of innovation that responds to changing student needs
Design's purpose	problem solving	taming wicked problems	innovation	develop and apply skills and mindsets needed to solve wicked problems through innovation
Key concepts	design ability as a form of intelligence, reflection-in-action	design has no special subject matter of its own	human-centered, collaborative, visualization, prototyping	human-centered, collaborative, optimistic, experimental, empathetic, integrative thinking
Nature of Problems	design problems are ill-structured, problem and solution co-evolve	design problems are wicked problems	organizational problems are design problems	educational problems are wicked problems steeped in varying social contexts
Sites of expertise and activity	traditional design disciplines	four orders of design	any context, healthcare to access to clean water (Brown and Wyatt, 2010)	K-12 and higher education settings open to experimentation and change
Key texts	Cross 1982; Schön, 1983; Rowe, 1987; Lawson, 2006 [1987]; Cross, 2006; Dorst, 2011	Buchanan, 1992	Dunne and Martin, 2006; Hasso Plattner Institute of Design at Stanford. (2007); Brown, 2009; Martin, 2010; Kelley & Kelley, 2013	Golman and Kabayadondo, 2017; IDEO, 2012; Mau, et al., 2010

Table 1. The evolution of describing design thinking.

Source: Based on Kimbell's "different ways of describing design thinking" (2010), with the addition of design thinking as a resource for education settings.

Potential barriers to successful integration of design thinking

Questions will inevitably arise about whether and how design thinking can work in certain circumstances, systems, and with varying resources. Researchers and practitioners are working to address such questions. Yet, the following could act as barriers to widescale application of design thinking to learning in K-12 settings:

- **Confusion about design thinking.** As a flexible approach, design thinking has been enthusiastically embraced by multiple disciplines (i.e., architecture, business, engineering, and of course design). Thus, it is open to confusion, misconception, and loss of meaning. Yet, the approach relies on a unique process built on particular mindsets. While these elements may differ subtly among disciplines, they do exist and give a unifying framework to design thinking. Two common misconceptions, in particular, stand out: “design thinking is what we have always done” (as opposed to recognizing how design thinking is complimentary, and enhances other approaches), and “design thinking is mostly used to generate a lot of ideas” (as opposed to using the approach to develop ideas into really good ones and then into reality, i.e., final outcomes). As such, a need exists for researchers and practitioners to communicate clearly what design thinking is and is not.
- **Perception that design thinking is easy and can be done without training.** While anyone can learn design thinking, training and experience is needed to apply it well and consistently, particularly in K-12 settings, where multiple variables exist. Workshops and popular press accounts of design thinking being learned in an hour or less have contributed to the view that design thinking is an easily applied cure-all, or that questions its potential for impact. As Tim Brown wrote, “Now that design thinking is everywhere, it’s tempting to simply declare it dead—to ordain something new in its place.” However, success with design thinking means success “not just [as] practitioners, but [as] masters of the art,” or the approach of design thinking (2015, n.p.). Future efforts to bring design thinking to education will need to include guidance on what mastery looks like, and how it can be achieved.
- **Misunderstanding of design thinking as an approach that lacks rigor.** With biases toward optimism, empathy, and action, design thinking can strike some researchers and practitioners as naive, or lacking rigor. Additionally, a cultural tension between K-12 practitioners and general design thinkers may be at work. Educators are trained to be critical and see value

in finding “what’s wrong.” As such, it may be difficult for some to strike a balance between critical analysis and criticism while still embracing creativity. It is important that the communication of, and training in design thinking includes accounts of the rigor that guides exploration, synthesis, and iteration, while also emphasizing and encouraging experimentation.

- **Scarcity of guidelines, best practices, and training for applying design thinking to K-12 settings.** Educators need scaffolding, training, and feedback in order to apply design thinking in meaningful and sustainable ways that also address the needs of individual countries and contexts. Efforts to formalize design thinking, particularly as part of educators’ training, would both encourage and lend credence to the approach, while offering researchers a focal point for empirical study and critical analysis.
- **Skepticism around sustainability and alignment.** All of these potential barriers can contribute to skepticism that hinders buy-in throughout an educational system. This can be exacerbated by the view of some educators and researchers that design thinking is an ‘outsider approach’ (i.e., an approach for designers or business leaders) and not truly appropriate to the field of education.

Challenges and opportunities: How do we meet students' evolving needs?

Innovation has always been part of education. Schools must continually find ways to respond to shifts in social, economic, and technological ideals, sparking questions like who should have access to education, what will happen as classroom demographics change, or how new devices might support learning (Graham, 2005; Tyack & Cuban, 1995).

However, the pace at which the world is changing is increasing dramatically, and so is the complexity of preparing students for the future. Researcher Cathy Davidson wrote that 65 percent of children entering grade school in 2011 will end up working in careers that have yet to be defined (2011, p. 18). Additionally, as Richard Riley, former U.S. Secretary of Education, pointed out, tomorrow's jobs "will require workers to use technologies that have not yet been invented to solve problems that we don't yet even know are problems" (Gunderson, Jones, & Scanland, 2004).

An implication of this unknown future is that education may need to shift from its current emphasis on transferring existing knowledge to students, or "knowing," to fostering learning agility, creativity, and adapting to change (Araya & McGowan, 2016). In other words:

We need to equip today's students not just to navigate an unknown and complex world, but to reimagine that new world and lead the way. We need change-makers.

Thinking and acting as a designer are powerful ways to make change and, at the same time, foster change-makers. Regardless of what craft designers focus on (architecture, interaction design, graphic design, etc.), they take in information about the world and synthesize it into new, tangible solutions for others to experience. Design thinking is an outgrowth of the designer's approach to creation. Because it helps to redefine problems, inspire new ideas, instill confidence by taking informed risks, and propel continuous learning through implementing and evolving solutions, design thinking offers many opportunities for meeting students' educational needs. In the following chapters, we will share the stories of students and educators across the globe who are using design thinking to build their creative confidence.

Chapter 2

Design Thinking for School Design: How education systems might be re-imagined



We talk about creating a student-centered school, and so often in education, we don't have the time or we think about it later to include students. To me, the only way you can create a student-centered school is to have students at the center of the design process.

— Kerry Tuttlebee
principal
360 High School
(Business Innovation Factory, 2015)

Like all communities, East San Jose is comprised of a distinct set of family circumstances, cultures, beliefs, and experiences. Before designing anything we needed to clearly understand our students' and families' needs within this context, not as we interpreted them, but as they did through their experiences.

— John Glover & Will Eden
founder & principal
Alpha Cindy Avitia High School
(Alpha Public Schools, 2014)

For schools to truly meet the needs of a changing global environment, we need to ask, 'How do our schools and systems need to change?'

Many of our schools and education models were created decades ago and still cling to outdated notions of what is best for students' education.

Certainly, many schools are innovating within existing structures and systems. But sometimes there is a special opportunity to design a school from scratch. New school systems, which include everything from physical buildings and teacher training to daily schedules and routines, offer a profound way to reimagine education. New school systems like the ones examined below offer clear examples for what is possible, especially when they reconsider fundamental assumptions about how to best meet student needs.

The process and mindsets of design thinking offer an integrative approach to designing schools so that all parts of the system fit together, creating coherent guidance for the curriculum team that sets up the pedagogical approach, the architect who designs the building, and the team that makes key hiring decisions, creating a symbiotic relationship between the individual parts.

The following examples of school designs illustrate how the process and mindsets of design thinking are used to reimagine the environments, delivery methods, and facilitation of learning.

Design with, not for, community

Developing a new school model requires countless interconnected decisions, including school mission, bell schedule, professional development, and the financial and operational models. Finding a strategic starting point to guide decision-making can be challenging. Thinking and acting like a designer when approaching the design of a school or school system means finding your strategic anchors in the needs and desires of people. All cascading decisions can then be grounded in that empathy. When designing a school, this involves a focus on the needs of students. Yet schools are complex ecosystems with many stakeholders, including parents, teachers, administrators, staff, funders, policy makers, and community members.

An effective way to engage stakeholders is to deeply collaborate—to design with, not for—in order to develop inclusive ideas where everyone feels a sense of ownership. A design team made up of students, teachers, and community members, for instance, came together in Providence, Rhode Island, for a radical approach to designing a student-centered school made possible by a partnership with the Business Innovation Factory, Youth in Action, the Providence Public School Department, and the Rhode Island Department of Education, with support from the Carnegie Corporation of New York, the Nellie Mae Education Foundation, and the Rhode Island Foundation.



Students, teachers, and community members provided feedback throughout the school design process. Photo courtesy of BIF Student Experience Lab.

A steering committee comprised of students reviewed and gave feedback on the design team’s work, and students and team members were coached in the design thinking process, which guided the school-model creation process (Springpoint Schools, 2015).

Across the country in East San Jose, California, parents in a predominantly Latino community were dissatisfied with their community’s secondary school options and wanted to create a new high school for their kids. The school founders recognized the importance of understanding the parent perspective within their unique cultural context, and decided to include communities in their design process that had been marginalized or not historically included in major decisions that affected them. Will Eden, the school’s first principal, recruited and assembled a volunteer team of parents, teachers, high school students, and community members to co-design a school model that better prepared students for higher education. Team members were trained in design thinking and embarked on an intensive design process to create the school. Alpha Cindy Avitia High School, which opened in 2015, is the result of this work.



High school students participated in regular brain-storming sessions when imagining the new school. Photo courtesy of Will Eden

A decade earlier, another team of entrepreneurs, Fred Swaniker and Chris Bradford, used a similar approach to a similar education challenge. While based at the Stanford d.school, they wanted to design a school to educate a network of future leaders throughout Africa. The school would grow leaders to tackle some of Africa’s greatest challenges and accelerate the continent’s growth. Swaniker and Bradford, too, chose a design thinking approach:

We believe a human-centered approach to entrepreneurial leadership is key for Africa’s growth.

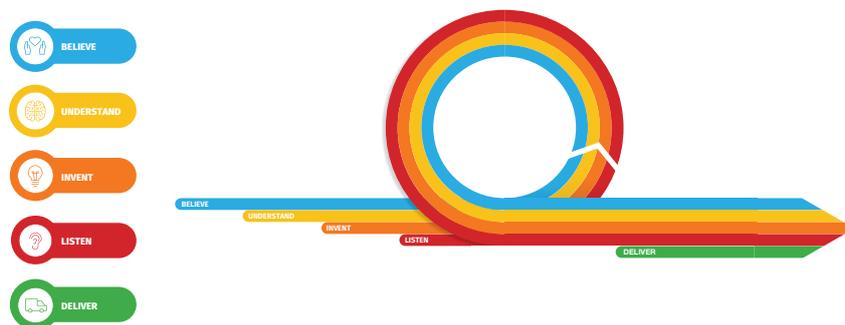
— Dave Tait
director of entrepreneurial leadership
 African Leadership Academy
 (Olukotun, 2012)

Yet designing this school for Africa, “a place where thousands of languages, tribes, and cultures span boundaries of 54 countries made long ago by European conquerors,” posed a complex challenge. The founding team therefore decided they needed to add a cultural competency lens to the design process to prevent any perception of “outsider knows best” (Findley, 2016).

These attributes of cultural competence are especially important when designing for diverse communities. In its Good Practice Guide, the New South Wales (NSW) Department of Community Services (2005) underscores that “whilst all children, young people and families are characterized by diverse needs, backgrounds and experience, these are more pronounced for those from culturally and linguistically diverse backgrounds, and thereby require specific strategies to ensure appropriate and equitable outcomes.” It defines competency as “sensitivity, knowledge, skills, actions, and awareness of one’s own biases.”

Swaniker and Bradford adapted the design thinking process for the African context by developing the BUILD (Believe – Understand – Invent – Listen – Deliver) Model, which places extra emphasis on understanding biases, assumptions, and historical context. BUILD is a major part of how ideas are developed and tested at the African Leadership Academy (ALA), which launched in 2008 (Mbazo, 2014).

**human-centered entrepreneurship:
 The BUILD Process**



© 2008 African Leadership Academy



Believe Output: INSPIRATION

Entrepreneurs must BELIEVE that they have the power to change the world around them and must embrace a mindset of continual improvement.

Understand Output: NEEDS

Before designing solutions to meet needs of the community, entrepreneurs must build deep empathy to UNDERSTAND both individuals they are designing for and the system in which they reside.

Invent Output: IDEAS

To meet needs, human-centered innovation requires a cyclical process to arrive at the right idea. Entrepreneurs INVENT a wide range of possible solutions, making them tangible through prototyping.

Listen Output: FEEDBACK

Then entrepreneurs LISTEN to feedback from potential customer and other stakeholders to iterate and improve these solutions.

Deliver Output: OPPORTUNITIES

Solutions are evaluated for viability and long-term sustainability to discover which are true opportunities. Entrepreneurs DELIVER these solutions by mobilizing resources, venture planning and leveraging networks.

ALA’s BUILD framework adapts the design thinking process for the African context. Illustration courtesy of African Leadership Academy.

As we've integrated BUILD into almost every element of ALA — including staff development, student discipline and college applications, amongst other things — the human-centered approach has marked our organization.

— Ryan Findley
leadership architect
 African Leadership University School of Business
 (2016)

By following the design thinking process, the school designs of 360 High School, Alpha Cindy Avitia High School, and the African Leadership Academy are rooted in and responsive to the needs of students, as well as parents, teachers, staff, community members, and other stakeholders.

Question assumptions

One of the most powerful skills designers employ is the ability to question assumptions. Instead of presuming to know the answer or even the root of the problem, designers often step back and ask, “Why?”, “What if...?” and “How might we...?” As Susie Wise (2016), director of the Stanford d.school K12 Lab Network, explained, “challenging assumptions steers you in the direction of more effective policies and practices because you are willing to see things differently.”

People often base their assumptions about what a school is on their own educational experiences or the schools they have seen. These assumptions might include an early morning start time, textbooks, or a teacher at the front of a classroom. There is probably a lunch period, rows of student desks, and a summer break. Perhaps there are grades, lockers, and a reception office.

While these elements are common, are they still what students need? What might school look like if we question even the most basic assumptions? What if we rethink the entire experience in order to deliver on our goal of ensuring that every student is prepared for college, career, and life?

Questioning assumptions was at the heart of XQ: The Super School Project, incubated by the Emerson Collective. Project leaders invited people across America to think and act like designers (XQ Super School, 2017). The year-long contest has become the “largest open call in history to rethink the American high school.” To activate radical innovation, the project provided tools to help teams move through a student-centered design process. The contest also offered incentives of \$10 million in seed funding for winning entries to implement their ideas. XQ required teams to “scrap the existing blueprint, which clearly isn’t working, and start from scratch, harnessing the power of experiential design and innovation to build a super school” (SYPartners, 2016). As Alec Resnick, a XQ SuperSchool Challenge winner explained, the Super School Project highlighted “just how ridiculously hard it is to start a new public school that substantially rethinks the basic assumptions behind school” (Next Generation Learning Challenges, 2016).

Nearly 700 self-assembled teams from 45 states took part in the movement. Teams were guided through a series of knowledge modules, helping them consider thirteen vectors of school design, including the science of adolescent learning, student agency and engagement, time, space, and technology (XQ, 2016b). Student voice anchored all of the work—educators listened to students in student roundtables, community-led summits, town halls, and approximately 2,000 testimonials (XQ, 2016c).

In the end, XQ chose ten teams based on its goals of brand-new high school models that are diverse, academically rigorous, radically inventive, and practically implementable. The XQ Super School’s initiative worked to demonstrate possibilities for transformational school concepts that others might apply elsewhere, spreading a sense of possibility and tangible solutions across the globe.

Spotlight: Ten innovative school models

Ten teams out of 700, representing 45 U.S. states, were designated as America’s first future Super Schools in the XQ: The Super School Project, which promoted the skills and process of design thinking (XQ, 2017). Each of these design teams decided to reject traditional assumptions of how schools are designed, and used design thinking to reach tangible outcomes (XQ, 2016a):

Schools questioning where learning takes place and what school looks like

A school on a barge

New Harmony High School (New Harmony, Louisiana) will teach students real-world skills related to coastal restoration and urban planning with immersive classes in the wetlands of Plaquemines Parish.

A school in a museum

Grand Rapids Public Museum School (Grand Rapids, Michigan) plans to renovate the 80-year-old Grand Rapids Public Museum, making its collection of 250,000 cultural and historical artifacts the basis of its rigorous high school curriculum and project- and place-based learning environment.

A school on wheels

To accommodate more homeless students and foster children, RISE High School (Los Angeles, California) will have a bus outfitted with a “mobile resource” system to travel to students, physical sites that share space with existing nonprofits, and an online learning platform.

Schools questioning what topics and skills are important for students to be learning in today's world

A place-based curriculum

Furr High School (Houston, Texas) will integrate more place-based, project-based, and environmental stewardship into its curriculum.

A bridge to career

Brooklyn Lab High School (Brooklyn, New York) plans to partner with local nonprofits, cultural institutions, businesses, and universities to give students career experience.

A design lab

Design-Lab High School (Wilmington, Delaware) has design thinking baked into its DNA to teach students a curriculum of STEM (science, technology, engineering, media, and design).

A school of tech creators

Washington Leadership Academy (Washington, D.C.) hopes to encourage students to be creators of technology, not just consumers of it, by requiring them to take four years of computer science.

Schools questioning the one-size-fits-all model of traditional school design by putting students in the driver's seat.

A radically personalized school

Vista High School (Vista, California) plans to spread rigorous personalized learning, "authentic examination," and flexible learning environments that extend beyond the four walls of a traditional program.

A technology-enabled process

A partnership between California College of the Arts and Oakland Unified School District, Summit Elevate (Oakland, California) will truly put students "in the driver's seat" of their own educations, supported by a personalized learning platform.

School all-year-round

Nonprofit Sprout & Co is teaming up with Somerville Public Schools to create the year-round Powderhouse Studios (Somerville, Massachusetts) school, where students will pursue projects of their interests supported by a social worker, curriculum developer, and personal project manager.

Learn what works through prototyping

One approach to starting a new school is to find a model that has been proven to work and replicate it in a new setting. Yet this approach assumes that a model working in one setting will work in another. School leaders know the unique needs of their students and community—and school models are most effective when they are tailored to their specific socioeconomic, cultural, and geographical contexts. Through design thinking, teams can learn what works through prototyping each part of a school design, rather than taking an all-or-nothing approach to choosing a model (Candler, 2015).

With countless unknown, interconnecting questions, school design greatly benefits from quick cycles of experimentation. 4.0 Schools in New Orleans, Louisiana, a nonprofit incubator that invests in and supports educator-created ventures, developed a new approach to school design, rooted in design thinking and rapid prototyping.

Through the Tiny Schools Project, an initiative of 4.0 schools, cohorts of entrepreneurs receive training in design thinking. School concepts are tested at a radically small and scrappy scale with ten to fifteen students, once or twice a week for two to 12 months, in borrowed spaces. With this iterative approach, the entrepreneurs get constant feedback from students and families, which feeds directly into planning for a full-scale school.

If we're going to rethink school for the twenty-first century, we need to rethink how we create schools. Innovative schools coming out of the Tiny Schools Project will be battle tested and ready to scale based on clear evidence of success.

— Matt Candler
founder & CEO
4.0 Schools
(2015)

4.0 Schools and the Tiny Schools Project¹ are taking place within a broader “micro-schools” movement in the United States with the launch of schools like AltSchool, Acton Academy, and Khan Lab School (O’Connell, 2014). The origins of this movement are connected to the UK, where small independent schools termed micro-schools have surfaced over the last decade in response to a dissatisfaction with the educational status quo (Horn, 2015). With their small scale, each school is essentially an R&D lab for school innovation that responds iteratively to the needs of the student.

¹ To date, five full-scale schools have launched out of the Tiny Schools Project, including Bricolage Academy, NOLA Micro Schools, Rooted School, The Noble Minds Institute for Whole Child Learning, and 1881 Institute.

Spotlight: Rapid prototyping



After a few pop up versions of Bricolage, Josh Densen worked with a local charter school to run a recurring pop-up at their campus. Photo courtesy of Bricolage Academy of New Orleans

When Josh Densen, a parent of two, was thinking about starting a new school, he got inspired by agile development, a rapid and incremental approach to software creation. Densen wanted a way to test small aspects of a school idea before launching an entire concept. A crazy idea emerged. What if we used a food truck to test school ideas in a low-risk, high customer engagement way? How might we approach school design like opening a new restaurant?

To find answers to these questions, conversations with parents took place in living rooms, libraries, community centers, and churches. Richard and April Johnson organized some of those early sessions, where two clear needs emerged—socioeconomic diversity and a focus on creative thinking.

Knowing that our son would have a diverse group of friends from different cultures and backgrounds, friends who looked like him and didn't look like him — that was a big thing [for us as his parents]. It's hard to prepare kids for the unknown of the future, but we can prepare them with how to problem solve and how to face new circumstances.

— April Johnson
Bricolage parent
(Bricolage Academy of New Orleans, 2016a)

Armed with these insights, the idea for Bricolage Academy, a charter elementary school, began to emerge. Densen then launched guerilla marketing events to get as much feedback as possible while raising parents' awareness of the idea. He brought toys that might help kids build creative confidence, and listened to parents while their kids played.

After trying out a single “pop up classroom” to test ideas, Densen and his team determined they needed more regular class sessions. So once a week, they held their pop-ups at a local charter school, which drew students from a low-income area. They also brought in six kids who didn’t attend that school to participate. By running classes, Josh was able to articulate insights not only about how the curriculum developed creativity, but about how to manage a classroom with socioeconomic diversity.

Through this iterative, human-centered process, Densen created a new school model that is focused on equity and innovation. Today, through participation in innovation classes and presenting at the New Orleans Mini Maker Faire, students at Bricolage learn twenty-first century problem-solving skills at one of the most diverse schools in New Orleans (Candler, 2016; LA School Finder, 2016).

Participants in those early meetings looked ahead to a world where comfort with diversity and experience with innovation are essential to personal achievement and the well-being of communities... Every day at Bricolage, students question, discover, collaborate, and create. We put innovation into action.

— Josh Densen
founder and executive director
Bricolage Academy of New Orleans
(2016b)



The school founders tested key ideas in “pop-up classrooms” before expanding to regular class sessions. Photo courtesy of Bricolage Academy of New Orleans

Design for scale

While some schools are starting small, others are being developed at the opposite end of the spectrum. Design thinking can also be used to conceptualize systems at scale. Peruvian entrepreneur Carlos Rodriguez-Pastor, CEO of business group Intercorp, approached IDEO with an ambitious goal: to grow Peru’s middle class. To do this, Rodriguez-Pastor wanted to create a network of schools that delivered a high-quality, international education to Peru’s underserved youth. The challenge was immense. Peru ranked last in the Program for International Student Assessment (PISA) out of 65 countries (OECD, 2012). Rodriguez-Pastor wanted to raise the country’s education level and develop a model that would scale rapidly.

Approaching this systems challenge with a human-centered approach, a multi-disciplinary team of designers from IDEO collaborated closely with a large group of stakeholders — everyone from parents to first-time teachers to the Ministry of Education — to understand what excellent education means in Peru, and what constraints might hinder scalability. These constraints became the basis of the team’s creativity — instead of designing the perfect model for one school and seeking to replicate it, the team designed the model to work when there might be 70, or even 200 of these schools.

The team developed a concept including a learning model and strategy for scale that utilizes blended-learning, modular and flexible spaces, and tools and training to support teachers. This holistic, human-centered approach to school design resulted in a K-12 learning experience that is affordable, scalable, and excellent.

The Innova school system is considered one of Latin America’s most ambitious privately-funded educational projects. After just its first year, Innova students scored well ahead of national averages on state tests: 61 percent achieved proficiency in math and 86 percent in literacy (Quattrocchi, 2014). Today, the system includes 41 schools across Peru that serve more than 32,000 students.



A blended learning approach combines self-directed learning and group time.
Photo: IDEO

While schools like Innova used design thinking to create a blueprint, they continue to be in a state of continuous innovation, growing, changing, and evolving as the needs of students, schools, and society at large change.

For example, Innova’s initial teacher training was carefully designed for teachers who were brand-new to teaching, since most new recruits were recent university graduates. But a few years into the program, some of the teachers needed more advanced training. So Innova rethought their teacher training program and introduced a new, tiered approach that would provide a career navigation system and incentives for teachers.

Approaching school design with a human-centered lens and a goal of systemic change opens up opportunities for impact at scale. Whether developing one school, a whole network, or iterating on an existing model, the design thinking approach starts with optimism to approach daunting challenges, engages diverse communities of stakeholders, roots decisions in human needs, and develops and validates ideas through experimentation.



Today, the model has been scaled to a system of 41 schools across Peru that serve more than 32,000 students.
Photo: IDEO

Challenges and opportunities: How do we keep innovation in perspective?

Designing whole schools and systems can redefine expectations how teaching and learning look, which can shape the perceptions, outlooks, and attitudes of everyone who walks in the door. Integrating community needs from day one promotes a more vested interest in a school's success.

Opportunities to design new schools and entire systems may not come around often, but they have a profound impact on the sector through their ability to push the boundaries of education. This is one of the most powerful and comprehensive ways to affect change for the next generation. Given the importance of this approach, there are many exciting opportunities that we can consider as systems design gains momentum in education. Among them are the following:

1. **Balancing human-centeredness:**

How might we understand the needs of all stakeholders in a system while holding the needs of students paramount?

Design thinking is focused on the needs of people, which, in the case of schools, is mostly students. When designing a complex system like a school, though, it is important to take into account the needs of those around the student as well, including teachers, administrators, staff, policy makers, et al. This can also reveal constraints, such as the limitations of teacher experience, and the political contexts, which may have an influence on the best implementable strategies for students. However, it can be challenging to balance and sift through the many competing needs of different stakeholder groups.

2. **Balancing context sensitivity with scale:**

How might we understand the conditions at scale while simultaneously respecting local value?

While new approaches to education need to be developed with an eye toward scale, it is the adaptation to a specific context that can make all the difference. There is no shortage of good or new ideas in education, and design thinking is often misunderstood as an idea-generating mechanism first and foremost. Its value, though, is the choice, iteration, and adaptation of ideas to the specific needs of the people they will impact. It can be a challenge to find the right balance between the focus on localization versus scalability especially in education, where often, educators perceive their school environment as highly individualized, while the sector calls for solutions that can impact many.

3. Knowing what works:

How might we distinguish between what works and what needs to change?

It sometimes may seem as if everything needs to be redesigned, but many aspects of schools work well, at least for now. The question is which ones? And for how long? What's needed are mechanisms to determine what to redesign and what to keep intact.

Every school year at Riverside School in Ahmedabad, India, the staff review each element of the school and ask whether the design still has the same value it had when it was conceptualized. As Kiran Bir Sethi, the founder of Riverside, explains, “We don't change for the sake of changing. We ask, ‘Is this shift actually making a difference in the user experience?’”

Developing such approaches further is especially important for school change that happens within existing schools that cannot start with a blank slate.

4. Sustaining continuous development:

How might we plan for the long arc of school design?

Many of the vignettes featured in this chapter were born out of national challenges launched from organizations such as XQ, the Bill and Melinda Gates Foundation, or 4.0 Schools. These organizations have found ways to structure contests and programs to encourage people to think and act like designers to get to new solutions for schools and classrooms. Foundations, nonprofit organizations, and governments can catalyze these human-centric approaches to designing innovative schools. Often this means the solutions, however, are not proven, so continuous learning, innovation, and iteration will need to be supported. Such long-term investment is not always granted, and especially important since it can take years before changes in the impact on students' trajectories become evident.

Chapter 3

Design Thinking for Transforming School Culture: Changing how adults work together



Design Tech High School (d.tech), a free public charter school in Burlingame, California, created a “playbook” for change management where teachers and administrators work together to solve school-level challenges. During intersessions, staff members come together to do “design sprints,” or rapid design challenges, working toward improving how the school responds to students’ needs. So far, challenges have included how to onboard staff, designing student presentations, and creating better structures around individualized learning.

We like to say, ‘Everything has an expiration date.’ If something isn’t working, it gives staff members a sense of, ‘It’s okay, we can iterate on it or go in a different direction.’

— Melissa Mizel
English teacher
Design Tech High School

Ken Montgomery, founder and executive director of d.tech, says that **teachers may not think of themselves as designers, or want to continually make changes.** But that misses the point. The purpose of design thinking, in his mind, is to meet students’ needs, not change for the sake of change.

Changing culture is not easy in any organization. Transforming school culture in K-12 environments can be particularly challenging, but is necessary in many schools today to create learning experiences that meet student needs. Without a responsive culture, introducing design thinking as a way to support innovation in educational settings can be especially challenging. As researchers have noted, the vision for schools fostering twenty-first century skills, including design thinking, has yet to be translated into general practice (Koh, Chai, & Lim, 2015). Teachers’ conceptions of learning, as well as curriculum, often lag behind this vision (Ertmer & Ottenbreit-Leftwich, 2013; Mioduser, Nachmias, Tubin, & Forkosh-Baruch, 2003; Koh, Chai, & Lim, 2015).

A mix of factors, including educational legislation and policies, school administration, classroom practices, and student characteristics (notably ways of working, social routines, and participation), can confound efforts to change a school’s culture (Zhao & Frank, 2003; Chai et al., 2014; Kershner et al., 2014). In particular, macro and mezzo levels — what Porras-Hernández and Salinas-Amescua explain as sociopolitical environment and policies (macro) that form the school level (mezzo) — should not be underestimated when working to change a school’s culture (2013). Macro and mezzo levels contribute to a “contextual perspective” that, in turn, may form individuals’ “design frames for pedagogical change” and willingness to modify those frames (Koh et al., 2015, p. 87). Within these levels are local actors, including administrators, school and community leaders, teachers, and others, who can encourage or hinder change in educational systems (Weinbaum & Supovitz, 2010).

To move schools, their ecosystems, and communities toward cultural change, Penuel et al. highlighted the potential of collaborative design that focuses on challenges of practice as a way to develop effective programs, revamp

ineffective or stalled programs, help school districts better support teachers in their efforts to improve instruction, and build system capacity (Penuel, Fishman, Cheng, & Sabelli, 2011). Koh et al. considered this approach along the reliance on “design frames,” explaining that “through the management of design framing, teachers can potentially transform contextual constraints into opportunities” (2015, p. 105).

Culture comprises the shared mindsets and behaviors that guide the interactions of a group. Thus, transforming culture through beliefs matters on both the individual and organizational level. The designer’s mindset can give rise to a shared culture of practice (Lave and Wenger, 1991, p. 95), in which people are united in their beliefs and processes for learning and education. If we want students to be creative, collaborative, communicative problem-solvers, adults — administrators, as well as teachers — need to act the same way.

Fundamental to teachers’ conceptions of learning and, in turn, their practice are their belief systems, or mindsets (Cuban, 1986; Kagan, 1992; Pajares, 1992; Niederhauser & Stoddart, 2001), and the move to mindshifts (Goldman et al., 2012). While Pajares rightly called teachers’ beliefs a “messy construct,” (1992, p. 307), empirical evidence shows the significance of beliefs as critical to understanding teacher behavior (Koh, Chai, & Lim, 2015). Researchers have long argued that “when implementing a significant curricular, organizational, or structural change, teachers’ belief systems can be ignored only at the innovator’s peril” (Clark & Peterson, 1986, p. 291). Guskey (1986) wrote that changes in belief follow changes in practice; thus, encouraging teachers and other adults in education to adopt successful new practices can eventually lead to mindshifts in thinking (Koh, Chai, & Lim, 2015).

Despite a lack of systematic studies on the value of design thinking in teacher preparation and professional development (Koh, Chai, & Lim, Conceptions, 2015), scholars have considered how different conceptions of design thinking can encourage educator engagement through “reflection-in-action” and “iterative framing, developing, and reflection of design ideas” (Koh, Chai, & Lim, 2015, p. 9), as well as “disciplined improvisation” (Knudsen & Shechtman, 2017, p. 163) and “empathy, authenticity and ambiguity in design” (Zielezinski, 2017, p. 195). Design thinking, another messy construct, promotes these forms of engagement largely through its generative nature and the intertwining of practice (through process) and belief.

Yet embracing design thinking as a culture or a practice can be intimidating for teachers. As Molly Zielezinski, a researcher with classroom experience, wrote, while design thinking in K-12 settings is gaining traction, best practices for implementing it remain muddled and contingent on multiple contextual features, from subject matter and grade level to classroom norms and curricular objectives (2017, p. 195). As she explained,

Committing to a complete [design thinking] challenge felt risky and overwhelming given how new I was to the process, and because I had limited time allotted for covering specific content that would be wasted if my challenge proved ineffective. Later, I learned that design thinking does not have to be a step-by-step process where teams progress neatly through each state of the process.

As researchers heed this call, practitioners can look to the Technological Pedagogical Content Knowledge (TPACK) framework for guidance in creating professional development for cultural change, design thinking, and pedagogical improvement. With TPACK, Mishra and Koehler (2006) extended Shulman’s (1986) model for pedagogical content knowledge (PCK) to technological knowledge, and their efforts have engaged those interested in incorporating design thinking into K-12 settings.

As a framework, TPACK identifies what educators need to integrate technology into their classrooms and explores how it might address twenty-first century learning needs (Cox & Graham, 2009). A full exploration of TPACK is outside the realm of this publication; however, as Koh, Chai, Wong, and Hong argue, there is a need to consider both TPACK and design thinking when working to address emerging learning needs, develop professional development tools, and highlight mindsets that encourage transformation (2015). Yet, while TPACK benefits from greater formalization and assessment, design thinking still lacks uniform guidelines to fully inform its development and evaluation (Koh, Chai, Lim, 2015). Such a lack inhibits the use of design thinking to encourage cultural change in schools.

Certainly, encouraging the mindsets of design thinking (i.e., self-efficacy [Bandura, 1997; Schunk, 2000] and growth mindset [Dweck, 2006]; creative confidence [Kelley & Kelley, 2013]) lays the groundwork for meaningful changes in belief and practice. As Koh, Chai, and Lim highlighted, simply “building a teacher’s confidence through successful experiences with small instructional changes before attempting larger changes” can help (2015, p. 33).

While many learning-based approaches encourage such scaffolding, the process of design thinking can be used to do this, too (IDEO, 2010). Compared to more conventional approaches to teacher preparation, design thinking focuses less on core teaching knowledge and skills from teacher education curricula, which can be scripted and procedural (Hirsh, 1996; Slavin & Madden, 2001; Adams & Engelmann, 1996) and more on “cultivating adaptive expertise,” which “emphasizes the ability to go beyond the pursuit of justified claims about how and what to teach” and “argues for the necessity for teachers to work creatively with ideas” (Koh, Chai, & Lim, *Creating*, 2015, p. 68). Ultimately, design thinking allows teachers to experience teaching as a way to creatively engage students in “deep learning” (Koh, Chai, & Lim, *Conceptions*, 2015).

What does culture change look like when design thinking is at the core of a school's culture?

The rest of this chapter explores how the process and mindsets of design thinking can be used to change the culture in a school. Creating a culture as a whole is difficult. But the conditions to encourage certain behaviors and mindsets are good opportunities for design: rituals, processes, roles, incentives, and spaces. These elements work together to shape collective mindsets and behaviors among individuals, resulting in cultural shifts. Creating a school culture that supports students becoming change-makers therefore involves modeling, incentivizing, and reinforcing corresponding mindsets and behaviors. Design thinking, through its mindsets and process, can encourage the following shifts:

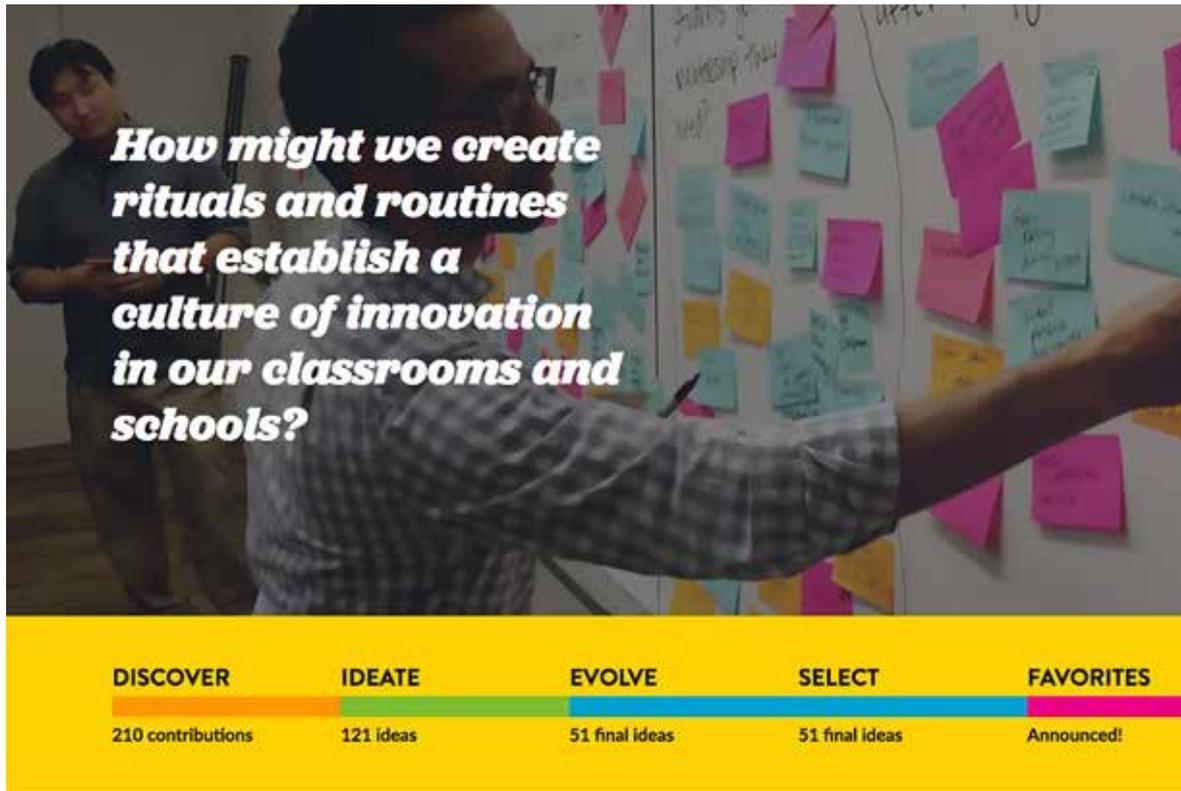
- From working alone to working together
- From planning to bias for action
- From assuming to inquiring
- From seeing problems to seeking opportunities

The following examples highlight what culture changes look like when design thinking is employed as a method of making change.

Teachers as agents of change

With enormous pressure to deliver engaging experiences for today's youth and to align with the ever-changing agendas of the system, teachers can feel deflated or under attack (OECD, 2014), making it harder to do the demanding work of an educator. In fact, only teachers in Finland, Singapore, and Abu Dhabi reported feeling that their profession was valued in society (OECD, 2014).

What if that view and the underlying system that encourages it could be changed? What if teachers felt empowered to make change and be part of creating new solutions? What if teaching was seen as the most creative profession in the world? These are the questions that drive The Teachers Guild, a professional community launched in 2015 that brings teachers together to solve big problems in education. Through an online platform, teachers are guided through the design process outlined in the Design Thinking for Educators toolkit (IDEO, 2012). Together, teachers solve challenges initiated in collaboration with educational organizations and development partners such as, "How might we reimagine professional learning?" and "How might we spark student curiosity?" Teacher-generated ideas that gain recognition from the peer-based community and partners are then further developed and implemented.



SubHack: When the Teacher is Absent

The best sub plan is genius hour

Charlie Shryock, a teacher from Baltimore, Maryland, shares his idea on the Teachers Guild website.
Photo: IDEO

The Teachers Guild, founded by PLUSSED+, a nonprofit learning studio at Riverdale Country School in New York, and IDEO, is built on the belief that educators are inherently designers. The Teachers Guild provides a platform for teachers to collaboratively solve for “the biggest challenges in education today” (The Teachers Guild, 2016).

The goal of the platform is to help teachers develop the capacity to model positive cultural shifts in their schools. In a Teachers Guild Post-Collaboration Survey (2016), educators reported feeling transformed by the experience, and expressed a new confidence in integrating the methods and mindsets of design thinking into their schools. The transformation included designing improved experiences in their own classrooms, coaching other teachers, and in certain cases, taking on new leadership roles and working with colleagues in designing school-improvement solutions.



Through in-person workshops around Teachers Guild challenges, educators collaborate to build their design thinking capacity. Photo: IDEO

Globally, more and more organizations aim to harness the creativity of teachers. Changemakers Australia and STIR in Uganda and India are two other examples of organizations across the world that are engaging and encouraging teachers as creative leaders and edu-preneurs. While these programs do not focus explicitly on design thinking, they encourage the same spirit of teacher empowerment and share the mindsets of design thinking. As previously discussed, design thinking overlaps with and can be employed alongside other design-based learning approaches.



Education Changemakers (2016), based in Australia, provides professional development and leadership training for educators, by educators. In 2016 they provided design thinking and edupreneurship support to more than 25,000 educators across the globe. Photo courtesy of Education Changemakers



STIR Education (2016), based in Uganda and India, empowers teachers to be changemakers. Their approach reignites teacher motivation, professional mindset, and engagement to drive better learning outcomes for students. Photo courtesy of STIR Education

Collaboration as the norm

Complex challenges are often interdisciplinary in nature. To address this, more and more schools are incorporating cross-disciplinary, project-based learning. However, one of the biggest challenges is creating a culture of collaboration among teachers where they work together to plan curriculum and craft authentic projects (Ertmer & Simons, 2006). In many schools, teachers are used to working independently, with little time to meaningfully collaborate (Ramirez, 2013).

Schools with a culture of design thinking intentionally create time, tools, and spaces for teachers to collaborate. The Nueva School in Hillsborough, California, built a dedicated Innovation Lab (or I-Lab) as a physical space both for students to collaborate on projects and for faculty to co-design shared curricula (Stanford University, 2007). At Design Tech High School in Burlingame, California, teachers share common prep periods and the school ends early twice a week to allow for small group collaboration. Every eight weeks, professionals from nearby companies teach students during “intersessions,” freeing up time for teachers to participate in professional development, side projects, and group design sessions. Teachers and administrators noted an expected outcome they credited to embracing design thinking: teachers and administrators were viewed equally as learners, leaders, and collaborators. In many cases, this meant teachers were invited to collaborate on school-level questions and challenges.

In 2010, St. Vrain Valley School District in Longmont, Colorado won a multimillion dollar grant, totalling approximately \$3.6 million over five years, through the U.S. government’s Investing in Innovation (i3) initiative. In 2012, the district was awarded an additional \$16.6 million Race to the Top grant. Members of the school district believed leveraging the help of everyone in the district to be their best chance for closing persistent student achievement gaps among poor students, Hispanic students, and English language learners (ELL). More specifically, the district’s plan was to accelerate the learning of its most at-risk students through a cutting-edge Science, Technology, Engineering, and Math (STEM) approach. The plan targeted students failing in either or both literacy and math. However, many teachers lacked expertise or comfort with the content.

The human-centered and collaborative nature of design thinking proved to be the bridge St. Vrain’s teachers and administrators needed. Through professional development, design thinking provided a common language and inclusive process for incorporating and spreading project-based STEM learning. The district also launched Design Challenges in 2014 to engage teachers on common school-level challenges such as, “How might we better incorporate components for learning technology?” (St. Vrain Valley School District, 2016a).

St. Vrain has since grown its STEM program from one school to twenty-six “deeply engaged” STEM schools, with all schools implementing design thinking. The district’s 2014–15 results from the state-mandated ACCESS test for English Language Learners showed some of the highest language development data the district has seen, an interested added benefit to a STEM program. Leadership attributes much of the progress to design thinking, and has now declared it to be central to the district’s mission (St. Vrain Valley School District, 2016b). The St. Vrain Valley School District (2016b) publicly announced that “[t]he change in the culture of our district is the single greatest accomplishment of our i3grant” (St. Vrain Valley School District, 2016a).

A number of other districts have employed design challenges as a method to encourage teachers to collaborate and innovate around larger challenges they face. In doing so, districts have found that it is not sufficient to simply issue a challenge, but important to provide scaffolding around the experience for teachers by providing a structured design process, professional learning opportunities, and incentives for participation.

Spotlight: Engaging an entire district

One of St. Vrain’s key approaches to spreading design thinking throughout the district is its annual Design Challenge competition for educators. Its purpose is to ignite innovation, create breakthrough ideas, and celebrate the enterprising ecosystem of St. Vrain Valley Schools. The competition is designed around the Stanford d.school’s design thinking process and uses the Design Thinking for Educators toolkit (IDEO, 2012) to help teach the process and mindsets to participants.



Jake Roberts, a senior at St. Vrain Valley School District presents a project using the NAO robot (SoftBank Robotics) at the IBM Watson Robotics Presentation in 2015. Jake has led several robotics projects, including one to help teachers use robots to support students with Autism and English Language Learners. Photo courtesy of St. Vrain Valley School District.

Each year, the district focuses on a particular area for innovation:

2014-15:

How might we better incorporate the six essential components for learning technology?

2015-16:

How might we increase student voice and choice?

Teams compete in one of two tiers, based on their experience with design thinking. The district offers a full-day professional development session for beginners and mentors to help teams approach their ideas through the frames of empathy, creativity, and rationality. Every participating team receives \$250, and grand-prize winners receive \$4,000. Examples of winning ideas include a virtual tutoring lab that connects students to support and resources from any location and a web-based homework club/reward program that works to improve student engagement. The challenge furthers the goal of giving educators a strong foundation in design thinking, which is another win for the district (St. Vrain Valley School District, 2016a).



One of St. Vrain's key approaches to spreading design thinking throughout the district is its annual Design Challenge competition. Its purpose is to ignite innovation, create breakthrough ideas, and celebrate the enterprising ecosystem of St. Vrain Valley Schools. Photo courtesy of St. Vrain Valley School District.

Without exception, each school found the design process to be a tool that can be used for approaching other challenges and opportunities for improvement.

— Lee Berg

executive director

Education Foundation for the St. Vrain Valley
(St. Vrain Valley School District, 2016a)

Make experiments happen

While changing school culture might be an aspiration of many school leaders, it is a big task to take on. School leaders often put pressure on themselves to create perfect plans before taking action (Zielezinski, 2017). Yet, striving for perfection can often prevent educators from taking any action at all.

In schools that practice design thinking, educators learn to embrace iterative cycles of trying ideas early and learning from experimentation along the way rather than by trying to perfect a plan. This provides educators with the potential for faster learning loops, creating feedback for which changes work. The key to making experimentation both feasible and responsible is keeping the experiments small.

The idea of “small steps leading to big change” lies at the core of School Retool, a professional development program that teaches school leaders a process for designing school culture. Developed as a collaboration between the Stanford d.school’s K12 Lab, the Hewlett Foundation, and IDEO, the four-month program helps leaders develop a mindset of a bias to action. In regional cohorts, leaders learn to develop “hacks” — small, scrappy experiments that help them work toward larger aspirations of behavior change in their schools. A participant from a cohort in 2016, Steven Ward, director of school culture at City Arts and Prep, PCS, in Washington, D.C., said,

“It’s so easy for us to get overwhelmed by all the things we have to do — all the moving components, all the people we have to involve. But just taking one small step, one small step in a week or every day to get you to that goal has been transformative to my practice.”

Spotlight: Small steps to big change

In School Retool, school leaders work with regional cohorts to redesign school culture using small, scrappy experiments called “hacks.” Fellows from the cohorts apply design thinking in these hacks toward an effort to build in their students the Deeper Learning competencies of academic mindset, effective communication, collaboration, “learning how to learn,” and critical thinking, all in the context of mastery of academic content (Hewlett Foundation, 2013, Madsen, 2015).

Marthaa Torres, principal of Thurgood Marshall Academic High School in San Francisco, was part of the fellowship’s Spring 2015 cohort. More than 85 percent of students at her public high school are socioeconomically disadvantaged and half are English Language Learners (ELL).



Marthaa Torres, principal of Thurgood Marshall Academic High School in San Francisco, said about her participation in the School Retool cohort: “The hacking approach is a framework that will help me eventually get to the kind of school that I’m trying to create”. Photo: IDEO

Torres wanted her students to have more agency in their learning. After contemplating practices from her fellowship (i.e., project-based learning, real-world challenges, teamwork, presentations and portfolios), Torres, inspired by the practice of advisory, and in the spirit of human-centered design, started with an activity common to most principals: meeting with a student.

Torres sat down with Winston, who had been struggling with disciplinary and academic issues. Rather than having a typical conversation about his behavior and grades, though, Torres reframed the meeting as an opportunity to uncover his interests. As Torres explains, “I spent some time just interviewing him about what he likes about school, what is concerning him. He wanted to have some focus and direction in his life. We walked over to his counselor, we sat together, with the spirit of the hack I said ‘Let’s go today and just check it out’” (School Retool, 2015).

Together, Torres and Winston reviewed the course offerings and she helped Winston reorganize his schedule to take a new class of his choosing — video-game design. When grades came out a few weeks later, Winston’s had significantly improved. He reacted by saying, “I felt happy because it was the first time I had ever done that. I never thought I would improve my grades in high school” (School Retool, 2015).

The following fall, Torres expanded the “hack” she tried with Winston to two of his peers. Together they went to enroll in City College classes for half days, while continuing their high school classes for the remaining half of the day.

Certainly, Torres could have tapped other approaches to human-centered learning with similar success. However, like many educators, Torres found the designer’s mindset, notably in regard to collaboration and iteration, made her work with Winston more effective and sustainable. For some educators, design thinking allows them to apply the fundamentals of theoretical pedagogies more successfully and consistently in real-world settings.

Set nothing in stone

In today’s innovation economy, society’s needs are constantly changing, and with them, the needs and desires of students and so, too, educators. What works today may not work tomorrow. Schools with a human-centered approach respond to this and stay relevant by being in a state of continuous innovation.

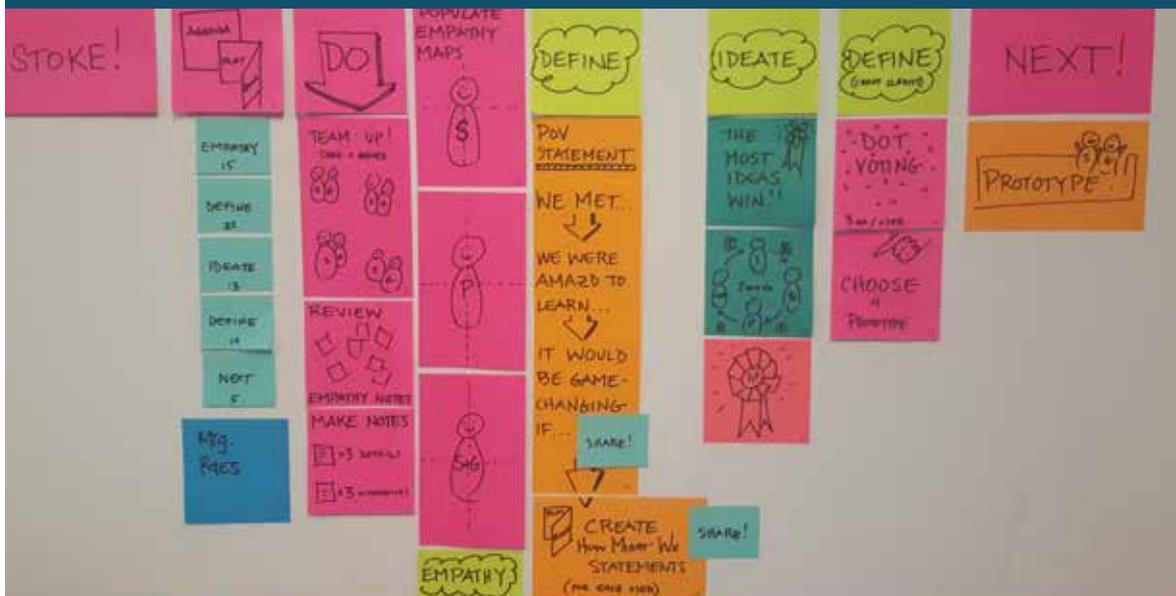
In Providence, Rhode Island, 360 High School, an experimental school created with design thinking, also has a system for constant reassessment and redesign based on students’ needs. The school’s governance model is based on a continuous loop of student feedback. Students are the ‘eyes’ in the school, and when something is not working, they bring suggestions to the ‘brain’ — a group of teachers and student leaders — who pass them on to the principal. For example, the school model started with two advisory periods per day. After student feedback surfaced a desire for more time to pursue interests, electives replaced one advisory period. As Chris Audette, a teacher and facilitator at 360 High, explained, “We’ve worked to develop the mindset that we’re building something that will continue to change and grow. It’s not finished yet, and it will never really be finished. That was really a mindset shift for me.” (Springpoint Schools, 2015).

Spotlight: Change management by design

At Design Tech High School (d.tech) design thinking shapes the way that teachers, staff, and administration work together. Last August, d.tech had an influx of new teachers. Melissa Mizel, an English teacher, and Nicole Cerra, director of curriculum, saw the opportunity to rethink professional development for new staff. As co-leaders of d.tech’s internal design efforts, they ran a design sprint, or compressed design cycle, around a challenge to identify and develop novel ways to engage and support new teachers in applying greater personalization in their work. With support from the K12 Lab at Stanford’s d.school, the design sprint entailed teachers meeting once a week over two months to research, ideate, and iterate (see Illustration 1 for more on these terms). The high levels of teacher participation in the sprint fostered alignment on solutions and direction.

One of the final prototypes was a set of cards, each with a different aspect of personalization, such as pace, competency-based grading, or learning modes. Teachers could then pick a card in the morning and focus on that specific personalization approach throughout the day. Teachers also created a prototype of a website in the design sprint to share resources and best practices for personalization. After running several design sprints like this, the d.tech team created a playbook for change management based on their observations and learnings. The goal of the playbook was to help staff feel confident creating teams and leading their own design sprints when they came across a problem that they could not solve alone.

Cerra said a key factor in making the playbook successful is for staff to support the implementation of ideas. She says, “you can do the design work and the sprints, but you have to account for rolling out whatever the result of that design sprint is. You have to dedicate time to the training, professional development, and implementation.”



A meeting agenda for a sprint meeting illustrates the approach d.tech staff and educators take to their internal design efforts. Photo courtesy of Design Tech High School

Empower others

There are certainly ways for educators to try out design thinking on their own by attending a workshop, using resources such as the Design Thinking for Educators toolkit (2012), or by engaging in The Teachers Guild community. But school and district leaders play a crucial role, not by providing answers or leading the charge, but by letting go. Whether implicit or explicit, leaders set permissions for teachers and students to feel empowered as designers, and to build creative confidence (Brown, 2009; Kelley & Kelley, 2013).

Empowering others takes time and support. Leaders of St. Vrain School District say it took two years for teachers to believe the district wanted them to experiment and learn. As Regina Renaldi, assistant superintendent of St. Vrain School District, explained, “Convincing them that leadership really wanted them to try and fail, try and fail, was the most interesting thing to watch. They started believing in themselves as educators again. It felt like flatline city here before. Now our teachers are facilitators of learning and student voice.”

Kiran Sethi, founder of Riverside School in Ahmedabad, India, and the Design For Change contest, agrees that administrators can play a pivotal role in whether staff take ownership of innovations to improve student learning experiences. According to Sethi, inspired leaders do not necessarily have all the answers. Instead, they make room for others who do. For example, the character-building sports program at Riverside was spearheaded by a staff member who started as an intern. By watching students play sports, he noticed they exhibited three strengths: skill, leadership, and inclusion. The staff member then advocated for a program to foster these strengths and co-designed it with students.

From a teacher’s perspective, support from leadership can make or break an idea. A participant in the Atlanta K-12 Design Challenge (2016), which uses design thinking as a process for school innovation in Atlanta-area public and private schools, said “I can’t emphasize enough how critically important it is to have supportive admin as an integral part of our team. This is the ultimate helper because we know, at every phase of every project, whether we have ‘buy-in.’” By providing buy-in, school leaders can amplify the efforts of teachers. Though culture change can be initiated through grassroots efforts by teachers or from top-down school leadership, culture change is best sustained through tight alignment between teachers and administrators.

Challenges and opportunities:

How do we extend design thinking to more stakeholders in education?

Helping students become change-makers is not only transformative for students, but can be just as meaningful for their teachers. As the previous examples show, adopting the process and mindset of design thinking helps educators become more empowered, creative, experimental, and collaborative.

Amplifying these behaviors changes the culture of schools. Everything from discipline decisions to designing master schedules becomes more iterative, tangible, and inclusive. It gives teachers an opportunity to get out of their classrooms, principals to get out of their offices, and to work together. Everyone is encouraged to learn and, most importantly, develop their creative confidence.

Given the shifts that this style of working requires, successfully implementing design thinking is no small feat. There are several challenges, discussed below, that remain important to address when trying to bring design thinking to an educator community.

1. Include diverse points of view

How might we involve everyone in a school building (including students, families, teachers, administrators, and staff) to tackle design challenges?

Multi-disciplinary teams are a key ingredient in generating innovative ideas (Brown, 2009; Kelley and Kelley, 2013) and thinking about new solutions, particularly when solving complex school challenges. At first glance, creating multidisciplinary teams in a school might seem challenging, given that most adults are educators. Often it can be helpful to look beneath the surface, beyond an individual's title, to deepen the perception of a person's contribution. For example, it can be helpful to consider people's experience before or outside of their work as educators, including all staff in the building, or including people of different experience levels or age groups in the design process.

2. Dedicate time and commit to depth

How might we ensure educators get the time and support they need to develop new skills and solutions?

While an introduction to design thinking may only take a few hours, becoming fluent in the process and adopting the mindset takes considerably longer. As demonstrated in the earlier examples, sometimes it might take years to develop a healthy and holistic design thinking culture. However, the risk of not committing to developing a depth of practice may turn innovation efforts into a kind of "innovation theater," where people expect that using post-it notes or following pre-determined steps will get them to creative solutions (Viki, 2016). This light-touch approach often fails, and often places

design thinking on people’s lists of failed approaches. Dedicating significant time to establishing a new school culture based on new methods and mindsets can be challenging for schools, especially since turnover rates among school leaders can be high. In the United States, 15 to 30 percent of teachers leave each year, especially in schools serving lower achieving students, low income students, or students of color (Béteille, Kalogrides, & Loeb, 2012). A strategy that can help is focusing on “quick wins” alongside long-term goals. St. Vrain Valley School District, for example, established an influential group of early adopters of design thinking who showed evidence of its value by creating effective solutions, as a first step toward their ultimate goal of spreading the culture district-wide.

3. Rethink professional learning

How might we reimagine and expand professional learning opportunities for educators so they can meet students’ changing needs?

This chapter touches on the importance of teachers modeling behaviors. But ensuring educators have access to learning opportunities — where they may develop the skills and behaviors they are asked to model and teach — is often overlooked. With this in mind, teacher preparation and professional learning opportunities, from single teacher trainings to college instruction, may benefit from a student-focused refresh. A human-centered place to start is with the question, ‘What do students need?’ and then asking, ‘What do teachers need to best meet student needs?’

Chapter 4

Design Thinking for Student Learning: Empowering a generation of change-makers



Disturbed by the prevalence of wildlife poaching in Kenya, Mercy Sigey and two classmates entered the Innovate Kenya competition in 2013 with the idea of developing a motion sensor to detect human intruders. The girls, who call themselves the 'A Team,' built a prototype with mentorship help from GMin (Pasulka, 2014).

Since it was too dangerous to test their first prototypes 'in the wild,' Mercy and her teammates asked their younger brothers to play the parts of the lions in order to test the sensor. The team continued to use their experimental mindset to further test and develop the device, which received national attention (Escalino, 2014).

At a young age, I make change to make my community a better place to live in... I discovered the world has so much to offer, therefore we should all leave our comfort zones, spread our wings and make the world a better place.

— Mercy Sigey
2013 Innovate Kenya Finalist
(2016)

Having the ability and agency to make change is more important now than ever. Technology is evolving rapidly and the world is becoming increasingly volatile and interconnected. Thought leaders from industry and education agree that the biggest challenge facing organizations is the rapid escalation of complexity in the global environment. Many also say that creativity is the single most important leadership trait for the future (IBM, 2010). Sir Ken Robinson, author and international advisor on education, explained that “[c]reativity now is as important in education as literacy and we should treat it with the same status” (2006).

Elevating creativity represents a huge shift for some of our education systems. Many schools and practices were designed at a time when education was seen as the transfer of fixed knowledge, which Freire (1970) referred to as the “banking system” of education. Building on Freire’s concept, Sleeter (2005) said that this view “treats students as empty vessels into which knowledge is poured for retrieval later” (p. 106).

As the world changes, knowledge’s place in education is changing with it. Author Jacob Morgan, explained, “[k]nowledge is a commodity. To be the smartest person in the room all you need is a smartphone. What is far more valuable than knowledge is the ability to learn new things and apply those learnings to new scenarios and environments. This is what the employee of the future needs to focus on, ‘learning to learn.’”

Researchers consistently identify design thinking among the twenty-first century problem-solving skills that students need for developing creative ways to tackle complex challenges and adjust to unexpected changes (Razzouk &

Shute, 2012; Noweski et al., 2012). Additionally, researchers note the potential for design thinking to contribute to young people using their skills to serve the larger good in a society. The term change-makers is increasingly used in reference to these youth (Majithia & Burman, n.d.), and for the context of this paper, we define change-makers as innovators who can imagine a different future and realize it.

The following vignettes show how practitioners in very different contexts are teaching design thinking in ways that address two key questions. First, how does design thinking teach students to be change-makers? And what happens when students are creatively confident?

Students confident in their power to change the world

When students have agency to influence the conditions of their learning, they also develop a belief in their abilities to accomplish a task (Absolum et al., 2009). Through the process and mindsets of design thinking, students can develop the confidence to learn new skills, come up with ideas, and test solutions (Razzouk & Shute, 2012). Instead of just learning skills today to use later on, students can be empowered as active citizens who create solutions that make a difference in their communities now. In doing so, they begin to see themselves as change-makers.

Kiran Bir Sethi, a designer-turned-educator in Ahmedabad, India, wanted to help children in India believe in the power of “I can.” In 2009, she launched Design for Change (DFC), a contest for students to address real problems in their communities through design thinking (Drenttel, 2010). On a large scale, DFC promoted design-based education and the idea of young people as change-makers (Koh, Chai, Benjamin, & Hong, *Conceptions*, 2015, p. 68). As Sethi explained, “Design for Change was born out of the conviction that children are not helpless, the optimism that change is possible, and the belief that they can drive it” (2016a).

While the program was originally created for India, requests poured in from other countries. Since each country’s context varies, Sethi and her team made the materials easily adaptable and shareable so students could apply a universal version of the design process in a way that was relevant to their communities. To date, millions of students have answered the call. Design for Change has grown into a global movement spanning more than forty countries.

Research by the Good Project at the Harvard Graduate School of Education shows that the Design for Change K-12 curriculum develops skills such as collaboration, creative thinking, and empathy. There is also evidence to suggest that the confidence developed through the process may translate to improved academic scores (Design for Change, 2016c).

Teaching design thinking to students may be having a similar effect in Africa, where the need to develop new ideas for the future is imperative. By far the world’s poorest region, 43 percent of the population in sub-Saharan Africa

is below age 15. Youth entering the workforce have few opportunities for employment outside of farming or extracting natural resources, a situation that could intensify as Africa’s population grows at a rate projected to outpace any world region by 2050 (Population Reference Bureau, 2013).

David Sengeh grew up in Sierra Leone and studied at Harvard and MIT. In Sierra Leone, approximately 70 percent of youth are underemployed or unemployed, which the United Nations Development Programme (2016) found to be a major root cause of the outbreak of civil conflict there. Sengeh saw design thinking as a way to change the course for Africa by empowering young people to tackle problems in their own communities. As he wrote, “Unless we have a host of young people who can think at any given point that, ‘Here’s a challenge, that’s a problem, but it is an opportunity to solve it,’ there won’t be a steep growth in national development” (THNKR, 2012).

Sengeh founded Global Minimum (GMin), an international non-governmental organization (NGO), with three other co-founders from Denmark. In GMin’s national Innovate Challenges (InChallenges), young secondary school youth from Sierra Leone receive mentorship and prototyping funds to solve problems in their local community. Prototypes included household fuel, waste disposal systems, and a community radio station. After the youth develop prototypes, finalists receive follow-up support and mentorship to improve and scale their ideas (GMin, 2016).



In response to the prevalence of wildlife poaching in Kenya, Mercy Sigey led a team of classmates to design and prototype a motion sensor to detect human intruders. Photo courtesy of Global Minimum



15 year-old Kelvin Doe built a FM Radio Station that can broadcast news because he noticed that “everyone in my home town, Dwozark, had a radio but the stations they picked up didn’t broadcast local news and events happening in their community.” Photo courtesy of Global Minimum

Fifteen-year-old Kelvin Doe, winner of the 2012 inaugural Innovate Salone competition in Sierra Leone, said, “If I’m asked to summarize the lessons of my life so far, there is one thing I would say. Creativity is universal and can be found in places where one does not expect to find it” (THNKR, 2013). To expand its impact in Africa, GMin has also customized its approach for Kenya and South Africa, with each program reflecting the unique cultural and environmental differences of the communities.

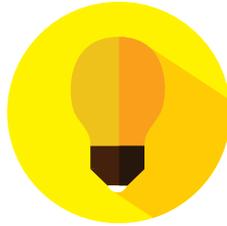
Through programs like Design for Change and GMin’s InChallenges, young people all over the world are not just learning to be tomorrow’s innovators, they are already becoming today’s change-makers.

Spotlight: Believing in ‘I can’

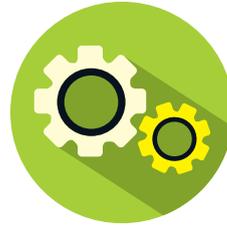
Design for Change guides students through a simplified, kid-friendly version of the design thinking process (IDEO, 2013). In four steps (i.e., Feel, Imagine, Do and Share), students learn to understand situations with empathy, imagine solutions, and make change happen.



FEEL



IMAGINE



DO



SHARE

A video on the Design For Change website (<https://www.youtube.com/watch?v=kQXpZRRxH3nI>) shows what one student team accomplished with the process and mindsets:

In 2015, a student in Chennai, India, was allegedly beaten up by teachers at school. Disturbed by this story, students at nearby K R Montford Matriculation Higher Secondary School, decided to do something about the common practice of corporal punishment in schools, using the Design for Change contest (Jagadeeshi, 2015).

Students in the Feel phase focused on observing and understanding people’s emotions. By interviewing school principals, teachers, and psychologists, students learned not only how educators viewed discipline, but also about the lasting effects of corporal punishment on children.

In the Imagine phase, students brainstormed ideas for alternative punishments. Wild ideas were encouraged — one of their most promising ideas, the Affirmative Discipline Wheel, was inspired by a game show.

During the Do phase, which is focused on putting plans into action, students created prototypes of their six favorite ideas and took them to different schools for teachers to use. Using the Affirmative Discipline Wheel, students chose their own disciplinary actions. Options on the wheel were mapped to learning outcomes, and included solving math problems, helping another student with homework, and helping to prepare a lesson plan. The Affirmative Discipline Wheel offered teachers more options for discipline, and helped students take more responsibility for their mistakes.

Finally, in the Share phase, students spread their story. Students traveled to other schools and showed their prototypes. They also conducted a signature campaign where teachers pledged to use alternative discipline methods (Design for Change, 2016b). The story was reported by The Times of India (Jagadeeshi, 2015).

Most remarkably, this story is one of many. Since 2009, there have been more than 18,000 stories of students making a difference on real-world problems all over the world (Imagination Foundation, 2016).

SPOTLIGHT

Young minds, big questions

Teaching children to be creative problem-solvers isn't just important for their future. Students of all ages can make a real difference in their communities today. Children across the world are tackling important problems—big and small with the Design for Change process and the optimistic mindset of “I CAN.”

SOUTH DAKOTA

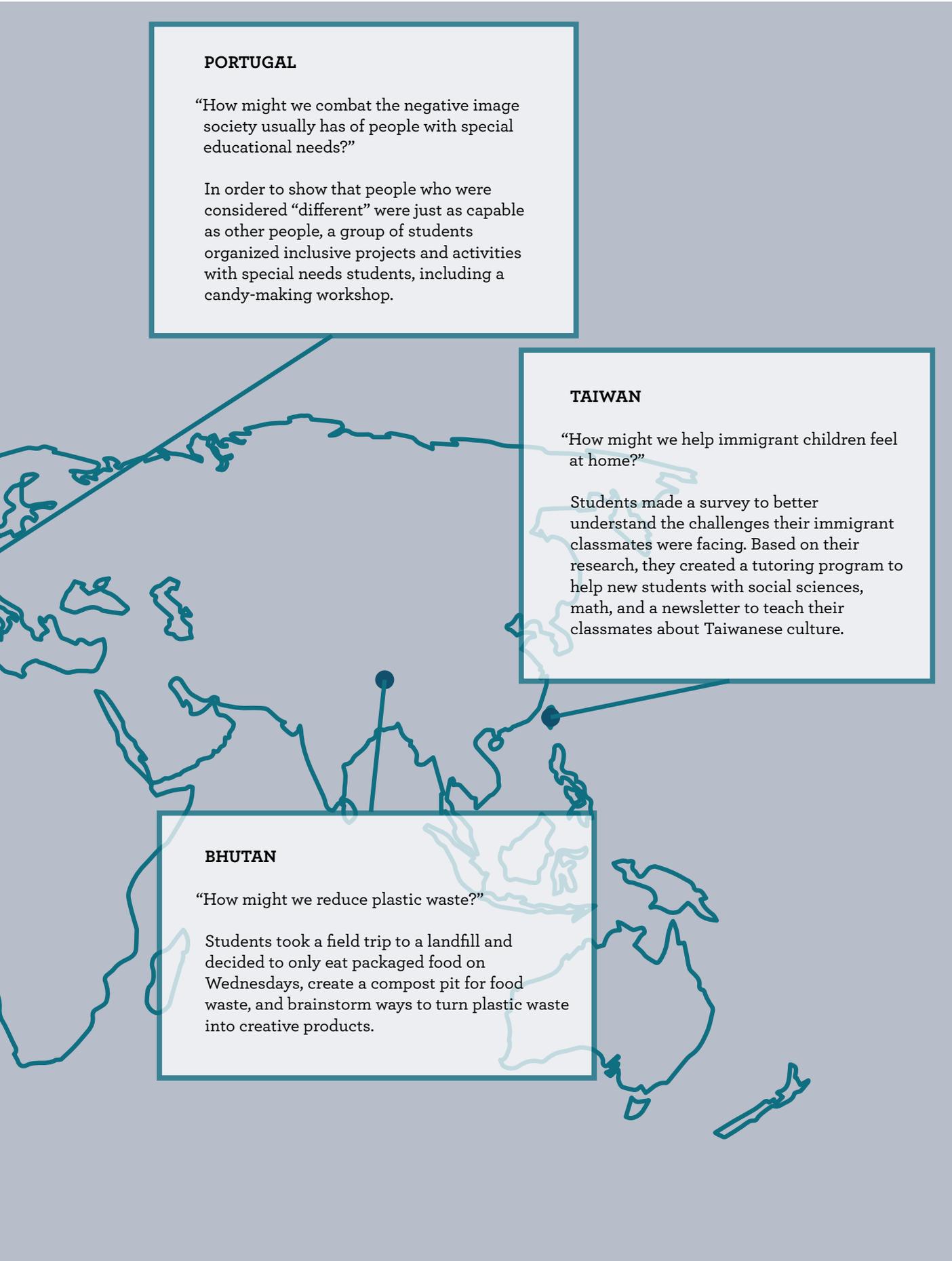
“How might we reduce dropout rates in Native American communities?”

Students decided to combat dropout rates by supporting children from a young age. In order to give younger students a chance to play, connect with one another, and feel valued in the school setting, the older students hosted a full day of community activities for all ages.

COLOMBIA

“How might we promote environmental consciousness in and out of school?”

Students worked to change attitudes and habits that negatively impact the environment.



PORTUGAL

“How might we combat the negative image society usually has of people with special educational needs?”

In order to show that people who were considered “different” were just as capable as other people, a group of students organized inclusive projects and activities with special needs students, including a candy-making workshop.

TAIWAN

“How might we help immigrant children feel at home?”

Students made a survey to better understand the challenges their immigrant classmates were facing. Based on their research, they created a tutoring program to help new students with social sciences, math, and a newsletter to teach their classmates about Taiwanese culture.

BHUTAN

“How might we reduce plastic waste?”

Students took a field trip to a landfill and decided to only eat packaged food on Wednesdays, create a compost pit for food waste, and brainstorm ways to turn plastic waste into creative products.

Innovation through play

Researchers and educators recognize the importance of play in learning, especially in early childhood. Through play, children learn language development, social competence, creativity, and imagination (Fromberg & Gullo, 1992). Play is also known as the “ultimate integrator of human experience” (Fromberg, 1990). During play, children create new games, situations, and interactions by drawing on past experiences, as well as things they may have seen on television or heard from adults or peers. Thus, there’s a natural connection between play and innovation, or coming up with new ideas. As Tim Brown explained, “playfulness helps gets us to better creative solutions” (2008).

Back in 2002, Glen Tripp, founder of Galileo Learning, noticed the gap between what kids were learning in school and the innovation skills needed for the future. He wrote, “We started imagining an eighth grader fully viewing themselves as someone who can change the world in big and small ways. What parents are really interested in is empowering kids to be an actor in the world, rather than a recipient of what the world gives them.”



The mission of Galileo summer camps is to create a world of fearless innovators by teaching kids to understand and apply their innovation approach. Photo courtesy of Galileo Learning

Tripp felt that within complex systems such as education, it is often easier to try something new at the edges of the established system, where barriers are lower and there’s more freedom to experiment. Tripp founded summer innovation camps for kids in pre-K through eighth grade, called Galileo, to try out this approach.

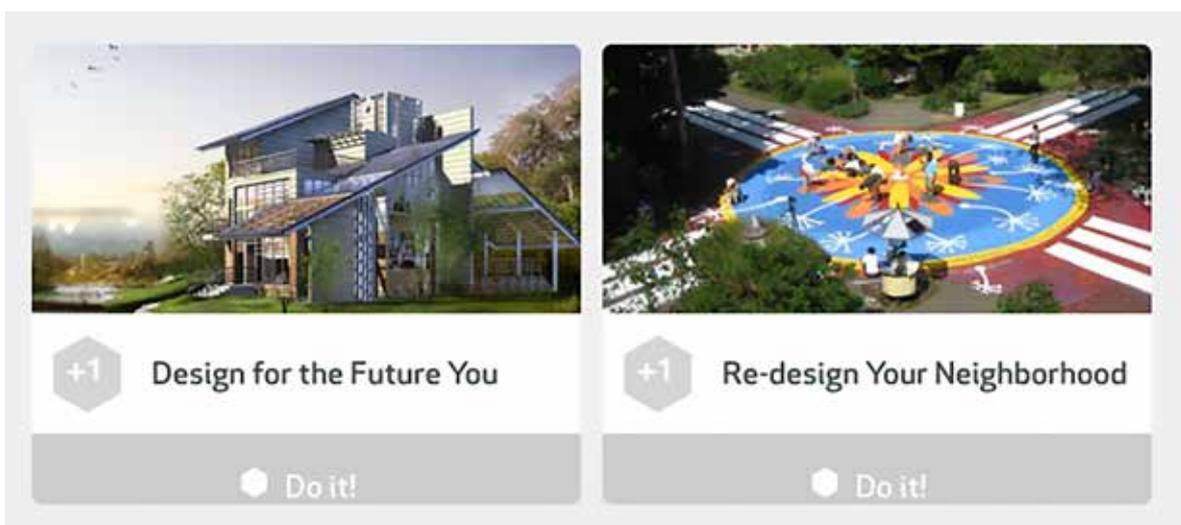
Galileo Learning’s (2016a) mission is “to develop innovators that imagine and create a better world.” It teaches a “kid-ified” version of the Stanford d.school’s design thinking process to empower young innovators. The Galileo approach synthesizes knowledge — concepts, facts, skills and techniques — with the design thinker’s mindsets and process. In one week of immersive programming, students complete a design cycle, with the goal of equipping them with the creative confidence and ability to develop a vision, learn from failure, and bring an idea to life.

As of 2016, thousands of kids in fifty locations throughout California and Illinois have experienced this intensive deep dive into design thinking. Galileo received positive reviews and numerous awards from parent groups (2016b). A parent, Sonya, said, “This camp sparks young minds to problem-solve through team collaboration and encourages them to think outside the box so they can build masterpieces with imagination and creativity” (2016b).

It’s really fun because you get to learn how to work as a group and as a team and as a leader. And it’s really fun to be able to put those skills together to build something that’s going to turn out really cool.

— Student at Galileo Learning
(2011)

Another place students are learning design thinking outside of school is DIY.org, a free, safe online community where kids can gain new skills and connect with one another anytime, anywhere. DIY.org is built with a student-centered understanding that most kids want to be an astronaut one day and a dancer the next, so they offer kids a variety of skill-building challenges to choose from, spanning baking to game design.



At DIY.org, Students learn design thinking through mini design challenges in a safe, collaborative online community. Photo courtesy of DIY.org

One of DIY.org’s popular skill areas is innovation. Co-developed with IDEO, the innovation challenges mirror the design thinking process through hands-on options such as “identify something to improve,” “brainstorm with friends,” and, “build three quick prototypes” (DIY, 2016). After completing at least three challenges, kids can earn badges in each skill area. Other badges linked to creative confidence and design thinking include making and rapid prototyping.

In the Extraordinaires Design Studio, the design thinking process becomes a game where innovators of all ages create solutions for characters such as a pirate, robot, or fairy. Illustrated snapshots of characters’ lives show the context and personalities of each character to convey their needs. Then a series of prompts guides kids through the process of designing solutions specifically for those needs, fostering imagination, empathy and problem-solving skills. Students can enjoy the Extraordinaires on their own, and educators can use it during class time. (Extraordinaires Design Studio, 2015)

Each of the examples included here builds on a natural connection between innovation and play. They harness and direct children’s boundless imagination and serve as reminders that we all — kids and adults alike — can learn to be innovative problem-solvers anytime, anywhere.



A group of students design solutions for a character from the Extraordinaires activity kit. The process starts with building empathy for the unique needs of the character. Photo courtesy of The Creativity Hub Ltd.

Spotlight: Rituals of innovation

One mindset Galileo summer camps emphasize is determination. Kids learn the importance of persevering to achieve goals and recognizing setbacks as opportunities to learn.

At the beginning of each day, teachers announce the mindset of the day, which is consistent across the entire camp. Then throughout the day, teachers call out opportunities where the mindset is required and give feedback accordingly.

Rituals provide mindset reinforcement. To emphasize the importance of learning from failure as part of determination, students literally celebrate failure. When the inevitable failure happens to students, they raise their hands and shout “epic fail!” to claps and cheers. The student writes the failure, along with what he or she learned, on a Post-it and adds it to a wall. Kids even get to wear a crown.

At the end of the day, students reflect on how the mindset of determination and learning from failure helped them throughout the day:

If you make a mistake you can say, ‘Oh, I like that better than what I was going to do.’ Or you say, ‘Oh I was going to do this and that wouldn’t work, but if I do this then this would work.’

— Student at Galileo Learning
(2011)

Design thinking as part of the curriculum

Schools are beginning to recognize the value of teaching innovation skills alongside academic skills and are recognizing that they are not just an extra-curricular bonus. The Henry Ford Academies, a network of small, urban K-12 public charter schools in Michigan and Texas, turned to design thinking as the bridge to connect real-world learning and relevant skills for employment. Rooted in industry and started by Henry Ford Learning Institute (HFLI), a non-profit founded in 2003 by The Henry Ford and Ford Motor Company Fund, HFLI created a framework for weaving design thinking into the entire K-12 journey.

HFLI partnered with the Stanford d.school to develop a semester-long Foundations of Innovation course for incoming sixth graders and ninth graders. Students learn the fundamentals of design thinking in a ten-week course. The original curriculum is available for free download.²

Each quarter, students tackle a design challenge that is integrated with their core subject courses (math, science, social studies, and English language arts). Challenges increase in complexity over the years, as students grow more adept with design thinking (Partnership for 21st Century Learning, 2016b).

² To download the curriculum, go to https://dschool.stanford.edu/groups/k12/wiki/e04cb/HFLI_Rubric.html.

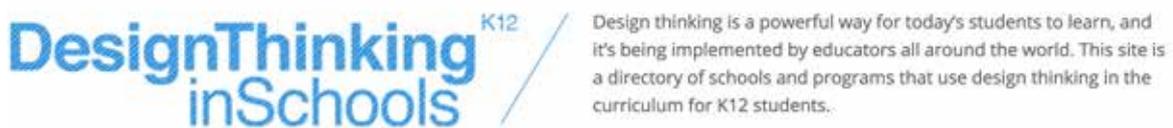
We believe that engagement with a series of progressively complex hands-on innovation projects leads students to develop deep and meaningful knowledge of the conditions of their world, a conscious understanding of their role in that world, a commitment to taking action to change that world for the better, and a significant focus on the future.

— Deborah Parizek
executive director
of HFLI
(IDEO, 2009)

Graduation rates suggest that teaching creative, real-world problem-solving skills does not detract from academic rigor, and may even be beneficial (Partnership for 21st Century Learning, 2016b). More than 95 percent of students at Henry Ford Academies get their diplomas and gain acceptance to colleges, universities, or military service (Capital Impact Partners, 2015).

A number of other schools have integrated design thinking into their curricular approach. Notable examples include The Nueva School in California, Mount Vernon Presbyterian School in Georgia, Bricolage Academy in New Orleans, Design Lab High School in Delaware, Riverside School in Ahmedabad, Gujarat, India, and the American Community School in Amman, Jordan.

The website designthinkinginschools.org offers a crowd-sourced directory of schools, programs and resources that teach design thinking to students. If a school, program, or resource is missing, it is easy to add it to the map.



The website was built by IDEO and the K12 Lab Network at Stanford's d.school with the intention to create a place to connect the many schools and programs that create design thinking experiences around the world. Photo: IDEO

Spotlight: A design thinking scope and sequence

Henry Ford Learning Institute developed a scope and sequence for quarterly design challenges at its schools that align with the K-12 core curriculum (Design Thinking in Schools, 2013).

DESIGN THINKING CHALLENGE SEQUENCES FOR STUDENTS IN GRADES K-5



Grade	Title	Prompt
K	Study Buddy	Design a Study Mat for a buddy
K	All's Well that Ends Well	Design a way to end the school day so that students will have a successful learning experience tomorrow
K	Rolling Out the Red Carpet	Design a way to welcome someone new to a classroom or a school
K	It's Your Day	Design a way to make someone in your family feel special
1	The Pampered Pet	Design a way to improve the life of a pet
1	Taming of the Toys	Design a way to keep toys organized
1	What to Wear?	Design a way for kids to know how to dress for recess before going outdoors
1	New Families, Welcome!	Design a way to welcome new families to a classroom
2	Healthy Eating	Design a way to produce healthy food
2	Getting There!	Improve the public transportation experience for parents with kids
2	Staying Alive!	Design a way to help office staff extend the life of plants at work
2	Quality Time	Design a way for someone else's family to enjoy a week together
3	Get Moving!	Design a way to increase movement in kids' lives
3	Less Is More	Design a way to reduce/eliminate waste in the home, school, community or world
3	Homework Helper	Design a way to help a friend complete his/her homework on time and with good quality
3	♥ Detroit!	Design a way for a family to enjoy Detroit
4	Unplugged! Surviving a Techno Fast	Design a way for a middle schooler to be entertained during a 3-4 day power outage
4	Detroit - How Cool is That?	Design a way to know about and take advantage of Detroit's cultural resources
4	Something to Love	Design a way to improve community space for neighborhood residents
4	Learning from Our Past	Design a way to capture the stories of families who moved to Detroit during the Great Migration
5	Be Part of Something Great	Design a way to educate the community about our school and motivate people to want to join us
5	Eat, Drink and Be Merry	Design a way to improve K-1 lunch/recess experience
5	Entertainment Tonight!	Design a way to entertain a young child
5	Get Involved!	Design a way to increase civic participation

Henry Ford Learning Institute © 2012 | www.hfli.org

Challenges and opportunities:

How might we define success with design thinking when developing change-makers?

Through these vignettes, a hopeful picture emerges of student agency and ability to not only navigate an unpredictable future, but to change it for the better. Yet we can do more to make this picture a lasting reality for more young people. We can start by taking stock of where our schools are today, recognizing the limits to progress, and moving forward with intentionality, or by design.

Below are a few challenges for design going forward.

1. Develop assessments

How might we apply a creative lens to developing methods and measurements for assessing creativity, innovation, and other twenty-first century skills?

An old adage reminds us, “what gets measured gets done.” Davila, Epstein, and Shelton explain that a measurement system “facilitates agreement in terms of what is important, how day-to-day activities add value, and how each person contributes to the mission” (2012, p. 148). Increasingly, school accountability measures are tied to standardized tests, which primarily focus on core academic knowledge.

In an age of school accountability, K-12 public schools too often narrow assessment to standardized tests and written assignments.

— Design-Lab Schools
(2016)

If students are supposed to engage their creativity, independence, and courage instead of regurgitating correct answers, then assessments need to shift accordingly. This is a huge opportunity for design, as there are not yet broadly-recognized, widely-adopted assessments for creativity and innovation.

Many schools that teach design thinking and innovation have developed and experimented with new forms of student assessment, notably Design-Lab Schools (2016) in Delaware, High Tech High Graduate School of Education (2016) in San Diego, and Henry Ford Academies in Michigan and Texas (The K12 Lab Wiki, 2013). Assessment experiments have included portfolios and public exhibitions of student learning. There is still work to be done, though, to develop reliable, fair assessments that must measure skills beyond the ability to complete an assignment.

2. Address equity

How might we ensure that under-resourced schools and students have an equal opportunity to benefit from design thinking?

Educators often point to resource constraints as a major barrier to implementing new approaches to learning, and in fact, many approaches centered on design thinking currently serve more affluent communities and independent schools. Such learning environments face less time, training, and governance impediments and benefit from more latitude to set their own goals and curriculum, thus making it easier to incorporate new methods. After all, when educators are stretched thin in a challenging environment, learning and incorporating new approaches can be difficult. Also, equity issues reach beyond an educational setting. Mehalik, Doppelt, and Schuun found that when students use materials from home, “performance differences can be exacerbated because of unequal access to resources and to available time outside of class” (2008, p. 76).

While having resources certainly can be beneficial, they are not required to teach students design thinking. Researchers have also found that design thinking can, in fact, help address issues of equity in K-12 settings. Goldman et al. have been examining “design thinking as conducive to an equity agenda for students” (2017, p. 11). As Mehalik et al. wrote,

Permitting students to choose what they design may reduce equity gaps. In addition, students needed to present their ideas to one another, and this was viewed as facilitating a process whereby students take ownership of their ideas, which also is expected to contribute to reducing equity gaps in performance (2008, p. 78).

Mehalik et al. also found that while a systems-design approach did not eliminate equity gaps, it did “move African American students from a position of almost no learning to better learning than the non-African American students were showing in the inquiry group” (2008, p. 78). The Design for Change contest and Global Minimum programs offer another instance of how students in a variety of circumstances, even those with the fewest resources, can better themselves and their communities through design thinking.

It will be important that similar success stories of design thinking leading to progress in resources constrained environments become widely known, to disperse the notion of design thinking being hard to access for less affluent communities.

3. Demonstrate evidence

How might we demonstrate the effectiveness of teaching design thinking to children?

As research about teaching and learning becomes more readily accessible, and policymakers increasingly emphasize the use of evidence-based practices in education, schools must often show proof that an education strategy works before adopting it.

In 2005, Australia’s National Inquiry into the Teaching of Literacy asserted that “teaching, learning, curriculum, and assessment need to be more firmly linked to findings from evidence-based research indicating effective practices, including those that are demonstrably effective for the particular needs of individual children” (Rowe, 2005, p. 9). Education leaders in the UK, US, and other countries have echoed this sentiment, with some U.S. federal education policy even linking funding to evidence-based policies (Mitchell, 2014).

Since teaching design thinking to students is a relatively new practice, data indicating its effectiveness remain scant. However, increased interest in the approach has come with increased rigor. Research is underway for some of the examples discussed in this chapter, including the Design for Change challenge, the Galileo summer camps, and related areas of priority in education. In particular, the development of character skills that is creating new frameworks demonstrates progress without relying on the same, standards-based approach that knowledge-based fields have taken. Still, many opportunities remain to collect evidence for the results of teaching design thinking to students.

Chapter 5

Recommendations

In examining the literature about design and design thinking from the past three decades, one can see how design thinking, in its various flavors and forms, has similarities to, and builds on the work of educators the world over. This publication, a review that straddles research and practice, offers a straightforward definition of design thinking, as a human-centered approach to creative thinking and problem solving.

This publication also places design thinking squarely in the realm of education, where educators — like designers — face wicked problems daily and foster an empathetic mix of creativity, critical thinking, communication, and collaboration as a way to develop options for addressing these challenges. Through a mix of scholarly research and accounts of practitioner experiences, we find it heartening that design thinking is being applied to solve some of the complex and important questions in education.

Anecdotal reports from K-12 settings suggest that students and educators are enthusiastic about applying design thinking to big challenges in ways that contribute to and shape society. As the vignettes included in this publication suggest, these challenges extend outside the realm of traditional education and learning, to the plains of Kenya, where students tested motion sensors to detect poachers, and to a city in Bhutan, where students visited a landfill, brainstormed for ways to turn plastic waste into creative products, and decided to eat packaged food only on Wednesdays as a way to avoid waste. As this publication shows, these students are thinking and acting like designers, and they highlight the potential for a generation of change-makers, people working to redefine problems, inspire new ideas, take informed risks, and continue learning well after their K-12 education.

Still, empirical evidence remains largely lacking as to the quantifiable value and impact of design thinking in educational settings. As researchers continue defining and assessing an array of learning outcomes to better understand the impact of design thinking in education, teachers and administrators will both need to gain access to this knowledge and work to transfer it into practice in sustainable ways that can scale across institutions and countries.

This publication focused on the central question, How do the processes and mindsets of design thinking help to answer questions about how schools are designed, how educators can work together, and how students might contribute and benefit? Through a consideration of available research and case studies, we find support for the hypothesis that design thinking creates the greatest impact when both the process and mindset are practiced in developing new curricula, school cultures, and education systems. The process of design thinking keeps people “thinking and doing” as it moves them through the iterative and generative phases of discovery, interpretation, idea generation, experimentation, evolution, and refinement. While the mindsets that encourage this process can vary, they include being human-centered, collaborative, optimistic, and experimental.

This publication highlights three key conclusions:

1. Design thinking can be used to fundamentally reimagine school models and systems;
2. Design thinking supports change in school culture by transforming how educators work together; and
3. Design thinking encourages student development of twenty-first century skills.

The process and mindsets of design thinking can offer an integrative approach to designing schools so that all parts of the system come together in a symbiotic relationship, from the curriculum to the physical space, and the pace of the school day. Design thinking can also help move a school toward cultural change, by encouraging a shift from working alone to working together, from planning to a bias for action, from assuming to inquiring, and from seeing problems to seeking opportunities. The process of design thinking also pushes teachers to become agents of change, empowered to lead and work alongside administrators while keeping students at the center of the learning process. Design thinking also has the potential to contribute to young people using their skills to improve their learning while also serving the larger good in their community. In their efforts to become change-makers, young people can look to the process and mindsets of design thinking to innovate as they imagine a different future and work toward it.

Yet by no means is design thinking a cure-all or quick fix for what ails education. Researchers should continue questioning the ongoing status of design thinking as emergent, even decades after the term and approach surfaced. There continues to be a lack of quantitative research about design thinking. While research in K-12 settings can be particularly challenging with the multitude of variables accompanying every child, teacher, school, and community, there remains a need for empirical data on design thinking as a pedagogical approach.

Still, as this publication shows, educators, students, and communities across the world have pointed us to their moments of success employing design thinking. The vignettes included in this publication illustrate that there is strong warrant to further explore design thinking as a tool for educators, and to reconcile the tension between research and practice. Through best and forward-looking practices and new ideas for employing design thinking in K-12 settings, this publication begins to articulate how design thinking might contribute to an educator's professional toolkit.

All this is imperative, given how fast the world is moving in terms of the skills needed by students to succeed in the twenty-first century. Much remains to be done to equip educators and students with the confidence, mindset, and skills to act like designers, and ultimately to become change-makers. Moving forward, we offer the following recommendations:

1. Greater efforts to clarify confusion and misconceptions about design thinking. As a term and an approach gaining popularity and enthusiasm, design thinking could face a loss of meaning if reduced to a buzzword, trend, or mere wishful thinking.
2. A continued examination of how various approaches to improving education can complement and support, not compete against, each other. For instance, how might design thinking be applied alongside a mix of problem-based learning, enquiry-based learning, and project-based learning approaches?
3. A stronger united effort among stakeholders (i.e., teachers, administrators, students, parents, school boards, and policymakers) to work toward excellence in the application of design thinking in K-12 settings that is accessible to and scaleable for all educators and students. Systematic efforts throughout the education sector to generate, develop, and share guidelines and best practices are needed.
4. The incorporation of design thinking as a method and practice for teaching creative problem solving in teacher training in schools of education and in ongoing professional development programs. Formalizing design thinking as a signature pedagogy, what Lee Shulman calls a profession's implicit definition of what counts as knowledge and how that knowledge is known (2005), is likely crucial for a large-scale embrace of design thinking in education. However, equally crucial is the need for design thinking to keep its so-called softness or fuzziness – its inherently optimistic and empathetic bias toward action and positive change.
5. Continued research, both quantitative and qualitative, that examines what works and why in regard to design thinking. Such an effort should include a commitment from researchers to extend their work to practitioners, who may not have easy or affordable access to scholarly forms of knowledge distribution (i.e., journal articles and conferences hosted by educational research associations).

Finally, we hope that this publication can be a starting point to encourage practitioners as well as researchers to contribute to bringing design thinking to the challenges of education, globally.

Glossary of Terms

Change-maker: an innovator, someone who can imagine a different future and realize it.

Creative confidence: the natural human ability to come up with breakthrough ideas and the courage to act on them.

Culture: shorthand for school culture. Comprises the shared mindsets and behaviors that guide the interactions of a group.

Design thinking: a creative process and mindset for solving problems and finding opportunities to understand people, and develop innovative solutions to meet their needs. Also referred to as human-centered design.

Design process: refers to a set of stages that designers go through, beginning with problem-defining and empathy and ending with implementation. In this paper, the stages are defined as follows:

Discovery: finding inspiration through empathy.

Interpretation: uncovering patterns and insights.

Ideation: generating ideas.

Experimentation: fast, iterative learning by doing.

Evolution: refining a concept over time.

Design thinker's mindset: a set of beliefs and attitudes characterized by seeing challenges as opportunities for design. This paper uses “the mindsets” as a shorthand to refer to the following beliefs and attitudes:

Human-centered: a belief that meaningful and innovative solutions are rooted in empathy.

Collaborative: an attitude that regards more minds as better than one.

Optimistic: the belief in your agency to create a different outcome.

Experimental: an attitude that learning includes iteration and failure.

Human-centered design: a creative process and mindset for solving problems and finding opportunities to understand people, and develop innovative solutions to meet their needs. Also referred to as design thinking.

School culture: the shared mindsets and behaviors that guide the interactions of a group.

About the Authors

The team that created this publication brings a unique combination of perspectives to the topic of design thinking in education. Sandy Speicher has pioneered bringing design to the education field—formerly an educator herself, she founded the education practice at the global design and innovation firm IDEO, and has created a portfolio of design solutions that bring effective and meaningful experiences to today’s learners and teachers. Annette Diefenthaler, long-term practitioner of design thinking, co-authored IDEO’s Design Thinking For Educators Toolkit, and has since engaged in helping spread design thinking across the sector. Dr. Laura Moorhead is an assistant professor at San Francisco State University’s Journalism Department and holds a Ph.D. from Stanford University’s Learning Sciences & Technology Design program. Deirdre Cerminaro has led and contributed to many key projects that bring design thinking to education. Charla Bear is an award-winning journalist and design researcher, focused on translating insights from research into actionable ideas. The team used their combination of experience as practitioners of, and reflection on the literature about, design thinking to critically examine the topic at hand.



Annette Diefenthaler
Portfolio Director, Education
IDEO



Laura Moorhead, PhD
Assistant Professor
San Francisco State University



Sandy Speicher
Partner &
Managing Director, Education
IDEO



Deirdre Cerminaro
Systems Design Lead,
Education
IDEO



Charla Bear
Senior Design Researcher &
Journalist, Education
IDEO

IDEO

IDEO is a global innovation and design firm that uses a human-centered, design-based approach to help organizations in the business, government, education, and social sectors innovate and grow. Innovation at IDEO is grounded in a collaborative methodology that simultaneously examines user desirability, technical feasibility, and business viability. IDEO is known as a pioneer of human-centered design — putting people at the center of our work. This approach has come to be known as design thinking.

IDEO's Design for Learning studio uses the process of design thinking to create progress in education systems around the world. Over the last decade, its team has completed hundreds of projects in education — from designing systems to be more human-centered to designing individualized learning tools and technologies. Challenges addressed in the last decade range from literacy development in Brazil, to support systems for first generation college students, to envisioning new learning experiences in K-12 and higher ed, to designing an affordable, scalable and excellent school system in Peru.

The Design for Learning team includes designers with backgrounds in teaching, journalism, creative coding, architecture, interaction design, communication design, and many other design disciplines. We consider ourselves advocates of learners open to all perspectives in approaching challenges in education.

About WISE



world innovation summit for education
مؤتمر القمة العالمي للابتكار في التعليم

An Initiative of Qatar Foundation

The World Innovation Summit for Education was established by Qatar Foundation in 2009 under the leadership of its Chairperson, Her Highness Sheikha Moza bint Nasser. WISE is an international, multi-sectoral platform for creative, evidence-based thinking, debate, and purposeful action toward building the future of education. Through the biennial summit, collaborative research and a range of on-going programs, WISE is a global reference in new approaches to education.

The WISE Research series, produced in collaboration with experts from around the world, addresses key education issues that are globally relevant and reflect the priorities of the Qatar National Research Strategy. Presenting the latest knowledge, these comprehensive reports examine a range of education challenges faced in diverse contexts around the globe, offering action-oriented recommendations and policy guidance for all education stakeholders. Past WISE Research publications have addressed issues of access, quality, financing, teacher training, school systems leadership, education in conflict areas, entrepreneurship, early-childhood education, and twenty-first century skills.

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Finally, a thank you to our readers for their commitment to and passion for improving educational opportunities for students. By reading publications such as this one or attending conferences such as the World Innovation Summit for Education, you are part of an inspiring effort to spread the most innovative ideas for teaching and learning around the world.

DISCLAIMER:

The views and opinions in this publication are solely those of the authors. Errors and omissions remain the responsibility of the authors.

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