

**A NEW CULTURE
OF LEARNING
CULTIVATING THE
IMAGINATION
FOR A WORLD
OF CONSTANT
CHANGE**

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1 ARC-OF-LIFE LEARNING

When people think about learning, they usually think about schools. And when people think about schools, they usually think about teachers. In this book, we take a different approach. In our view, the kind of learning that will define the twenty-first century is not taking place in a classroom—at least not in today’s classroom. Rather, it is happening all around us, everywhere, and it is powerful. We call this phenomenon the *new culture of learning*, and it is grounded in a very simple question: What happens to learning when we move from the stable infrastructure of the twentieth century to the fluid infrastructure of the twenty-first century, where technology is constantly creating and responding to change? The answer is surprisingly simple.

Ironically, the relentless pace of change that is responsible for our disequilibrium is also our greatest hope. A growing digital, networked infrastructure is amplifying our ability to access and

use nearly unlimited resources and incredible instruments while connecting with one another at the same time. However, the type of learning that is going on as a result looks so different from the kinds of learning described by most educational theorists that it is essentially invisible.

This new type of learning is a cultural phenomenon that underlies a large number of people's experiences and affects them in myriad ways. It takes place without books, without teachers, and without classrooms, and it requires environments that are bounded yet provide complete freedom of action within those boundaries. This familiar dynamic, in fact, structures all our contemporary notions of play, games, and imagination. Play can be defined as the tension between the rules of the game and the freedom to act within those rules. But when play happens within a medium for learning—much like a culture in a petri dish—it creates a context in which information, ideas, and passions grow. Potent tools for this type of learning already exist in the world around us and have become part of our daily lives—think of Wikipedia, Facebook, YouTube, and online games, to name just a few.

The new culture of learning allows us to recognize, harness, and institutionalize these ideas. It also requires a shift in our thinking about education. Although much of the new learning takes place outside traditional educational forums, we do not argue that classrooms are obsolete or that teaching no longer matters. Our goal is quite the opposite. We believe that this new culture of learning can augment learning in nearly every facet of education and every stage of life. It is a core part of what we think of as “arc of life” learning, which comprises the activities in our daily lives that keep us learning, growing, and exploring.

Play, questioning, and—perhaps most important—

imagination lie at the very heart of arc-of-life learning. Children, for instance, embrace play as a central part of how they experience the world, and they learn that questioning the world is one of the key ways they can understand it. Think of how a child's imagination blossoms when she discovers the "why?" game, for instance. No matter what answer an adult provides, it can always be met with the question "why?"—and the game can continue. For a child, the potential for fun is limitless. The principles of questioning and play can serve to define arc-of-life learning, and they have a tremendous effect on, and resonance with, learning today.

So what frameworks do we need to make sense of learning in our world of constant change? The new culture of learning actually comprises two elements. The first is a massive information network that provides almost unlimited access and resources to learn about anything. The second is a bounded and structured environment that allows for unlimited agency to build and experiment with things within those boundaries. The reason we have failed to embrace these notions is that neither one alone makes for effective learning. It is the combination of the two, and the interplay between them, that makes the new culture of learning so powerful.

One of the metaphors we adopt to describe this process is *cultivation*. A farmer, for example, takes the nearly unlimited resources of sunlight, wind, water, earth, and biology and consolidates them into the bounded and structured environment of a garden or farm. We see the new culture of learning as a similar kind of process—but cultivating minds instead of plants.

The stories we provide in the following pages show how the new culture of learning is intricately woven into the fabric of our

society; indeed, it permeates nearly everything we do. They also illustrate how the tools for learning in this new environment make the old way of learning and schooling seem much less effective. In each case we find that the very things that are speeding up the rate of change in the world are also giving us those new tools. The trick is to figure out how to harness these new resources, which make play, questioning, and imagination the bedrocks of our new culture of learning. The question is: In the twenty-first century, how do we cultivate the *imagination*?

SAM'S STORY

Sam is nine years old. Like most kids his age, he is already familiar with the Internet. But Sam has started playing with some new software, programs like Gamestar Mechanic¹ and Scratch, which are designed to help children understand the basics of design. Gamestar Mechanic is focused on game design elements, while Scratch deals more with the fundamentals of programming.

Scratch was created at MIT as a platform to help kids gain a level of technological fluency. Its colored and coded building blocks allow a programmer to drag and drop various algorithms and procedures into a window and then link them together in different sequences to create programs. The results are immediately visible in a second window on the screen. Within a few minutes of playing with the software, kids can create basic animations and user interactions and can add their own images and backgrounds to the program.

One of Sam's first programs was an animation in which he created an avatar, using his own picture, inside a virtual Grand Canyon. The goal of the game was to move the avatar around the Grand Canyon, chasing a piece of paper that was blowing in the

wind. Every time the avatar touched the paper, the player gained points.

Like many other kids, Sam quickly discovered how to program movement and how to import images for avatars and backgrounds. He also took a summer class to help him better learn how to create Scratch programs.

If we were talking about traditional approaches to learning, this would simply be a nice story, and this is probably where it would end. There is no doubt that Sam knows more about programming now than he did before and that he is able to use the tool to create something that is both interesting and personally expressive.

But Scratch has an additional element that takes the experience to a different level: a *collective*, a community of similarly minded people who helped Sam learn and meet the very particular set of needs that he had. When Sam posted his game online to that community, it became accessible to thousands of other kids who were also working with Scratch, and that's when some very interesting things started to happen. The other players were able not only to play Sam's game, but also, with the click of a button, to download it into the Scratch interface, see the code, and modify it if they wished.

Perhaps the most important aspect of all, however, was the users' ability to comment on projects they liked by clicking a "Love it?" button. What Sam found when he joined the online community was that he was no longer simply creating animations or games; he was part of a larger conversation. He was excited about receiving his first comment, of course. But when we asked Sam what it meant to be a good member of the Scratch community, we were surprised by his answer. It had nothing to do with building games

or posting animations. Instead, Sam told us that the single most important thing was to “not be mean” in your comments and to make sure that you commented on something good when you came across it, as well. The game does not just teach programming; it cultivates citizenship.

One of the options that Scratch provides is to “remix” other people’s work. When Sam came across a program he particularly liked, for example, he left a comment to which the original programmer responded “Wanna remix?” This invitation started a conversation between the two players. They began looking at each other’s programs, changing them, modifying them, and building on them. Because anyone can download the code to any posted program and make changes to it, Scratch has a built-in system that tags any remixed content as “based on” the original programmer’s content. This sense of remix has served to define a significant part of the Scratch culture.

When we asked Sam what makes a remix different from a copy, he told us without hesitation that for something to be a contribution, you have to change “three big things.” It wasn’t enough to make minor adjustments, such as “changing sprite movement from 14x, 3y to 15x, 4y.” It required something that reflected real work done by the programmer. The goal of remixing, he told us, is to improve the program. “You get it as good as possible first,” he told us, and then “if it needs improvement, you are happy to have others remix.”

Sam has taken classes on Scratch that have helped him “learn a little,” and he talks with two friends who use the program (though they are not part of the online community). Those interactions, however, are rarely about programming techniques. His friends are most interested in “what my comments were and

who commented on me.”

Yet Sam made perhaps the most revealing comment, one that tells us the most about the new culture of learning, when we asked him what he looks for in other people’s programs. He told us, “something really cool you could never know yourself.” While playing Scratch, Sam has learned a lot about programming and a lot about participating in online communities. But what he has learned most of all is how to learn from others.

TEACHING IN A GALAXY FAR, FAR AWAY

In the spring of 2004, one of us, Douglas Thomas, taught a course titled “Massively Multiplayer Online Games and the University of Southern California.” The class met once a week for three hours and was scheduled as a seminar to be divided into three parts. Part one was lecture: Doug would go over that week’s course readings, which covered some pretty heavy theoretical terrain—books and scholarly articles on game theory, identity, gender and politics, social theory, and technological determinism. Just to make sure no one questioned the course’s academic rigor, he even made the intrepid undergraduates wade through not one but *two* essays by Martin Heidegger.

Each class featured a lecture for the first hour and a half, followed by forty-five minutes of discussion, and then a half hour of show-and-tell, where the students, who had previously spent time playing in the virtual world of *Star Wars Galaxies*, would share examples from their gaming experience that would illustrate course concepts.

That was the plan, at least. During the second week, the discussion time was cut short by the students’ insistence that they show their examples as part of the discussion. They argued that it

was the only way they could really talk about what was happening in the game world without actually being there.

By the third week, students were arriving early to class, waiting to plead their case. “Professor, I know we need to do the lecture and discussion, but we were all in the game last night and found the perfect example for class today, so can we please start with it and then do the lecture after?” Doug agreed, though he couldn’t help feeling that his class was now slipping away from him. In one sense that was true. But he had missed a far more important message: Students were getting together, outside of class, and discussing how they might make the class itself better. “This just doesn’t happen,” Doug recalls. “At least not to me.”

By the fifth week, show-and-tell lasted for two-and-a-half hours and was followed by Doug’s brief attempt to make a few points about the week’s readings and see if there were any questions.

By week nine, one of the students was getting married (for the third time) within the construct of the game. The entire class was invited. It was elaborate, with all sorts of in-game items repurposed to transform a guildhall into a wedding chapel. Players all helped carry candles, and the ceremony lasted over an hour.

By week ten, Doug had written off the class as an interesting experiment that, while fun for the students, was a complete failure. He complained repeatedly to his spouse (also a professor) that he was teaching them nothing and that his “teaching in a virtual world” experiment was probably something that needed to be rethought. At the very least, he decided, he needed to figure out how to regain control of his classroom.

And then Doug read the students’ final exams. Every single paper was filled with examples from the students’ own experiences

in the game woven together with readings that had never been addressed in class, either through lecture or discussion. And the students weren't just repeating theory or quoting from source material, either—the examples were very rich and highly textured. They referenced Donna Haraway, Langdon Winner, Sherry Turkle, and, yes, even Martin Heidegger.

Far more important, however, the students referenced each other. For them, classroom time had become the least significant part of the overall experience. They had formed their own learning community and used course readings and material to make sense of what they were doing. And they had done it by themselves, for themselves.

After the course was over, Doug saw one of the students on campus and told him that he was very impressed by the quality of everyone's exams. Perhaps inappropriately, he expressed some surprise at that result. The student, however, just smiled and asked, somewhat incredulously, "What, did you think we were just playing games all semester?"

In a sense, Doug had indeed taught the students nothing. They, however, had taught him a great deal about what the new culture of learning might look like and how powerful it can be when students see each other as resources and figure out how to learn from one another.

GOOGLING THE ERROR

In northern California, Allen runs a small business writing computer code as a freelance hacker. He is fluent in nearly all the core languages and can program for a wide variety of tasks. He also has no formal training in computer programming beyond a degree in computer science he achieved nearly 50 years ago.

Allen's skill was developed in two ways: first, by experimenting with various computer language programs and compilers and second, by making mistakes. The second part would prove to be the most instructive but not for the reason one might think. Computer code provides almost endless flexibility in design, naming conventions, and routines—so much so that programmers are expected to document their code in plain language within the program to help others decipher their algorithms. But as anyone who has spent even a small amount of time around computers knows, when you run into a problem, the first thing the computer does is give you an error message. That message provides information that is often very specific to the language, program, or computer, but it is almost always completely incomprehensible and therefore useless. In some cases it can be indecipherable to even the most seasoned computer-programming veterans.

Allen took this failure and turned it into a learning opportunity. As he was learning to write code, he would write his program and run it. When it crashed, as it usually did, he would copy the obscure error code that popped up and paste it into Google. Within seconds, the search engine would present a list of discussions, FAQs, blog posts, and manual pages all citing or referring to that precise error. He learned incredible amounts of information, including the dos and don'ts of using particular aspects of code for different problems.

By “googling” the error, he was able to tap into—and learn from—large, diverse networks of programmers and hobbyists who all faced similar issues, and he often found solutions that would allow him to complete his project. Ultimately, Allen mastered every computer language he needed to start and run his own business—without ever attending a single class on programming.

GAMING ACROSS GENERATIONS

Becky and Nick are hard-core gamers. The two have been gaming together for more than a decade, going back to some of the earliest massively multiplayer online (MMO) games, such as *Ultima Online* (released in 1996) and *Dark Age of Camelot* (2001). In *World of Warcraft*, they take on the characters of a priest and a hunter, respectively. Becky describes herself as “less twitchy” than many of her team, or “guild,” mates, meaning she relies less on fast reflexes than she does on patience, careful strategy, and knowledge of the game. Ambitious and risk-taking, Nick is the class leader for his guild and knows just about everything there is to know about playing a hunter in *World of Warcraft*. They have very different playing styles and attitudes toward the game, but both are core members of the guild’s “raiding” culture, in which they battle fictional monsters. As part of the large group of players who are considered the best in the guild, they spend 15 to 20 hours a week taking on some of the most complex and difficult challenges that the game has to offer.

Becky also happens to be Nick’s mom.

Becky and Nick are part of the increasingly common phenomenon of children, parents, and even grandparents playing online games together. In some families, the relationship is very casual; they might all play the same game, but they won’t necessarily interact much. In others, playing the game together becomes the basis for family interaction. One family whose members are geographically dispersed, for example, uses the game as a way to stay in touch. Every Friday, three generations get together in *World of Warcraft*’s Azeroth to play for four or five hours. Prior to that, their interactions had been limited to real-world holiday visits and periodic phone calls. Now, the children

are staying home on a Friday night to spend time online with their grandparents.

We are seeing more and more intergenerational gaming, which picks up on the deeply social nature of online games while simultaneously providing a context in which even young children can play the role of “expert” in an increasingly acceptable fashion. During the time they spend together, family members are not just idly chatting; they are actively engaged with one another—questing, learning, and building teams to complete real tasks. They feel that the connections they build in the context of gaming can be about something concrete: accomplishments and shared experiences that bring them together and motivate them. Playing side by side, they also appreciate the different phases of life represented within the group and recognize each individual’s distinct motivations and skill sets. What’s more, everyone has fun at the same time.

CLICK HERE TO START LEARNING

Tom was 41 when he was diagnosed with adult-onset diabetes. At the hospital, he was shown a video, given several booklets and pamphlets with information about diet and treatment, and then sent home with instructions to follow up with regular visits to his physician. Each follow-up visit consisted of a brief discussion with his doctor and a blood test. A week after that, he would receive a letter in the mail with the test results and a reminder to schedule another follow-up appointment.

During this time, Tom was also visiting a website called Diabetes Daily, where he found articles about the condition written by members of the community and message forums covering topics ranging from evaluations of blood-sugar testing

kits to recipes for low-sugar, low-carbohydrate meals. The site also has a live chat room, usually populated by ten to 15 people at any given time. “The chat room was really important for me right after I was diagnosed,” Tom told us. “I was scared, and I didn’t really know how my diabetes was going to change my life. Just seeing a bunch of people living with it, doing fine, going about their lives was a huge relief. I remember thinking if these people are doing OK, because some of them were much worse off than I was, that I was going to be fine, too.”

Diabetes Daily is more than just a repository of informational resources, however. It is a community made up of thousands of people who visit the site every day to share their experiences, insights, successes, failures, and, on occasion, tragedies. For Tom, the site (along with a handful of others) started out as a place where he could go to better understand his disease. But it quickly became more than that: He found that the stories people told and the advice they gave were much more useful than the information provided by the hospital’s pamphlets—so much so that he keeps up with the forums even now. He also found that all his questions had already been asked, and most had generated long series of responses. Perhaps the most important thing he found was that almost every aspect of diabetes—from diagnosis to treatment to the very standards used to measure it—was in dispute.

The forums are not intended to substitute for visits to the doctor, and dispensing medical advice is strictly prohibited. (In fact, the forum rule against doing so is listed, in bold, as the first and most important of them all. Posts that cross the line are immediately reported to forum moderators and deleted.) The forums did help Tom make sense of his visits to his doctor, however, and they provided information that wasn’t available

from medical professionals. “The boards give you information that doctors just can’t, either because they don’t know it or don’t have time to tell you about it,” he said. “You also learn from other people’s experiences. You find out what are the right questions to ask your doctor and you can learn how to tell a good doctor from a bad one.” Through the postings, Tom realized that his own doctor was truly exceptional: “More than anything,” he said, “I learned how good my doctor was, especially in comparison to some of the others that are out there.”

In the forums, Tom found support among fellow diabetics. From them, he learned about daily practices for managing his disease, including how to deal with others. Doctors may provide medical advice, but online communities provide much-needed social advice. “Having diabetes is very different from living with diabetes,” Tom said, “and the forums are all about living with it.”

Almost all the learning that occurs on the site is the result of member interaction, and it fills in the gaps in people’s understanding about every aspect of the disease, from the most important to the most trivial. Perhaps the best summary of the site appears on the first page, which prominently features a small box that reads: “Newly diagnosed? Click here to start learning!”

Of particular interest to Tom was the question of how to handle pushy relatives around the holidays. “One of my online friends had posted a message about Thanksgiving. They had talked about the difference between saying ‘I can’t’ and ‘I don’t’ when you are offered food. Whenever you tell someone you ‘can’t’ eat something, they tend to push you, saying ‘come on, it’s Thanksgiving’ or ‘just one bite can’t hurt.’ But when you tell them ‘I don’t eat that’ it is much harder for them to say ‘yes, you do.’”

THE MORAL OF THE STORIES

Each of these stories illustrates how the new culture of learning is taking root and transforming the way we think about information, imagination, and play. They also reveal many motivations for learning across generations, platforms, purposes, and goals. We can see that learning is taking place in day-to-day life through the fusion of vast informational resources with very personal, specific needs and actions. The new culture of learning gives us the freedom to make the general personal and then share our personal experience in a way that, in turn, adds to the general flow of knowledge.

The people in these stories learned much more than facts, figures, and data. They shared their interests, developed their passions, and engaged in a play of imagination. They learned to participate and experiment. In that sense, something larger was always being addressed, built, created, and cultivated. Each of these stories is about a bridge between two worlds—one that is largely public and information-based (a software program, a university, a search engine, a game, a website) and another that is intensely personal and structured (colleagues, a classroom, a business, family, the daily challenges of living with a chronic disease). The bridge between them—and what makes the concept of the new culture of learning so potent—is how the imagination was cultivated to harness the power of almost unlimited informational resources and create something personally meaningful. In each case, fusing a vast informational resource with a deeply personal motivation led to an unexpected, unplanned, or innovative use of the space. In short, the connection between resources and personal motivation led people to cultivate their imaginations and recreate the space in a new way.

Through Scratch, Sam was able to join a larger learning community and become fluent in it with time, experience, and practice. What mattered most to him were not the programs he wrote or the games he played, but his engagement with others. Even though Sam had taken classes in Scratch, the real learning took place through comments, remixing, and looking at how other people solved problems. Sam was able to draw upon a vast set of resources, to ask questions, and to build on others' work, as they built on his. In the Scratch community, everyone learns from one another.

The same kind of community emerged around *Star Wars Galaxies* for the college students. They turned to one another to understand their experiences and the course material and to make the whole thing relevant to their lives. They started to see the difference between learning and being taught. Perhaps equally important, so did their professor.

By pasting confounding error messages into Google, Allen was able to tap into—and learn from—the vast wealth of knowledge available in the global community of computer practitioners.

Emerging new platforms offer a glimpse of what might be possible for families who game together.

And in online medical communities, people use networks to build learning communities that fill the gaps in and around information about health, medicine, diet, and exercise. Those communities provide patients with the tools to ask better questions of their doctors and to make better decisions about their medical care.

In the new culture we describe, learning thus becomes a lifelong interest that is renewed and redefined on a continual basis. Furthermore, everything—and everyone—around us can be seen as

resources for learning. To harness that new kind of learning and understand where we are now headed, we must dig deeply into that emerging culture. And in order to do that, we need to clarify what we mean by “culture.”

2 A TALE OF TWO CULTURES

For most of the twentieth century our educational system has been built on the assumption that teaching is necessary for learning to occur. Accordingly, education has been seen as a process of transferring information from a higher authority (the teacher) down to the student. This model, however, just can't keep up with the rapid rate of change in the twenty-first century. It's time to shift our thinking from the old model of teaching to a new model of learning.

A MECHANISTIC VIEW

At the moment, we are suffering the consequences produced by a long-standing form of education that regards knowledge in a very specific and practical way. Many traditional venues for teaching—such as the classroom, the workplace, and even books and instructional videos—have been predicated on what we would

describe as a *mechanistic* approach: Learning is treated as a series of steps to be mastered, as if students were being taught how to operate a machine or even, in some cases, as if the students themselves were machines being programmed to accomplish tasks. The ultimate endpoint of a mechanistic perspective is efficiency: The goal is to learn as much as you can, as fast as you can. In this teaching-based approach, standardization is a reasonable way to do this, and testing is a reasonable way to measure the result. The processes that necessarily occur to reach the goal, therefore, are considered of little consequence in and of themselves. They are valued only for the results they provide.

LEARNING ENVIRONMENTS

We believe, however, that learning should be viewed in terms of an environment—combined with the rich resources provided by the digital information network—where the context in which learning happens, the boundaries that define it, and the students, teachers, and information within it all coexist and shape each other in a mutually reinforcing way. Here, boundaries serve not only as constraints but also, oftentimes, as catalysts for innovation. Encountering boundaries spurs the imagination to become more active in figuring out novel solutions within the constraints of the situation or context.

Environments with well-defined and carefully constructed boundaries are not usually thought of as standardized, nor are they tested and measured. Rather, they can be described as a set of pressures that nudge and guide change. They are substrates for evolution, and they move at varying rates of speed.

By reframing the discussion this way, we can see how the new culture of learning will augment—rather than replace—

traditional educational venues. For example, people today often describe schools as “broken.” At first, it seems hard to argue with that. But what the proponents of that position mean is that schools have ceased to function efficiently; they are failing as machines. If we change the vocabulary and consider schools as learning environments, however, it makes no sense to talk about them being broken because environments don’t break.

Rather, we look at the question in terms of how our schools’ environments blend—or fail to blend—with the freedom and wealth of the digital information network. When viewed from this perspective, the learning that goes on in the school environment becomes more of an organic process, and the focus of the discussion changes from fixing a problem to growing a solution.

A SPECIAL TYPE OF CULTURE

Typically, when we think of a culture, we think of an existing, stable entity that changes and evolves over long periods of time. Individuals can choose to join cultures, but no individual can create one. What becomes important in this traditional sense of culture is the process through which people join a culture and the transformation that occurs as a result. We can imagine certain people joining a culture and changing it wholesale, but, for the most part, the process works the other way. When individuals become part of a new culture, they are generally the ones who are transformed. Consider an exchange student who has just arrived in a foreign country, for example. As he becomes immersed in the new culture, he undergoes a process of transformation in which he either adapts to the customs and conventions of the new culture and becomes integrated into it or finds he cannot adapt and elects to leave.

What we want to explore is a second sense of culture, one that inverts the process. In this second sense, a culture is what a scientist grows in a petri dish in a lab under controlled conditions, with very limited foreknowledge of what will result.² One of the basic principles of this kind of cultivation is that you don't interfere with the process, because it is the process itself that is interesting. In fact, the entire point of the experiment is to allow the culture to reproduce in an uninhibited, completely organic way, within the constraints of medium and environment—and then see what happens.

Unlike the traditional sense of culture, which strives for stability and adapts to changes in its environment only when forced, this emerging culture responds to its surroundings organically. It does not adapt. Rather, it *thrives* on change, integrating it into its process as one of its environmental variables and creating further change. In other words, it forms a symbiotic relationship with the environment. This is the type of culture that exists in the new culture of learning. It makes no sense to think of people adapting to what they are already doing. But it does make sense to see them as functioning within a broader culture and creating it, rather than merely responding to it.

THE NEW CULTURE OF LEARNING

From this perspective, therefore, the primary difference between the teaching-based approach to education and the learning-based approach is that in the first case the culture *is* the environment, while in the second case, the culture *emerges* from the environment—and grows along with it. In the new culture of learning, the classroom as a model is replaced by learning environments in which digital media provide access to a rich

source of information and play, and the processes that occur within those environments are integral to the results.

A second difference is that the teaching-based approach focuses on teaching us *about* the world, while the new culture of learning focuses on learning through engagement *within* the world.

Finally, in the teaching-based approach, students must prove that they have received the information transferred to them—that they quite literally “get it.” As we will see, however, in the new culture of learning the point is to embrace what we don’t know, come up with better questions about it, and continue asking those questions in order to learn more and more, both incrementally and exponentially. The goal is for each of us to take the world in and make it part of ourselves. In doing so, it turns out, we can re-create it.

3 EMBRACING CHANGE

Change has been a subject for philosophical meditation throughout human history. The Greek philosopher Heraclitus observed, “No man ever steps in the same river twice, for it’s not the same river and he’s not the same man.” What he meant was that by the time you remove your foot from the water and put it back in again, both the river and the person have changed.

Throughout the twentieth century, particularly after the Second World War, we had a slow-moving river. Stability, continuity, and maintaining the status quo defined our culture, and progress was carefully controlled. This environment influenced both education and technology.

EDUCATION

In the traditional view of teaching, information is transferred from one person (the teacher) to another (the student).

It presumes the existence of knowledge that both is worth communicating and doesn't tend to change very much over time. Ironically, however, it is that very stability that makes the model impossible to maintain as the world roils in a state of constant flux.

Many educators, for example, consider the principle underlying the adage, "Give a man a fish and feed him for a day, teach a man to fish and feed him for a lifetime," to represent the height of educational practice today. Yet it is hardly cutting edge. It assumes that there will always be an endless supply of fish to catch and that the techniques for catching them will last a lifetime.

And therein lies the major pitfall of the twenty-first century's teaching model—namely, the belief that most of what we know will remain relatively unchanged for a long enough period of time to be worth the effort of transferring it. Certainly there are some ideas, facts, and concepts for which this holds true. But our contention is that the pool of unchanging resources is shrinking, and that the pond is providing us with fewer and fewer things that we can even identify as fish anymore.

TECHNOLOGY

Advances in technology during the middle of the past century reflect just how gradually change used to occur. The development of color television is a particularly good example.

Bell Labs developed the first color signal in 1929, and RCA demonstrated it for the first time in 1940. During the following year, two of the three major broadcast networks (NBC and CBS; ABC did not participate) began field tests for color television. In the early 1950s, networks experimented with color broadcasting, and color signals went through a three-year period of standardization to meet FCC broadcast regulations. Prime-time shows in color

were first aired by all three networks in 1966, and in 1972 the number of color televisions in American households finally surpassed the number of black-and-white sets. By 1999, according to Neilson, 68% of U.S. households had a television.³

Now compare those numbers to the figures for adopting Internet technology: In 1997, 18% of families had Internet access in their homes. By 2001, that number had grown to 50%. Two years later, it was up to 55%. By 2006, it had risen to 65%.⁴ In 2008, it was 73%.⁵

Thus, it took 70 years to go from the first color signal to widespread adoption of color television. And the adoption itself could not have been easier: All you had to do was buy a TV.

Going online is a different story. Over a ten-year period, for example, most users will have owned several different computers, installed or learned multiple operating systems, and gone through dozens of e-mail clients, web browsers, news readers, and video players. Their software will have been altered, updated, patched, and revised numerous times. They will have discovered and migrated to and from hundreds of websites and may have created a host of identities, e-mail addresses, and points of contact. If you ask anyone who has been on the Internet for at least a decade what has changed, the answer will probably be, “Everything.”

And the changes are not just skin deep. The infrastructure will expand to accommodate them—it may, in fact, be driving them. In terms of bandwidth alone, YouTube’s website in 2007 took up more bandwidth than did the entire Internet in the year 2000.⁶ What’s more, YouTube would have been a failure back then: Broadband (which is required to stream video), fast processors, and high-end video cards did not yet exist, and the ability to create, digitize, and distribute digital content had not yet been developed.

Today, broadband is everywhere, digital cameras and webcams are either already built into machines or available very inexpensively, and all new computers can stream digital content. Indeed, many cell phones now have more computing power and Internet access than the average home computer did in 2000. The advances in processors, power consumption, bandwidth, and storage have all increased at a remarkable rate, doubling roughly every 18 months. The things that are commonplace in 2010 were unthinkable just ten years ago. As information is constantly produced, consumed, updated, and altered, new practices of reading, writing, thinking, and learning have evolved with it.

The Internet, in particular, has changed the way we think of both technology and information. Technology is no longer just a fast way of transporting information from one place to another, and the information it moves is no longer static. Instead, information technology has become a participatory medium, giving rise to an environment that is constantly being changed and reshaped by the participation itself. The process is almost quantum in nature: The more we interact with these informational spaces, the more the environment changes, and the very act of finding information reshapes not only the context that gives that information meaning but also the meaning itself. Consider what happens to a news story on a website that aggregates information from multiple sources. Just reading the story literally changes the shape of the news that day. As more people show interest in it, the story is moved higher up on the page and displayed more prominently. As even more people then become exposed to it, it gains yet greater prominence, and the significance of its impact continues to grow.

When change comes slowly, adaptation is easy. Many of the daily routines and practices during the past century involved

managing change on a gradual basis. For instance, when a new technology came along in the workplace once every ten or 20 years, businesses could offer classes, retrain employees, hold seminars, or schedule retreats to bring everyone up to speed. In short, they could create structured, centralized learning tools to help people adapt. With shorter time frames, this has become more difficult: Retraining every year, for example, is burdensome (and is apt to create an alienated workforce). What happens, then, when you are dealing with change on a weekly, daily, or even hourly basis?

LEARNING TO EMBRACE CHANGE

Change motivates and challenges. It makes clear when things are obsolete or have outlived their usefulness. But most of all, change forces us to learn differently. If the twentieth century was about creating a sense of stability to buttress against change and then trying to adapt to it, then the twenty-first century is about *embracing* change, not fighting it. Embracing change means looking forward to what will come next. It means viewing the future as a set of new possibilities, rather than something that forces us to adjust. It means making the most of living in a world of motion. We can no longer count on being taught or trained to handle each new change in our tools, the media, or the ways we communicate on a case-by-case basis.

Many approaches to learning in the twentieth century did, in fact, work but largely because of the glacial rate of change that characterized the era. Memorization, one of the basic staples of education, is not a bad way to learn about things that seldom change, such as spelling, the periodic table of the elements, and dates in history. Unfortunately, however, what students memorize are things

they don't actually use very often in their day-to-day lives.

Now consider the type of learning that has swept up an entire generation of children through J.K. Rowling's *Harry Potter* books. Ask any young fan about one of the main characters or about the significance of the scar on Harry's forehead, and the child will probably be able not only to answer your question but also to do so in great detail. Though it's very unlikely that she memorized the information, she learned it nevertheless. She absorbed it, like a sponge.

In fact, the kids reading the thousands of pages of text (the *Harry Potter* books, websites, wikis, blogs, and fan fiction) learned a lot about history, geography, philosophy, interpersonal communication, and basic sociology—and all without memorization. They did so by becoming part of the evolving story, which was told through seven books over the course of ten years. Each book in the series changed the narrative and managed to leave open questions about the fate, character, and role of many of the main characters right up until the end. The many possible permutations for the outcomes therefore spurred fans to create web pages, wikis, and thousands of their own stories set in Harry Potter's fictional universe. They organized meetings and conventions and formed discussion and reading groups. They even created a new genre of music, dubbed “wizard rock,” that mimics the style of music referenced in the books.

To most people, that doesn't sound very much like “real” learning. What good are made-up facts absorbed from a fictional universe? Those people are missing the point. The important thing about the *Harry Potter* phenomenon is not so much *what* the kids were learning, but *how* they were learning. Though there was no teacher in this setting, readers engaged in deep, sustained learning

from one another through their discussions and other interactions.

Kids learned the *story* of Harry Potter by reading the books. They learned the *meaning* of *Harry Potter* by engaging with the material on a much deeper level. Just as important, they followed their passion. Much of the pleasure of the *Harry Potter* series for this generation was about experiencing the unfolding of the story with friends, both online and offline. They anticipated, were energized by, and, ultimately, looked forward to the changes that each new installment brought to the narrative. In other words, with each new book, they were learning to embrace change.

MAKING CHANGE VISIBLE

Wikipedia may be one of the best examples of a system that embraces change. It may also be one of the best examples of the new culture of learning. One can look at Wikipedia from a perspective of either stability or embracing change and get two completely different readings of the site. In fact, the perspective you choose determines not only how you think about the uses of the site, but also what aspects of it you focus on.

In 2005, *Nature* published the results of a study conducted by Jim Giles, in which he compared Wikipedia's accuracy with that of its print counterpart, *Encyclopedia Britannica*. The study, which focused on factual errors, omissions, and misleading statements, found that Wikipedia and *Encyclopedia Britannica* were more or less equally accurate. News headlines announcing the findings generally echoed the sentiment offered in the title of Daniel Terdiman's CNET article: "Study: Wikipedia as accurate as Britannica."

The study, however, approached the comparison from the wrong perspective. What it really assessed was which of the two

sources was more stable. If the study had viewed the question as one of embracing change, the conclusion would have been just the opposite: that Wikipedia and *Encyclopedia Britannica* are more or less equally *erroneous*—neither one gets it right. *Nature's* analysis found that in 50 articles, *Britannica* had 123 factual errors, omissions, and misleading statements, while Wikipedia had 162 (the numbers were deemed close enough to call them comparable).⁷ The problem is magnified when you consider information that is not just factually wrong but has become outdated. Making knowledge stable in a changing world is an unwinnable game. What happens when a nation's name changes or borders are moved? How does a print publication deal with areas of science that are not only contested but also subject to radical change—or even reversal—based on a single experiment or new observation?

What Wikipedia can do, unlike *Encyclopedia Britannica*, is offer a very detailed record of the controversies over certain pieces of knowledge. And it does so exceptionally well. A quick glance at any Wikipedia entry reveals not only what the current, ephemeral, status of a given piece of knowledge is; it also discloses the history of any discussions, resolutions, and subsequent alterations to the entry that have given rise to its current form.

The Wikipedia entry for Christopher Columbus, for example, has been changed and updated thousands of times over the past several years. Those changes are stored and can be traced through a series of debates over Columbus's role in the history of the Americas. The entry reflects, in myriad forms, the shifts in opinions about the cultural, social, and political aspects of colonization, exploration, and the writing of history. Wikipedia allows us to read across time.

Print resources, however, in their attempt to create a

permanent record of stable knowledge, are forced to make choices that include or exclude similar material for reasons of form, content, or even organization. And by doing so, they render that information invisible. Imagine if we were able to see every aspect of the process for an encyclopedia entry, including the publisher's choice for who would write it, what the original entry looked like, what other people thought of the original entry, the edits and editorial decisions that went into the publication process, and the feedback provided by experts and lay readers. We would have a very different picture of what that entry represents.

Wikipedia allows us to see all those things, understand the process, and participate in it. As such, it requires a new kind of reading practice, an ability to evaluate a contested piece of knowledge and decide for yourself how you want to interpret it. And because Wikipedia is a living, changing embodiment of knowledge, such a reading practice must embrace change.

LEARNING THROUGH PLAY AND IMAGINATION

Embracing change and seeing information as a resource can help us stop thinking of learning as an isolated process of information absorption and start thinking of it as a cultural and social process of engaging with the constantly changing world around us. Once again, the experience of children can show the way.

Children use play and imagination as the primary mechanisms for making sense of their new, rapidly evolving world. In other words, as children encounter new places, people, things, and ideas, they use play and imagination to cope with the massive influx of information they receive. Child developmental psychologist Jean Piaget found that information became

“susceptible to play” once it was assimilated and repeated, and that play was the means by which most children learn to understand the world from their earliest stages of development.⁸

Historically, the pattern has been that as children grow up and become more proficient at making sense of the environment in which they live, their world seems to become more stable. Thus, as a child grows and becomes accustomed to the world, the perceived need for play diminishes.

Today, however, children and adults alike must continue to deal with an ever-changing, expanding world. A child playing with a new toy and an adult logging onto the Internet, for example, both wonder, “What do I do now? How do I handle this new situation, process this new information, and make sense of this new world?”

This alters the formula: In a world of near-constant flux, play becomes a strategy for embracing change, rather than a way for growing out of it.

As we have argued earlier, traditional approaches to learning are no longer capable of coping with a constantly changing world. They have yet to find a balance between the structure that educational institutions provide and the freedom afforded by the new media’s almost unlimited resources, without losing a sense of purpose and direction. Some posit that one of the primary problems with education, for example, is that our schools suffer from excess structure, which has no room for new technologies like Facebook and Wikipedia. Others believe that the trouble lies with insufficient structure, which cannot fully harness the power of new media and technology. Supporting either position may offer short-term payoffs but will fail in the long term because neither one addresses the shifts that are happening in the world around them. In other words, simply unleashing students on the Internet

doesn't solve the problem any more than lecturing and testing them more does.

Similar problems exist in the workplace. The need for innovation—the lifeblood of business—is widely recognized, and imagination and play are key ingredients for making it happen. Yet while people in other adult learning cultures, such as amateur hobbyists, are innovating like crazy, workplaces have become relatively moribund.

The challenge is to find a way to marry structure and freedom to create something altogether new.