LEARNING BY DESIGN

LIVE | PLAY | ENGAGE | CREATE

Prakash Nair & Roni Zimmer Doctori
with Dr. Richard F. Elmore

There is a garden in every childhood, an enchanted place where colors are brighter, the air softer, and the morning more fragrant than ever again.

Elizabeth Lawrence

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Prakash Nair & Roni Zimmer Doctori
with
Dr. Richard F. Elmore
Professor Emeritus, Harvard University

Foreword by
Dr. Heidi Hayes Jacobs
Author, Curriculum 21 and Bold Moves

Education Design International

Education Design International, USA

Learning by Design: Live | Play | Engage | Create

Architecture/Education/School Reform

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Front Cover Photo: Learning Community at Renovated Middle School. Academy of the Holy Names, Tampa, Florida.

Back Cover Photo: Exterior View of Meadowlark School, Erie, Colorado. Boulder Valley School District

Photo by Fred J. Fuhrmeister

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PART I

FOREWORD
HEIDI HAYES JACOBS

"We are architects! We are educators!" Proclaimed with conviction and experience, Prakash Nair and Roni Zimmer Doctori declare they are bringing their perspectives both as designers and specialists to the book in your hands, Learning by Design. With enthusiasm, pragmatism, and imagination, Nair and Doctori take the reader on a rewarding dive into exploring possibilities for the contemporary learner. They encourage us to envision what modern learning can and should look like in a reimagined school environment.

Given the authors' exceptional expertise as architects, it is refreshing to see their design thinking and experience reflected in the layout of the book. They set the stage with an overview of what constitutes good space design followed by the exploration of a powerful set of four shifts that guide us to considering a new school design paradigm:

- Teacher Practice: From Solo to Collaborative Teams
- Pedagogy: From Teacher Directed to Student Directed
- Curriculum: From Segregated Subjects to Interdisciplinary Courses
- Community: From Classroom to Network

These shifts move the reader to consider the world of the learner as we proceed. What I found particularly refreshing was the authors' focus on bringing a kind of natural ease to our work in schools; that is, to build on our innate desire and capacity to learn as human beings. They note that we are "learning organisms and do not need to be taught how to learn." With that concept in mind, Nair and Doctori wrap their vision around four accessible and natural elements: Live, Play, Engage, Create. We examine how to operationalize each of these fundamental tenets into curriculum and instruction planning. How to cultivate living, playing, engagement, and creation in the world of our children and young people is at the heart of this book. Their approach is to provide examples and accessible lists unpacking the four elements with succinct descriptions. We see how every decision from games, to socializing, to eating, to gardening, and on to scholarly pursuits should emerge from the four elements and tap into the motivation of our students.

The elements are followed by a direct and engaging examination of how to make the transformation happen in a setting (perhaps your setting). With a crisp and insightful review of the historical context for the development of school life in the United States, we are reminded that things have stayed remarkably the same for over a century. The time is ripe for growth and seismic change. We are encouraged as progressive educators to bring fresh thinking to the planning table. Nair and Doctori model that bold notion as they propose we consider ideas such as capital spending as a catalyst for change. They consider how this transformation can play out in steps through a systemic process engaging the "right people on the bus" that explore, research, and discover new options for consideration. We see that a master strategic plan that dynamically embraces the full array of education planning from fundamental structures to curriculum planning needs to be interconnected. What struck me as exciting was to return to the earlier chapters and see how Live, Play, Engage, Create could and should directly inform each component in a strategic plan. Over time, the authors see how implementation is gradual but

How to cultivate living, playing, engagement, and creation in the world of our children and young people is at the heart of this book.

“Elmore shines light on how our calcified views of education are loosened when we “reverse the relationship between schooling and learning.”

steady and needs corresponding changes in governance and management. This latter point is amplified in the authors’ spirited chapter on Pathfinders.

Providing examples from a range of schools, Nair and Doctori take us on a kind of tour through the lens of a set of questions regarding what is happening in real settings. What is a flexible learning environment? How does it affect learning? This discrete focus on fundamental decisions regarding how we group learners, structure their time, while connecting them with flexible spaces brings all of the previous chapters together. We see that it is possible to modernize schools and to respect our learners. The case studies they provide give hope and inspiration to readers.

But, there is more. In an original and engaging book design move, Nair and Doctori invited an internationally respected colleague and one of our seminal thinkers in education, Dr. Richard F. Elmore, to provide a powerful coda to the book. His chapter, The Challenges of Learning and Design, takes us into operationalizing the potential of “learning organizations.” Elmore organizes his discussion around five key propositions, a quadrant framework for analyzing the modalities and context for learning, and then provides us with a dynamic set of design principles to underscore the planning process Nair and Doctori proposed earlier in the book. Written with a deft touch, Elmore shines light on how our calcified views of education are loosened when we “reverse the relationship between schooling and learning.” His contribution has gravitas, adding depth to the discussion even as it is eye-opening and engaging.

We have an exuberant and practical guide in our hands with Learning by Design, which gives educators, communities, and learners an inspired roadmap to transformation. Yes, we are all architects! We are all educators!

INTRODUCTION
BACK TO THE FUTURE

It is self-evident that the original purpose of school as a place to deliver content and knowledge ceased to apply ever since the Internet became an integral and irreversible part of our existence. How can one teacher delivering content to a diverse group of children ever compete with the personal and highly customized learning from world-renowned experts that anyone can access online? If teaching generic "stuff" is no longer the primary reason for a school's existence, then what is? Why do we need schools when their very mission has become irrelevant? This is a rhetorical question because it is an undeniable truth that given the way society is structured, only a small fraction of parents can afford to keep children at home, away from schools. The vast majority still need a place for children to be during the day when they (the parents) are at work.

That means the school continues to have a place in modern society at least in this one aspect – as a custodial service for children. This begs the question: If we have them here anyway, what kind of a place can schools be where children can be

Figure I-1: *Children are not little adults. A school's primary job is to provide opportunities for students to discover the world around them. Happy, engaged students will leave school with the skills needed to live happy, fulfilled lives.*

Figure I-2: *The "capacity" for learning starts with one key ingredient – curiosity. The learning environment should provide lots of opportunities for children to indulge their curiosity.*
Early Childhood Center at Shorecrest Prep School in St. Petersburg, Florida.

children? Everything we now know about human development points to one simple fact – children are not little adults. Schools shouldn't only be about preparing children for life because, at least as far as the children are concerned, the school is their life in the here and now. As adults, we need to make this life, the one they are living every day in school, as good as it can be. This does not require us to choose between a path that makes them happy today versus one that will make them successful tomorrow. The good news is that happy, engaged students will leave school with the skills needed to live happy, fulfilled lives as productive members of society.

One of the most interesting findings of neuroscience is that learning is not what happens as a direct result of teaching. According to this book's distinguished co-author, Harvard Prof. Richard Elmore, "Learning is the capacity to consciously modify understandings, attitudes, and beliefs in the presence of experience and knowledge over time." The "capacity" for learning starts with one key ingredient – curiosity. Curiosity drives students to "consciously modify understandings, attitudes and beliefs." Students will only modify their existing worldviews when they are 1) convinced that there is another, more credible perspective of a particular subject or event and 2) curious and motivated enough to know what that alternative view might be. It is up to us as adults to create the conditions that lead children to ask questions and

> "If teaching generic "stuff" is no longer the primary reason for a school's existence, then what is?

Figure I-3: *From a very early age, doing is the most effective form of learning. No matter how young they are, children thrive on being given meaningful tasks to complete. Working alongside expert adults as their "interns" provides motivation for students to master the craft.*

give them the freedom to explore the world around them so that they can find their own answers.

Back to the Future

The schools we are arguing for in this book are not some brand new invention. They represent the way learning used to happen before the model that we now know as "school" was invented. The predominant "cells and bells" model of school (students start the school day in a cell and move to another, identical cell when the bell goes off) that most of us are familiar with is actually a remnant of the industrial revolution. It represents the idea that education can be mass produced in a factory-like setting to churn out "educated" students ready to tackle college and careers. Of course, we now know that this model is fundamentally flawed because no two students are the same and, therefore, subjecting them to the same "process" is unlikely to yield the same result. This failing of the dominant educational model was not as apparent when the vast majority of high school graduates had factory jobs waiting for them when they graduated. These jobs

"

The schools we are arguing for in this book are not some brand new invention. They represent the way learning used to happen before the model that we now know as "school" was invented.

Figure I-4: *The traditional classroom is the building block of the "cells and bells" model of education. It has some fundamental flaws as a place for modern education starting with the fact that it severely limits the modalities of learning that students can experience since it is optimized for teacher-led direct instruction.*

needed very basic entry-level skills, and employers benefited from having a barely literate but compliant workforce. The world where high school graduates could expect employment in decent-paying factory jobs does not exist anymore. The imperative to retool schools has never been greater.

As it turns out, we are talking about a new model that actually looks a lot like one that had existed for several hundred years before the factory model school was invented — interns learning a craft from a master teacher. We will be showcasing this model in greater detail in this book. In this sense we are returning to a model where learning represents the acquisition, demonstration, and mastery of real, practical and tangible skills.

Learning by Design

The title of this book, "Learning by Design" has two key themes - Learning and Design. The word "design" represents the physical design of schools but is also meant to be read as "intent." We have to be "intentional" regarding the future of education and then put in place all the various elements that are needed to realize this intention. For us, there is no question that the most visible, and maybe even the most influential, element of the educational experience is the environment in which we place children in their most impressionable and formative years. The way a school is setup with groups of children shut in with a teacher in a classroom speaks volumes about our expectations from school. We assert that the physical school already precludes almost all the learning goals that educators claim they want for our children. Take just two words - personalization and collaboration. A classroom is the worst place to personalize education or collaborate with your peers. And when these terms are extended to include teachers, then the abject hopelessness of the classroom-based model of school becomes even more apparent.

> "The most visible, and maybe even the most influential, element of the educational experience is the environment in which we place children in their most impressionable and formative years.

No matter how well it has or has not succeeded in the past, the educational establishment has always maintained that it exists to best serve the learning needs of children and young adults so that they can become productive members of society. However, like any other large enterprise, education also has a vast array of specialists, all of whom, supposedly, are pulling in the same direction. Among education's many specialists are architects whose role is to create the environments within which everything and everyone within the world of education reside.

> The world where high school graduates could expect employment in decent-paying factory jobs does not exist anymore. The imperative to retool schools has never been greater.

Even the most rudimentary Internet research about learning and the brain, especially in the context of a rapidly changing world, tells us that we need a radical rethinking about how to educate children. Since spaces are the "container" within which any new model of education must work, we felt that it is imperative we have some understanding of this whole new world of "learning research" and neurology. That is why we reached out to the pre-eminent educational authority on this subject — Dr. Richard Elmore, professor emeritus at Harvard University. You will find his ideas embedded throughout the first part of this book, which is presented from the perspective of space design. The ideas that underpin the future of education and how we can be "intentional" about where to go from here are spelled out elegantly by Prof. Elmore in Part Two of this book.

When we think about the "space" that students need for real learning to happen, we are also referring to the social, emotional, and creative space children (of all ages) need to grow and thrive. This kind of "space for learning" is at a premium in schools. We believe that the design of the physical environment of schools can make this other "space" — the social, emotional and creative space — not only more visible, but also more available. Of course, the design itself can only do so much. For students to truly feel that they have space for learning, schools need to use the design of the physical environment as a catalyst to change the whole dynamic of a school from a teacher-centered to a student-centered place. This is the area that will benefit the most from Part Two of the book that is presented from an educator's perspective.

Figure I-5: *When we talk about "space" for learning, we are also talking about giving students the space to develop socially, emotionally and creatively. Outdoor Café at Learning Gate Community School, Lutz, Florida.*

The transformation of a school from a teacher-centered to student-centered model will impact its curriculum, pedagogy, schedule and student assessment, not to mention its administration, operations and governance. Support systems need to be in place for this kind of a transformation that may seem radical at first but more natural as time goes on. In this book, in Part Two, you will start to learn about the conditions for success that need to be in place in these other areas beyond the physical design of the school campus. Prof. Elmore's section is not intended to be a how-to "manual" on education in the way that Part One may be for physical design. We have a higher purpose for his portion of the book. In reading what he has to say, we hope, our readers will understand the imperative for a holistic approach that is needed when we are talking about transforming education — and school design itself, while it is a vital part of that equation, is still only one piece of the puzzle.

> "Throughout this book, we have relied on what educators and students have told us to talk about the effectiveness of the physical spaces they inhabit.

Educator and Student Voices

Throughout this book, we have relied on what educators and students have told us to talk about the effectiveness of the physical spaces they inhabit. We as architects envision the ways in which the spaces we design will be used but, over time, we have learned that the actual use of spaces varies greatly from what we had anticipated. By hearing what teachers and students say about their own experiences in their learning environments, we have learned how to create living buildings that will flex and adapt to the constantly changing needs of schools. As we understand the profound impact of space not only on teaching and learning but on the overall development of young adults, we are humbled and honored to have a small role as the "architects" of student lives and not just of their learning spaces. We hope this book will be a reminder to everyone involved in the creation of school facilities of the awesome influence that physical environments wield over the lives of tens of thousands of students in the 30, 50, or even 100 years they will be in existence.

Structure of the Book

The more we talked to Dr. Elmore, the more we realized his unfiltered ideas and views deserved to be heard by our readers. This book did not start out as having two distinct parts to it but, after we read what he had to offer, we realized Dr. Elmore's thesis had to be presented in its original form and separate from our architecture-themed discussion about school design. The key principles he outlines that have directly influenced our thinking about how to structure the architectural portion of this book are summarized below in Dr. Elmore's own words.[1]

1. **Human beings are learning organisms and do not need to be taught how to learn:** We need to move away from attainment-driven models of schooling that disable human beings as learners by convincing them that they do not have the capability to manage their own learning.

2. **Individual variability is the rule, standardization is the exception:** New designs will have to take their point of departure from the assumption that individuals — children and adults — come to the learning project from different points of origin developmentally and experientially.

3. **Knowledge equals information plus affect plus cognition plus fluency:** Fluent and powerful learners tend to be highly variable in their absorptive capacity, depending on how interested they are in the knowledge they confront, how

[1] Excerpted from Part Two of this Book, "Learning and Design" by Dr. Richard F. Elmore, Prof. Emeritus, Harvard University

the knowledge domain matches their previous experience as learners, and how well they can use the skills of their previous learning to solve the puzzles of acquiring new knowledge.

> Teachers can be coaches, they can be counselors, and they can be role models for great learning.

4. **Depth and continuity over coverage:** One day, when I was 27 years old, in graduate school at Harvard, I walked out of an econometrics lecture on some hopelessly obscure topic I can't recall, and I approached one of those incredibly complicated traffic intersections near Harvard Square. It suddenly occurred to me with an electric jolt, as I observed the drivers orchestrating their behavior through the intersection, that "math is everywhere!" I realized that I could actually build a model using the language of mathematics that would describe what I was seeing.

5. **Learning and Design — Hard Questions, Provisional Answers:** Ambitious ventures in uncertain times begin with hard questions rather than clear answers.

   a. How will humans adapt to transformations in the practice of learning?

   b. How will the practice of learning and the design of learning environments adapt to the democratization of expertise?

Figure I-6: *Schools need to start with the assumption that all students, regardless of their age, are capable of learning and managing their own learning. For effective student-centered learning, the architecture of space, time, curriculum and the relationship between teachers and students must change.*
Meadowlark School, Boulder Valley, Colorado.
Photo © Fred J. Fuhrmeister.

c. How will society orchestrate its duty of care and responsibility for socialization of children and adolescents with the unfreezing of institutionalized learning?

d. How will learning environments adapt to the challenges of individualization?

> "Learning" itself is a collateral activity and one that is always happening no matter what we are doing.

These ideas started to make sense to us in the context of our own lives and careers and the educational experiences of our own children. We thought about all the learning that happened outside school that so greatly impacted who we and they (our children) are today as people. Even at school, it seemed that the spaces between classes, the stolen moments away from the direct instruction of teachers, and the time spent with friends were the most important and meaningful memories we retained from our school days. As we looked at the research we realized that these peripheral experiences – all the stuff beyond the classroom – is actually where the most meaningful and long-lasting "learning" happens. In other words, "learning" itself is a collateral activity and one that is always happening no matter what we are doing. This is what Dr. Elmore's math "Ah! Hah!" moment discussed above is about.

This was also the impetus for us to structure this book a bit differently than we had originally planned to do. Rather than schools focusing so heavily on learning itself, which is counterproductive since students naturally rebel at anything adults are forcing them to do, why not focus on the things that students tend to do naturally? What about using their natural desire to explore their world as the basis for their school experience? If we can create school as a set of rich experiences for students,

Figure I-7: *True engagement is about living, playing and creating.*
Early Childhood Center at Shorecrest Prep School in St. Petersburg, Florida.

then we will, by extension, also be providing rich opportunities for learning.

> If we can create school as a set of rich experiences for students, then we will, by extension, also be providing rich opportunities for learning.

We wanted to parallel these experiences with a student's life outside school and find the equivalent experiences during the school day and focus on those. The book's structure was derived from this line of thinking, and so we have our major sections as Live, Play, Engage, and Create. All the learning that students need to function as successful adults can be obtained as they alternate between these four states of being and doing.

Live, Play, Engage, and Create are Integrated

For clarity, we have looked separately at the four elements of Live, Play, Engage, and Create. However, we want to stress that these are not ironclad distinctions but parts of an integrated whole. Depending on the context in which they are analyzed, each of the four elements may have smaller or greater aspects of the other elements within them. That means a student who is obviously "playing" could also be "living," "engaging," and "creating."

Keeping this important qualifier in mind, let us look briefly at what will be covered under these four sections as described in the book:

Live

"Live" covers all the aspects of the school experience that has to do with students in their individual and social milieu at school. It is also the realm that provides the greatest opportunities for emotional and spiritual growth and nourishment. Here are the areas we cover under the "live" category:

- Group collaboration
- Relaxing
- Meditating
- Physical fitness
- Socializing
- Eating
- Taking care of animals
- Gardening
- Community service

Play

By some measures, play is quickly becoming the dominant form of learning in this century. From a very early age, children use play as a simulation of life itself. Think about these characteristics of spontaneous play – this list applies as much to a game of chess as it does to soccer. It is natural; it is

> Most of what is taught in classroom settings is forgotten, and much or what is remembered is irrelevant.
>
> — *Ben Johnson*

dynamic; it is creative; it requires strategy; it helps you learn from mistakes; and it is engaging and exciting. This list is the very essence of what we would want the whole school experience to be. Here are the areas that we cover in the "play" category:

- Social games
- Games with manipulatives
- Physical activity play/sports
- Creative play with different materials
- Computer games
- Playing in nature

> Students need to be fully "engaged" for the real value of their learning to be realized.

Engage

"Engage" is about the more familiar things we normally associate with school, primarily in the area of academic growth and achievement. Ironically, by focusing so heavily on academics, schools often lose the opportunity to showcase such learning not as an end unto itself, but in service of some higher purpose. The hard and, sometimes, uninspiring work students need to do in this realm can only be fully rationalized for its long-term value when students can see direct connections between theory and practice and understand why the academic aspects of school will benefit them at a very personal level. In other words, students need to be fully "engaged" for the real value of their learning to be realized. Such engagement has to go beyond the desire to please a teacher or do well on an exam. Let us keep referring back to Prof. Elmore's definition of learning which requires students to "consciously" engage with an activity as a prelude to "modifying" their worldview and "learning" something. Here are the areas covered in this book under the "Engage" category:

- Direct Instruction
- Reading
- Research
- Experimentation
- Cooperative Learning
- Entrepreneurship
- Presentations
- Internships
- Projects

Create

"Create" is what schools for today and tomorrow are about. Just pause for a moment and contemplate the billions of pages of information, games, music, services, courses, and specific tools for skill-building that are available online. Now ask yourself how much of this vast treasure trove of resources is consumed rather than produced by students while they are

> Just pause for a moment and contemplate the billions of pages of information, games, music, services, courses, and specific tools for skill-building that are available online.

Figure I-8: *The best learning happens when teachers become mentors, coaches and role models. The obsession with "teaching" is actually the most significant roadblock to real learning.*

in schools. It is a safe bet that while youth around the world are prolific in the extent to which they make creative contributions to the resources on the Internet, it is an equally safe bet that the vast majority of these contributions don't happen while they are in school. When students go from being passive consumers to active contributors to the Internet, not only will the world benefit from the vast untapped potential that is locked away in our young people, but we are also able to better prepare them for the creative and challenging lives and careers they can successfully navigate and thrive in. We cover these areas under the "create" category:

- Music
- Performance
- Fine Arts
- Cooking and baking
- Technology-assisted media

> True learning requires both theory and practice — knowing and doing.

- Writing
- Making and building things

Foundational Beliefs of this Book

1. **Schools are places for learning, not teaching:** Oscar Wilde may have been onto something when he said, "Education is an admirable thing, but it is well to remember from time to time that nothing that is worth learning can be taught." Unfortunately, what students experience in schools is a lot of teaching and not enough learning. Schools thus become places where children go to watch adults work. "Traditional education incorrectly assumes that for every ounce of teaching there is an ounce of learning by those who are taught. However, most of what we learn before, during, and after attending schools is learned without its being taught to us. A child learns such fundamental things as how to walk, talk, eat, dress, and so on without being taught these things. Adults learn most of what they use at work or at leisure while at work or leisure. Most of what is taught in classroom settings is forgotten, and much of what is remembered is irrelevant."[2] So what does a teacher do and why do we need them in schools? "Great teachers engineer learning experiences that maneuver the students into the driver's seat and then the teachers get out of the way."[3] Teachers can be many things that inspire students to learn. They can be coaches, they can be counselors and they can be role models for great learning. What they shouldn't be is obsessed with teaching as a way to impart learning.

2. **Education should be about learning, not just knowing:** While knowing is embedded in real learning, it is entirely possible to "know" something without having "learned" it. We can "know" all there is to know about how to drive a car from textbooks and videos but we don't truly "learn" how to drive a car until we sit behind the wheel. Thus true learning requires both theory and practice — knowing and doing. However, much of what schools do is about ensuring that students "know" the material in the curriculum regardless of whether they have truly "learned" it or not.

3. De-emphasize the obsession in school with "preparing" for the future: Everything about the education system from the days of early childhood education through graduating from high school, college, graduate school, and beyond is about preparing for what comes next. Nursery school kids are told how important it is to "prepare" for kindergarten and kindergartners are told to prepare for the 1st grade and so on. This unending series of milestones that are just ahead and out of reach that children are trained to pursue comes at a heavy cost. It prioritizes a vague and illusory future over the real and tangible present.

   According to Alan Watts, "If happiness always depends on something expected in the future, we are chasing a will-o'-the-wisp that ever eludes our grasp, until the future, and ourselves vanish into the abyss of death."[4]

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[2] The Objective of Education Is Learning, Not Teaching. Public Policy. Knowledge@Wharton. University of Pennsylvania. http://knowledge.wharton.upenn.edu/article/the-objective-of-education-is-learning-not-teaching/

[3] Great Teachers Don't Teach by Ben Johnson, Edutopia, June 28, 2013. https://www.edutopia.org/blog/great-teachers-do-not-teach-ben-johnson

[4] Alan Watts: 'Why modern education is a hoax' by Mike Colagrossi, 25 September, 2018. Big Think. https://bigthink.com/personal-growth/alan-watts-education

"Now rather than falling into a passive nihilism (which is where Buddhist thought can lead) Alan Watts instead argues for being within the here and now. Learn for learning's sake! Eternity is now... that is to become fully part of the process—whatever it may be—and do not focus on an ever elusive end goal."[5]

> Rich learning experiences occur at the nexus of great environments and a compelling curriculum.

How this Book Came About

When this book began as a germ of an idea in early 2017, the two original authors were at very different stages in their professional careers. One (Prakash) had more than 18 years' experience working on the design of innovative schools worldwide and the other (Roni) had just begun her journey with only a couple of years as an innovative schools designer. Our third key author, Prof. Richard Elmore, had initially agreed to write a chapter on learning and design to give greater clarity to these elements but what he ended up producing felt, to us, to be more than a chapter, which is why we decided to carve out an entire section of the book dedicated to his thoughts on the subject.

What all of us have in common is our passion to keep pushing against the education establishment – and anyone else who will

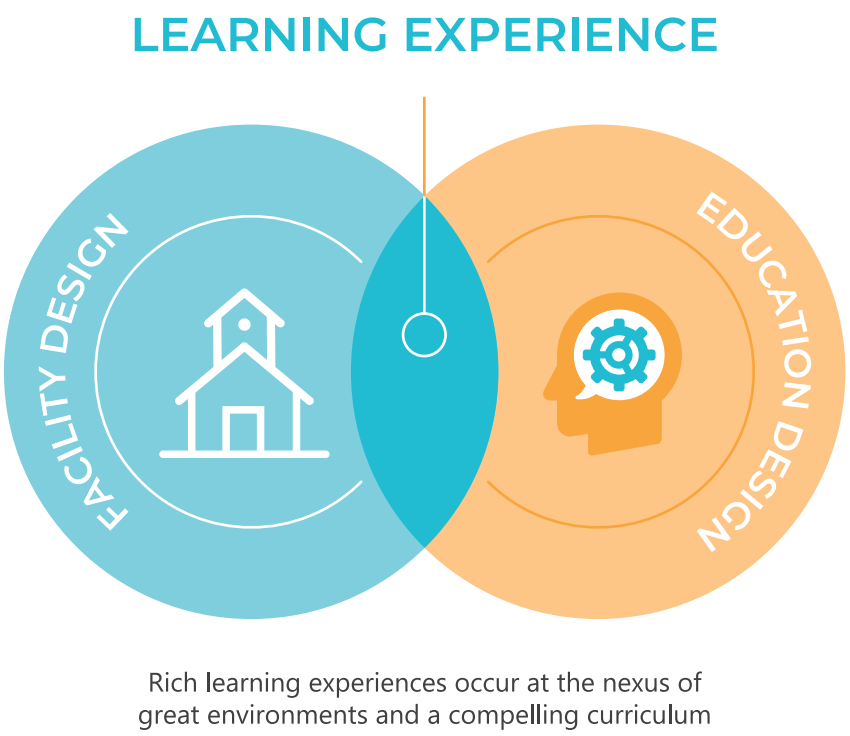


Figure I-9: *What we call "learning" involves what and how it is learned (the formal or informal "curriculum") as well as the "where" it is learned (the learning environment). The holistic experience that we can call learning is actually at the nexus of the curriculum and the environment. That means, truly rich learning experiences happen at the nexus of a great environment and a compelling curriculum.*

[5] Ibid

listen, for that matter — to bring about a new and better way to educate children. This is an imperative that grows more urgent with each passing year with the momentous changes the world itself is experiencing. Our common passion for education became the foundation for this writing partnership.

The vastly different perspectives we brought to this project given our vastly different life and career paths have allowed us to present a broader view of the subject than any one of us might have been able to on our own. Most of the collaborative work on this book happened remotely and via video conferences. However, the times that we were able to work side-by-side and, particularly, the times we were able to visit the schools featured in this book to meet and talk directly to teachers and students, brought forth the best ideas and, represent for us, the most inspiring and satisfying aspects of writing this book.

This book has been an amazing journey of discovery for us and we hope it will be for you as well. Every school we visited, every educator we met with and each student we talked to taught us something new. We had believed we would first need to tear down the education establishment so that a new one could be built in its place. Now, we realize that is not absolutely necessary. Instead, we have chosen to show how schooling and education as we have known it are dead but that learning is alive and well. What role schools should play to remain relevant in the years ahead is the question this book seeks to answer. What we are certain about is this: Rich learning experiences occur at the nexus of great environments and a compelling curriculum.

1 CHAPTER
THE EDUCATIONAL UNDERPINNING FOR GOOD SPACE DESIGN

Why do school facilities need to change? After all, one could argue, the current model of school has worked well for well over a hundred years. Over this time, many educational models have come and gone and, yet, the traditional school building design has soldiered on. So why change? Well, here is the most obvious reason:

The Purpose of Education has Changed: Education used to be about instilling "knowledge" into students, which is a fancy way of saying that education's primary purpose was to "teach" students "stuff." In the traditional educational model, the more "knowledge" one had, the more educated he or she was. But one doesn't need to go to school anymore for knowledge. There is a growing stock of information and tutorials of all kinds ready at hand on the Internet so that we are all free to learn anything, anytime, anywhere. With knowledge becoming an easily available commodity, education must now be about building

Figure 1-1: *Task Predicts Performance. Students get good at what they do. At this senior student center at Centaurus High School in Boulder Valley, Colorado, students get to spend time with their peers or working independently to complete tasks at their own pace.*

strong social, creative, and conceptual thinking skills, building character and a whole range of new literacies. According to the World Economic Forum's "Future of Jobs" report, the top 10 job skills for 2020 will be[6]:

1. Complex problem solving
2. Critical thinking
3. Creativity
4. People management
5. Coordinating with others
6. Emotional intelligence
7. Judgment and decision-making
8. Service orientation
9. Negotiation
10. Cognitive flexibility

> With knowledge becoming an easily available commodity, education must now be about building strong social, creative, and conceptual thinking skills.

Dr. Richard Elmore has an elegant saying, "Task Predicts Performance." That means, students need to be doing things in school that we want them to be good at as adults. Since we know what the top job skills for the future are, shouldn't we be designing student experiences in school that allow them to practice and perfect these skills? Clearly, the traditional classroom limited by its physical design and further encumbered by a teacher-directed pedagogy, offers little opportunity for students to practice and perfect the above list of ten future skills.

Four Key Domains of the Educational System

Let us look at four distinct domains of the educational "system". There is near-consensus among school reformers that each of these four domains needs a radical shift in order to best serve the new educational model represented by the new literacies noted above. Taken together, the shift in all four domains represents a whole new paradigm of education. What we are talking about is the "software" of education and how it has changed radically and irrevocably over the past couple of decades since the dawn of the Internet era.

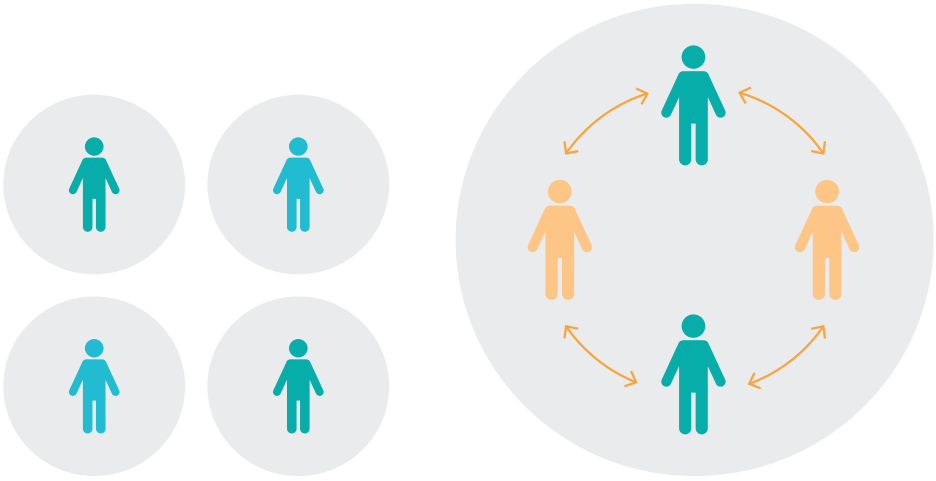
It follows that the "hardware" of education — in particular the buildings in which education is conducted — must also change to "run" the new "software." We will discuss the nature of the shift in each domain, and demonstrate why the traditional "cells and bells" (factory model with classrooms and corridors) school design is unsuited to accommodate the changes. From there, we will present a new "learning community" model that can become a template not only for the design of new schools but also for the renovation of existing school buildings.

Shifts in the Four Domains of Education

Teacher Practice — From Solo to Collaborative Teams: The "classroom teacher" is a staple of education systems worldwide. One might even say it is the bedrock foundation of everything we

> "Task Predicts Performance." That means, students need to be doing things in school that we want them to be good at as adults.

[6] The 10 skills you need to thrive in the Fourth Industrial Revolution by Alex Grey. World Economic Forum https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/



Teachers work independently, isolated in classrooms

Teachers work as part of a team in a learning community

Figure 1-2: *When teachers are trapped in individual classrooms, they are perpetually in a fixed teacher – student ratio. This makes it nearly impossible to personalize or differentiate learning. When teachers work as a team, they can personalize learning. In this model, working one-on-one with a student or a small group will be possible since the remaining students can be supervised by the rest of the teaching team.*

know as school; a single adult at the front of a room full of students sorted by age and grade. Teaching in school has largely been a solo practice and, to this day, remains the predominant way in which teachers work. Teachers being trapped alone with a bunch of students in a room for most of the school day is an undeniable and inescapable function of the way in which schools are designed with classrooms as their basic building block.

There is a strong educational rationale to change this model so that teachers have more opportunities — ideally throughout the school day — to work as part of a team. The research is clear on this. When teachers collaborate, student achievement improves. A Stanford study makes the compelling argument that when it comes to teachers, "social capital," which is measured by teachers' ability to interact frequently with their peers, has far greater value as measured by student achievement than "human

Figure 1-3: *Teachers work collaboratively as a team in their professional office and get to interact with each other regularly throughout the school day. This is a big change from the model where teachers own classrooms which are also their de-facto offices. Isolation in teacher-owned classrooms comes at a steep price because it sharply curtails the opportunity to collaborate and work as a team. Hillel School, Tampa, Florida.*

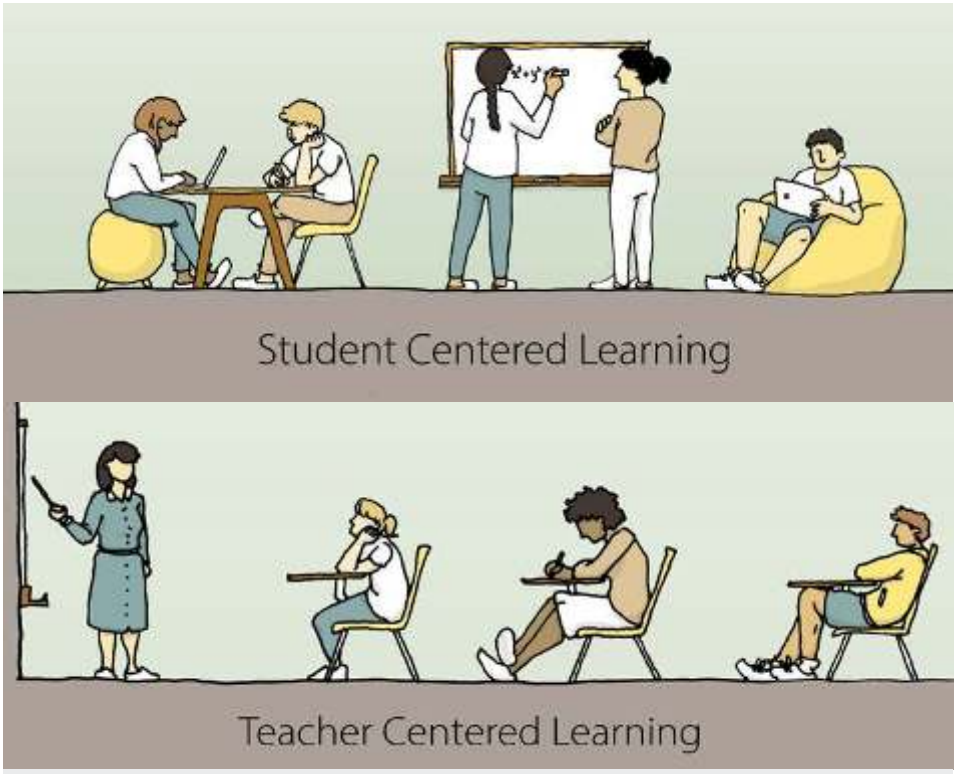


Figure 1-4: *Classrooms send a powerful message to students that they are there to listen to and take direction from the teacher. Common and breakout areas provide the ideal environments in which teachers can step aside and let students direct their own learning.*

capital," which represents the professional development classes and certifications that teachers receive.[7] The value of professional collaboration is further enhanced when teachers are afforded sufficient time during the school day to keep up with the latest research and developments in their own fields of expertise.

Pedagogy — From Teacher-Directed to Student-Directed: The classroom is perfectly designed to have one adult direct the work of several students under his or her charge. Consider the manner in which most classrooms are laid out. There is usually a desk for the teacher in front of the room and the rest of the room is filled with student desks and chairs. There is a "teaching wall" that contains a whiteboard and (sometimes) an electronic smart board. Very often the student desks and chairs are lined up to face the front of the room. Classrooms send a powerful message to students that they are there to listen to and take direction from the teacher. Even when teachers want to change the model to empower students by joining tables to create collaborative student groupings, the fundamental structure of the room remains one of control where one adult is fully in charge of what happens, how it happens and where it happens.

The teacher-centered model of education is now outdated because the kinds of skills it is best designed to develop such as rote learning, content mastery, memorization, and academic fluency are quickly giving way to the 21st century literacies noted at the start of this chapter. Beyond the need to change the educational model so as to make it more relevant to today's world, we also have to consider the question of student agency and autonomy. Prof. Elmore talks about this in Part Two of this book when he refers to the four "theories of learning" that determine how we set up schools.

> "The research is clear on this. When teachers collaborate, student achievement improves.

[7] The Missing Link in School Reform, Carrie R. Leanna, Stanford Social Innovation Review 2011 https://www2.ed.gov/programs/slcp/2011progdirmtg/mislinkinrfm.pdf

Figure 1-5: *This space that used to be a teacher-directed computer lab has been reconfigured so that it encourages teachers to step aside and let students manage their own time and direct their own learning.*
Middle School iLab at the Academy of the Holy Names in Tampa, Florida.

Hierarchical models, no matter how earnestly they wish to promote a student's best interests, have an intrinsic problem in that students don't like to be told what to do! There is also the practical reality that students will "learn" better — meaning they will get good at developing important and relevant skills needed for success in college, career and life — when they are actually practicing those skills while they are in school. Classrooms are simply not optimized to accommodate the wide range of activities associated with the new 21st century literacies. The imperatives for why it is critical to change from a teacher-directed to a student-directed model of education is discussed in greater detail in ***Blueprint for Tomorrow — Redesigning Spaces for Student Centered Learning***.[8]

Curriculum — From Segregated Subjects to Interdisciplinary Courses: Most classrooms have labels on them announcing the name of the teacher who lives there and the subject he or she teaches. And so we have a math classroom, a science classroom (and lab), an English classroom, a social studies classroom and maybe even a computer classroom. The arrangement of a school into a series of classrooms leads naturally into this model of labeling the rooms and assigning them to an adult who specializes

> "Classrooms send a powerful message to students that they are there to listen to and take direction from the teacher.

[8] Blueprint for Tomorrow, Redesigning Schools for Student Centered Learning by Prakash Nair. Harvard Education Press, 2014

Figure 1-6: *This commons space is part of a learning community that connects several learning studios. It serves as an ideal environment to encourage teachers to collaborate so that they can design and deliver an interdisciplinary curriculum. Middle School learning community at the Academy of the Holy Names in Tampa, Florida.*

in teaching one subject. Of course, in the early grades, homeroom teachers may teach more than one subject but, even here, the school day is broken down into periods devoted to the teaching of individual subjects like math and English.

There is no scientific rationale for the way the school building and the school day are broken down into bite-sized chunks of space called classrooms and bite-sized chunks of time called periods. In other words, we have no evidence that this is a good way to teach or learn anything. What we do know is that this kind of education militates against our stated goal of preparing students with the skills and competencies they need for college, career, and life. In the words of David Orr, "A fourth myth of higher education is that we can adequately restore that which we have dismantled. In the modern curriculum we have fragmented the world into bits and pieces called disciplines and subdisciplines. As a result, after 12 or 16 or 20 years of education, most students graduate without any broad integrated sense of

> "Beyond the need to change the educational model so as to make it more relevant to today's world, we also have to consider the question of student agency and autonomy.

Figure 1-7: *The advantage of breaking away from the classroom-based model of school design in favor of the learning community model is that students will have more opportunities to learn and socialize with a larger group of their peers – often across grade levels. Kevin Bartlett High School, International School of Brussels, Belgium.*

the unity of things."[9]

Interdisciplinary courses are needed for students to have opportunities to see that disciplines are not self-contained fragments of information and knowledge, but parts of a larger whole. Heidi Hayes Jacobs says, "In the real world, we do not wake up in the morning and do social studies for 50 minutes. The adolescent begins to realize that in real life we encounter problems and situations, gather data from all of our resources, and generate solutions. The fragmented school day does not reflect this reality." [10]

> Classrooms are simply not optimized to accommodate the wide range of activities associated with the new 21st century literacies.

It is true that in a field like medicine, specialization and

[9] What Is Education For? Six myths about the foundations of modern education, and six new principles to replace them By David Orr. One of the articles in The Learning Revolution (IC#27) Originally published in Winter 1991 on page 52

[10] Interdisciplinary Curriculum, The Growing Need for Interdisciplinary Curriculum Content by Heidi Hayes Jacobs. Edited for ASCD by Heidi Hayes Jacobs from her book, Interdisciplinary Curriculum, Design and Implementation, ASCD, 1989. Published online at: http://www.ascd.org/publications/books/61189156/chapters/The-Growing-Need-for-Interdisciplinary-Curriculum-Content.aspx

super-specialization has been common in the past but, today, doctors are also being asked to see their practice within the larger context of the human body, which is a complex, interdependent system driven not only by its biology but also by more abstract aspects such as mind and spirit.

> A new "learning community" model can become a template not only for the design of new schools but also for the renovation of existing school buildings.

It is beyond the scope of this book to discuss the details of how interdisciplinary curriculums work except that they can only work when two or more teachers design and are able to implement the interdisciplinary unit together. Interdisciplinary curriculum units also tend to provide a greater opportunity to design student experiences that fit the Live:Play:Engage:Create paradigm around which we argue that schools must be designed. Such curriculums also provide students the greatest opportunity to bring their own natural skills and personal experiences to bear on the problems they confront in school and, as a result, make education more democratic and less autocratic.

Community — From Classroom to Network: As knowledge and information become commodities, the purpose of school becomes less about formal content learning and more about social and emotional development and about giving students opportunities to participate in and function as effective members of a close-knit community. In traditional schools, and particularly in large public schools, the classroom cohort has tended to serve as a student's primary school "community." Given the constraints of the space design and the rigidity of school schedules, students rarely have time to build real friendships with others outside their classroom or develop close connections with other caring teachers with whom they spend scant time — usually in the company of 20 or 30 other students. From a learning perspective, the lack of a community that extends beyond the classroom is an even bigger concern in today's world. Today, more than ever before, students need to be able to meet and mingle with larger, more diverse groups than would be available within an age-restricted classroom cohort. Similarly, students need to be able to work and consult with several adults who bring different perspectives and worldviews to enrich learning.

The Network model is about a more democratic, and less hierarchical, organization of learning spaces and people. This model does not do well within the constraints of a traditional classroom, which is the ultimate representation of hierarchy and control.

Connecting the Hardware and Software of Education

Almost every school has seven key organizational components or "teaching and learning practices" in play that, taken together, will provide the most accurate picture of that particular school's "Theory of Learning," which is described in detail in Part Two of this book. While the organizational components themselves are common to all schools, they are, each of them, implementable according to a spectrum. On the left-hand side of the spectrum are practices that represent a more traditional teaching and learning model, and on the right-hand side are practices that are becoming more prevalent as schools work hard to better prepare students with the skills they need for today and tomorrow. That is not to say that the right side of the spectrum is "good" and the left is "bad." It is more a matter of picking the side that best suits the learning needs of students at any moment in time. That means, ideally, schools need to be set up in a way that allows for free movement across each spectrum.

> The Network model is about a more democratic, and less hierarchical, organization of learning spaces and people.

From a "software" standpoint, we have established that the school user community have an organizational need to move freely from the left side of each component to the right and back to the left side when and as needed. With this in mind, let us look at the "hardware" of schools represented by the school building to see how well it supports the free movement of each organizational component across all seven components.

The red line that is drawn vertically across all seven spectrums represents the manner in which an antiquated cells and bells school building will, literally and physically, prevent free movement from the left side of each component to the right. To illustrate, let us look at the first component, which is teacher collaboration. This is the situation in which individual teachers

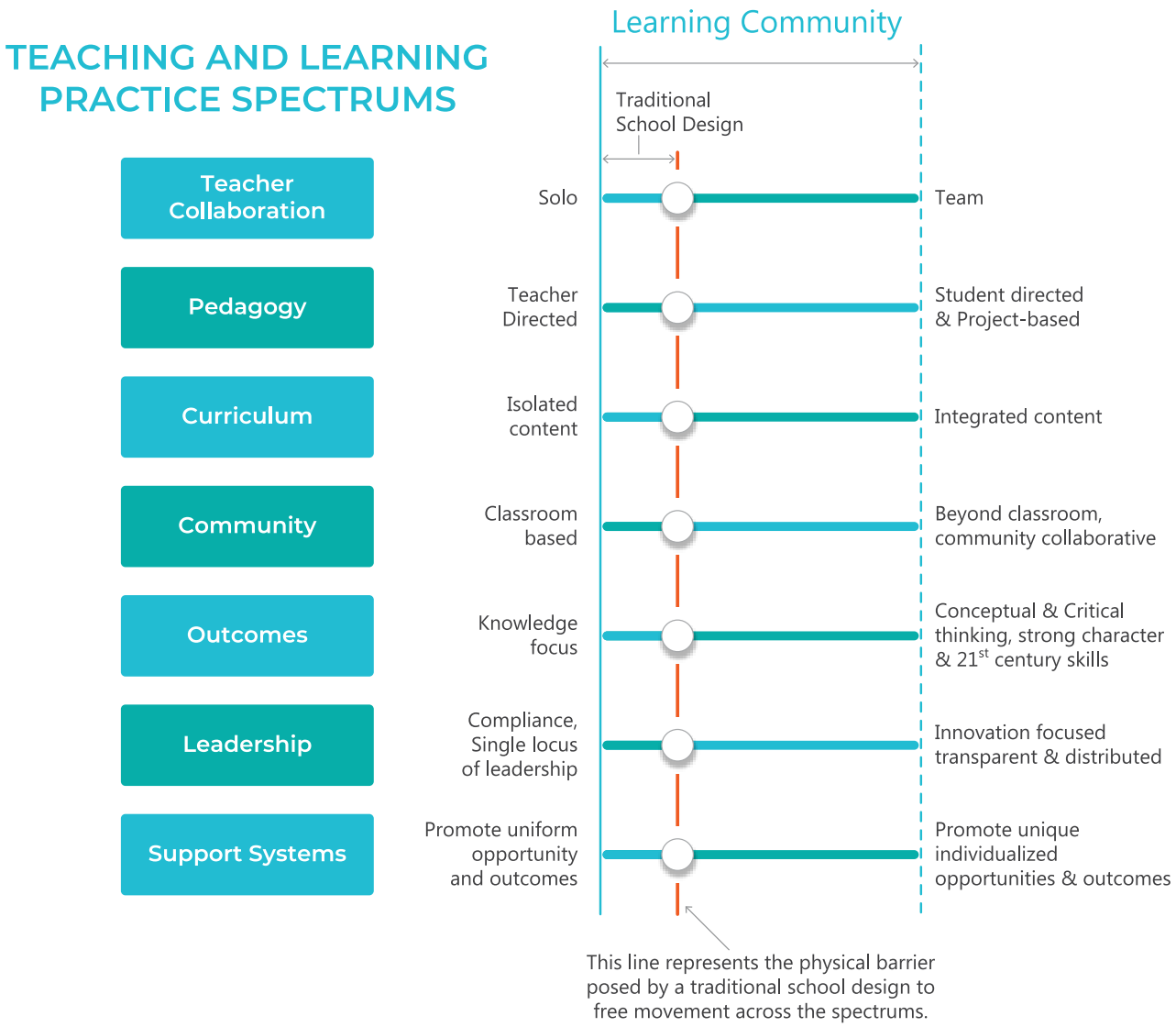


Figure 1-8: *The red line that is drawn vertically across all the seven spectrums represents the manner in which an antiquated cells and bells school building will, literally and physically, prevent free movement from the left side of each component to the right. This provides a compelling argument for why the physical design of school needs to be changed so that the building does not stand in the way of schools that choose to move from the Hierarchical model of education to the Distributed model (discussed in Part Two of this book).*

teach in individual classrooms. This model directly and overtly "prefers" the solo teaching model at the left-hand side of the spectrum and militates against teachers working together as a team.

In the same way, the cells and bells school building favors a teacher-directed pedagogy and militates against a student-directed model simply because classrooms are optimized for teacher direction, control, and lecture and has severe limitations when it comes to things like peer tutoring, team collaboration, independent study, research, and so on.

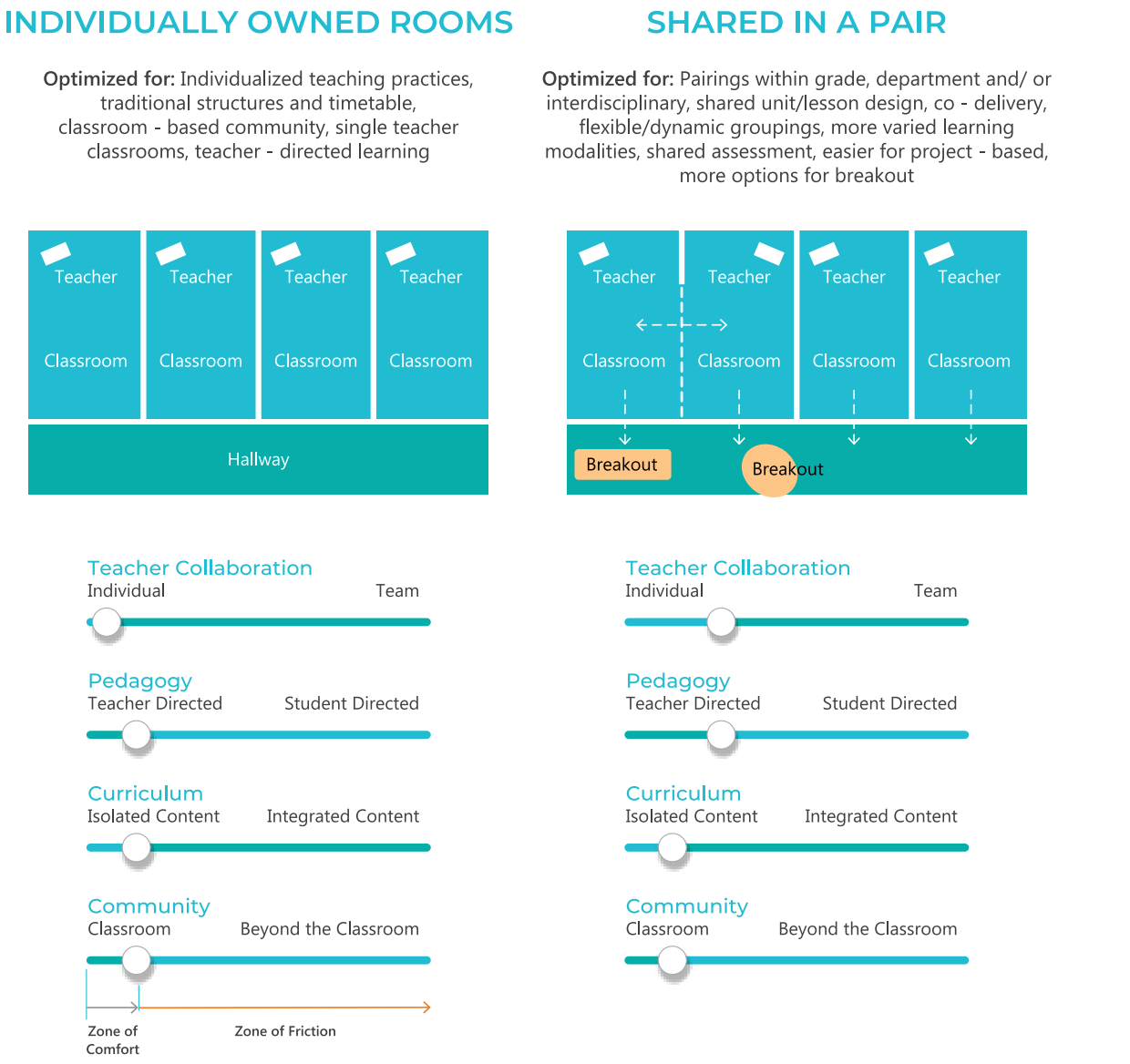


Figure 1-9: *These diagrams show how the "hardware" of schools – the learning spaces – have a direct and profound impact on the "software" of education represented by teacher collaboration, pedagogy, curriculum and community. Even minor changes in the way schools are designed can substantially impact teaching and learning.*

This line of reasoning can be applied across all seven components, but it is useful to look at the last one, which is "support systems." In our assessment, a cells and bells school is designed to promote uniform opportunity and outcome for all students because classrooms are, basically, about groups and not about individuals. In the classroom model, it has become prohibitively difficult to create a model where each student is offered unique, individualized opportunities to learn and grow.

> The cells and bells school building favors a teacher-directed pedagogy and militates against a student-directed model.

It is obvious from this discussion that the "hardware" represented by antiquated buildings places severe constraints on a school's ability to move from a "Hierarchical" to a "Distributed" model of education — discussed in Part Two of this book. The way out of this dilemma is to create a physical design of school in which the black line would completely disappear. That means, the architecture will facilitate free movement across all seven organizational components.

In the series of graphics shown below, we have illustrated the direct connections between what we call the educational "software" and the "hardware" on which it "runs," represented by the physical learning environment. We have narrowed the list of organizational components to just four domains for convenience, although the diagrams would be just as applicable if all seven were represented.

The first diagram, titled "Individually Owned Classrooms," shows how the traditional design of schools with individual teacher-owned classrooms keeps all four domains discussed in this chapter squarely at the left end of the spectrum. This demonstrates how the existing hardware represented by traditional school buildings is simply incapable of running the essential software of today's education.

In the second diagram, titled "Shared in a Pair," we show how even a modest change to the physical space, represented by the opening up of walls between pairs of classrooms, begins to move each bar within the four domains towards the right end of the spectrum. That is because 1) teachers can now work as a team; 2) with two adults supervising, more modes of student-centered learning can be introduced; 3) teachers are able to jointly design and deliver an interdisciplinary curriculum; and 4) students are now members of a community that extends beyond the limits of their own classroom. Personalization now becomes more possible. This is the kind of physical change that even cash-strapped schools and school districts can afford, and the changes can easily be completed during the summer break.

> The learning community offers a lot of benefits in that it is an agile, dynamic space that can quickly adapt to changes in population, pedagogy, and curriculum. Learning Communities are about building strong social, creative, and conceptual thinking skills.

The third diagram, titled "The Learning Community," is optimized for the educational software bars to move freely along the full length of the spectrum within each domain. This is a representational diagram and not intended to be seen as a prototypical design. Actual learning community designs vary widely and can be adapted to a variety of traditional building types. Naturally, new schools can also be designed

around the idea of learning communities. In our experience, traditional cells and bells schools can be reconfigured as learning communities without a huge investment of capital dollars and, almost always, such changes can be accomplished over the summer break.

From an operational standpoint also, the learning community offers a lot of benefits in that it is an agile, dynamic space that can quickly adapt to changes in population, pedagogy, and curriculum. It is the quintessential representation of a "Learning Building"[11] — a building that evolves over time as it "learns" from the users who occupy the space.

LEARNING COMMUNITY

Optimized for: Curriculum organized around interdisciplinary themes, distributed democratic leadership, shared student responsibility, co-facilitated, cohort scheduling, highest levels of "community" and self directed learning.

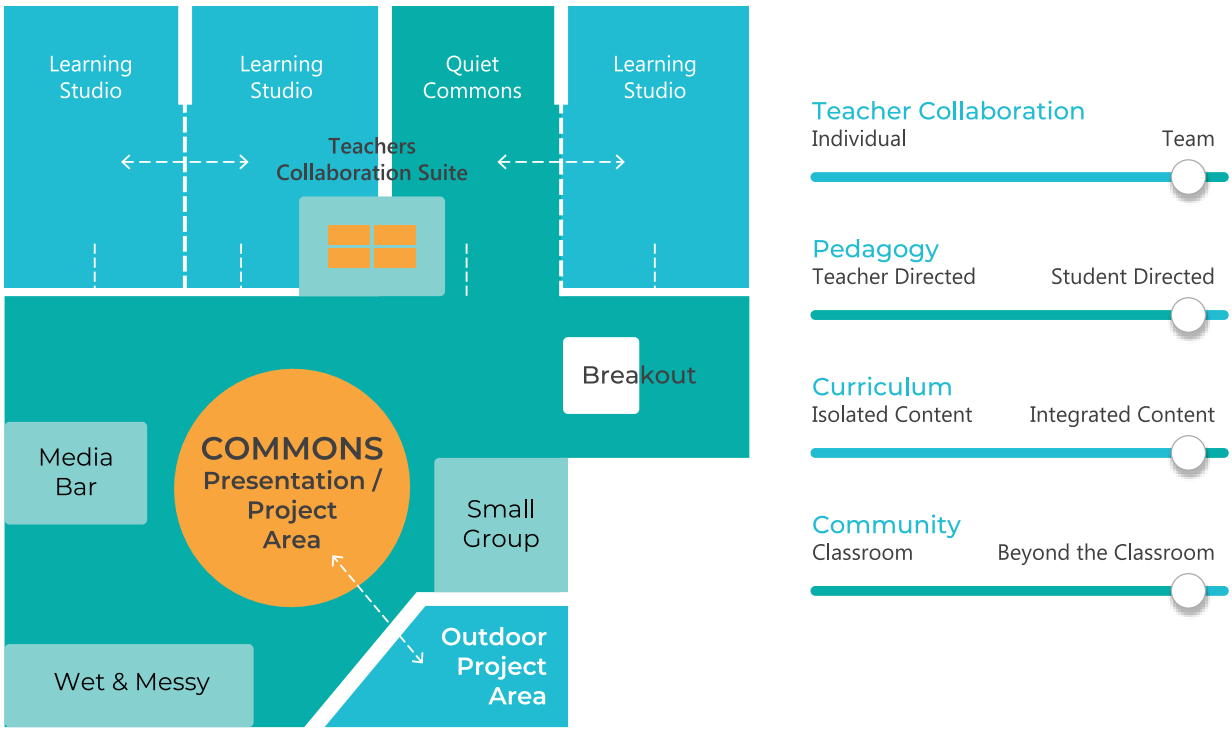


Figure 1-10: *The hardware-software connection comes into full force in this model of space design where there are no individually owned classrooms. There are a wide variety of spaces to facilitate different modalities of learning and a much richer curriculum than would be permitted under the traditional cells-and-bells model of classrooms aligned along a corridor.*

[11] Blueprint for Tomorrow, Redesigning Schools for Student Centered Learning by Prakash Nair, Harvard Education Press, 2014