CULTIVATING THE ENTREPRENEURIAL LEARNER IN THE 21ST CENTURY*

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The Entrepreneurial Learner

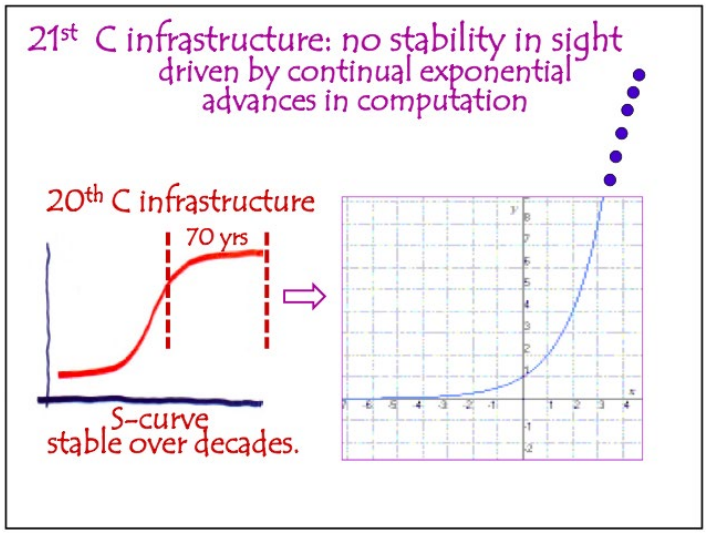
Several years ago I became interested in what it might mean to be an entrepreneurial learner. This does not mean how to become an entrepreneur. The entrepreneurial learner is constantly looking for new ways, new resources, new peers and potential mentors to learn new things. That's the sense of entrepreneur I'm talking about.

How do we prepare students for the 21st century workscape? I'd like to suggest that we need to build learning environments that foster entrepreneurial learners. We need to teach students to want to constantly learn new types of things, because that is the world that we are moving into – a world of constant and rapid change. The key for me is getting students to *play* with knowledge. Learning systems today primarily "push" information to students. However, the Internet now allows students to "pull" information and resources to them in the moment. Entrepreneurial learners will not only pull information from the web but also use it to connect and collaborate with other students and mentors across the world. These new methods of knowledge transfer enable rapid creation and collaboration in ways previously unfathomable. They also require something that has traditionally been excluded from the classroom: imagination. In some ways, imagination – making the strange familiar – is more important than creativity – making the familiar strange.

Overall, there are several pedagogies that exist today that we as educators are not yet taking advantage of to best prepare students for the 21st century workscape. There are new ways of learning that are built for the connected world. They are based on "pulling" information and using imagination. They teach students, through play, to become resilient learners in the face of rapid change. Most importantly, they scale. The elements of learning environments we seek to create already exist; we may just have to look in places we might not have considered in the past. So I want to first give you a preamble and then we'll move into the core of this topic, covering different examples of scalable learning systems with the potential to foster entrepreneurial learners in the 21st century.

Skills, Social Practices & Institutions Evolve Around New Technologies

Our digital infrastructure, what you might characterize as the 21st century infrastructure, is radically different than anything civilization has ever seen before. In the past, we always had S curves; brief moments of radical disruption, followed by 70 or so years of stability in which we invented the skills, social practices and institutional structures to support the new technology.

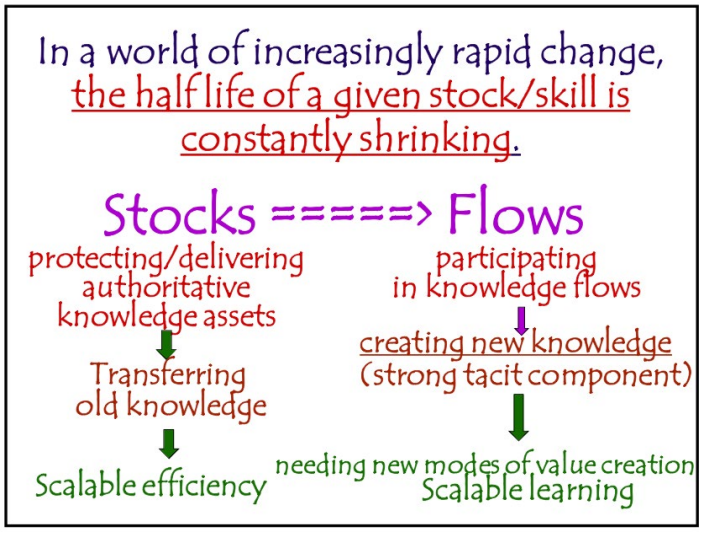


However, as you all know today with our digital infrastructure, we are now engaged in a world of exponential curves. Disruptive technologies are

being developed so rapidly that it's driving us a bit crazy. It is not the technology itself driving us crazy, but our inability to keep up to speed. The technology is the easy part. The hard part is figuring out the social and institutional structures around the technology. How do we invent new forums, new social practices, and new skills to leverage the capabilities of the technology? We have to ask ourselves what will the institutions of learning actually look like five or ten years from now? If they look the same as they do now, we've got problems.

A key aspect of these exponential changes is that you can now expect the half-life of many skills to be about five years. It used to be, not too long ago, that you could count on picking up a skillset and basically holding that for life. Today, that no longer works.

We are moving away from a 20th century notion of learning as picking up a set of fixed assets to a 21st century notion of learning as constantly reinventing and augmenting your skills. In the past, your skillset was authoritative, transferred to you in delivery models – often called schooling – and had wonderful scalable efficiency. How do we move from that transfer model of fixed assets to a model that requires participating in ever-changing flows of activities and knowledge? How do you move from being like a steamship that sets course and keeps going for a long time, to what you might call whitewater kayaking? Now, you have to be in the flow and able to pick things up in the moment. You have to be in it and feel it, not just above it and learning about it. We want to argue that in this new world of flows, learning is an active sport.

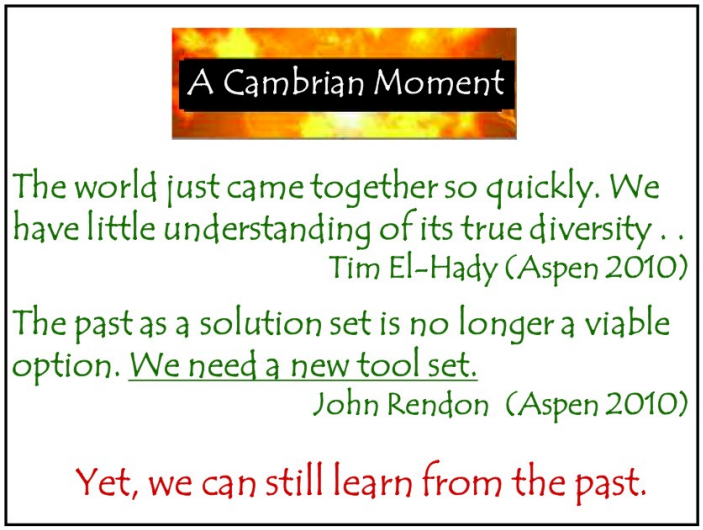


Here's the catch: In a world of rapid change and constant flux, learning has as much to do with creating the new as learning the old, but in creating the new, much of what is created is basically tacit. It has not had time to be crystallized out as explicit knowledge.

So, the role of tacit knowledge – of picking up the tacit – has become increasingly important. Yet, virtually none of our theories on schooling or transfer of learning really address the notion of coping with the tacit knowledge that flows hidden beneath us all the time. There is no roadmap to navigate this new learning environment. That is one of the reasons that we are now at an amazing moment.

A Cambrian Moment

I like to think of it as a Cambrian moment. It's very much like when I first went to Xerox PARC. It was in the early to mid 70's and basically everything was up for grabs. It was a new world. We could build and try anything we wanted. Now, in the age of the network, we are at another Cambrian moment. Everything is up for grabs. We are here to shape that future, and I think that is our real goal.



There are a couple of quotes that have always inspired me when thinking about this Cambrian moment. One is by Tim El-Hady who said, "The world just came together so quickly in this networked age. We have little understanding of its true diversity." In these periods of radical change – which are always going to be with us now – understanding how to leverage diversity is going be increasingly important.

Additionally, my colleague John Rendon in Washington says, "The past as a solution set is simply no longer a viable option. We need to create a new tool set." By "new tool set" he means institutions as much as the classical sense of tools. Nevertheless, we'd be foolish to say that we can't learn from the past.

In fact, speaking of learning from the past, let me give you all a quiz: What does this group of people have in common besides being creative, out-of-the box thinkers, doers and tinkerers?

You probably recognize most of these folks: Jeff Bezos, Will Wright, Larry Page and Sergey Brin, Jimmy Wales and Julia Child. Now the obvious answer is that they have a lot of money. Somehow, I overlooked that fact when I first pulled this collection together. There is another unifier for this entire collection of folks. What is it?

Here is the answer: every one of them went to Montessori schools. Maria Montessori, and I'd also like to add John Dewey, are two of my heroes from 75 years or so ago, that really drove a phenomenal movement in education. They valued play, imagination and other entrepreneurial learning skills. Sadly, their methods didn't scale. Perhaps they were 75 years ahead of their time. Perhaps their intuitions were right, but their tool set – going back to John Rendon – was wrong. Maybe, just maybe, their methods can scale now.

So, it becomes interesting to ask how we might relook at scaling in the network age. Using Montessori and Dewey as inspiration, let's look at some examples and see how many of their ideas could be recast in the networked age, providing us a with a way to create what one might call an "arc-of-life learning" that scales. This arc-of-life learning point is important because as the half-lives of skills decrease and the pace of change continues to increase exponentially, it is critical that we teach students to leverage this new learning ecosystem. How do we help

students transition from a “push” style of learning to being comfortable with “pulling” information on demand when encountering novel problems that they don’t know how to solve? How do we create a type of life-long learning that fosters entrepreneurial learners with the network technology that exists today?

about a topic, you can look up the information you need and explore it in the moment. This is a very big point. What you have is a curiosity amplifier coupled with an ability to pull information on demand to help navigate whatever activity you’re engaged in. The information you pull into action is learned in situ, made personal and contextualized.

Mobile Devices

Let’s start with something that is increasingly with us at all times of the day. Here’s an example of a 2-year-old looking over the shoulder of his 5-year-old sister. He is totally transfixed, looking at her surfing something on the web on her iPhone. I don’t think of the iPhone – and nor I think does she – as just a communication device. I think of it as a device to amplify curiosity. It is a curiosity amplifier.

This curiosity amplifier, for a rapidly changing world, turns out to be an amazingly important tool. At this point we are so used to using the iPhone, the iPad or some equivalent device to constantly look up things. It has become a natural part of conversation to stop and find answers to questions to aid in the discussion. If you’re doing something and you get stuck or become curious

With these new types of tools, all learning has a playful aspect to it. In the past, you had to go to the library, wait for an expert, or go to class. Basically, learning was quite separated from living. Now we can completely intermix things. Learning happens outside of the classroom. New information can flow into a conversation and be put into play right away. This is what creates almost unlimited scalability.

***Harry Potter* Worldwide Movement**

Another example I’m very fond of thinking about is the *Harry Potter* World Wide Movement in terms of the fan fiction networks. It’s very interesting to see that because of the networked age there are now over 6,000 communities of interest that have been created around *Harry Potter*. There are over a thousand discussion forums and 386,000 stories that have been

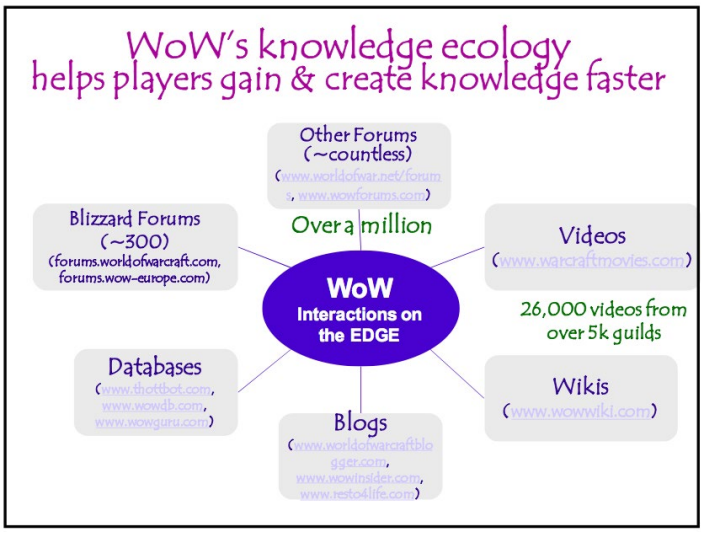
written. Perhaps more surprising to me is that there are the equivalent to at least one-hundred, maybe more, four-hundred page novels that have been written by people joining this *Harry Potter* movement. Writing is back. Writing is here in a major way, and we have the tools and social networking that incent people to do amazing pieces of work.

I keep being blown away by people telling me, "Oh no, no, no. Today's kids don't read, they don't write." And I just say, "Well, pardon me. Let me take you to some of these fan sites and look at some of the stories. Look at some of the *books* actually being written." In fact, I think the most recent data is that approximately a thousand books have been written in this subculture. It is a great example of the power our digital infrastructure has to connect people with similar interests and inspire the creation of massive amounts of original content.

***World of Warcraft*'s Knowledge Ecology**

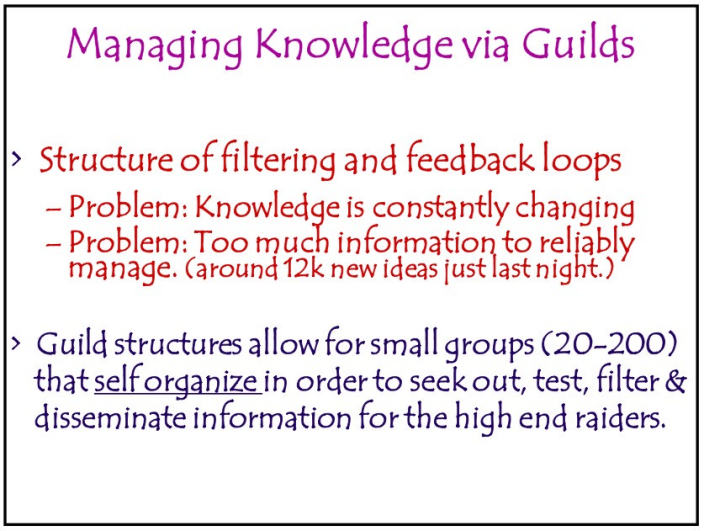
Now for something that I know a lot more about: *World of Warcraft*. I'm not arguing that the *World of Warcraft* as a game is all that important. Instead I'm arguing that the social life around the edge of the game is very important and something we ought to understand.

When you look at the infrastructure being created to support the videos, forums, wikis, and blogs about *World of Warcraft*, it can be baffling to think about how this works. Knowledge production and dissemination is happening at an unbelievable rate. How can 12,000, 14,000, 15,000 new ideas *a night* be processed? Well again – going back to the S-curves versus exponential curves – you want to talk about institutional innovation.



What are these kids inventing? They've created new institutional forums and knowledge processors. When a guild goes out to do a high-end raid, you will see that there are many sub parts of the guild that each take on responsibilities for processing specific chunks of knowledge. One sub-group will try out this chunk of knowledge, another sub-group will take on that chunk of knowledge, and so on. They get new ideas and try them out that afternoon. The things that work they pass up to a raid leader and the knowledge is saved for raids later that night.

So what's really happened here is a social structure has emerged within each of these guilds that actually turns out to be an amazing knowledge refinery. Knowledge is being created on the fly, filtered on the fly, validated on the fly, and then passed into action every 24 hours, literally around the world. What are the social dynamics underlying that form of learning and that form of knowledge creation? It's something I think we have an opportunity to study as we try to figure out the new ways to scale our learning systems.



Other aspects that I find so beautiful about the social life around the edge of *World of Warcraft* are the dashboards players create. The game is moderately complicated – a lifelong pursuit to some – so these kids craft their own dashboards in order to measure their performance. The dashboards amplify their ability to learn new skills more rapidly than anybody else. They provide players with a real-time feedback mechanism to improve their performance.

Now think about this: What would it mean in the school system if assessment wasn't superimposed on top, but we gave kids toolkits to be able to monitor their own behaviors and performances? They would get constant readouts for the sole purpose of helping them become higher performers. You would find competition about who was building the most useful dashboard. In fact, you find in the social life around the edge of some of these games like *World of Warcraft* an amazing mash-up community that is constantly combining new tools to measure themselves so they can get better and faster.

What would the workplace be like if, instead of having managers superimpose performance metrics, employees actually crafted their own measurements for productivity? How much time am I spending on different tasks? How much time am I wasting on random phone calls or emails? What kind of tools can I create to reflect on how I'm spending my time, so I can be more effective? This is what the participants in the social life on the edge of online games have figured out how to do. We have a lot to learn from them!

Social Networks of Learning

Now let's look at another example of the power of social networks of learning. Let's consider Ryerson College. At this school in Toronto, a

student named Chris Avenir was studying organic chemistry and decided to organize his own study group. Those of us that come out of the classical forms of education know that study groups are probably one of the most effective ways to learn anything.

social life & social networks of learning
Ryerson College

Chris Avenir organized a 146 member study group on Facebook called: "Dungeons/Mastering Chemistry Solutions"

Well, he organized a pretty big study group. He organized a group on Facebook of a hundred and forty-six members of his class. It was a wonderful study group. It was called, of course coming a little bit from the old days, *Dungeons/ Mastering Chemistry Solutions*. It was a great idea. However, beware. Implementing new tool sets can be problematic. Chris was thrown out of Ryerson College for inventing and using this new toolkit for learning.

The three "reasons" for the case against him were:

1) Learning should be hard.
2) There's no structure of regulation for online behavior and that makes it incompatible with academic work.
3) It is our job to protect academic integrity from any threat.

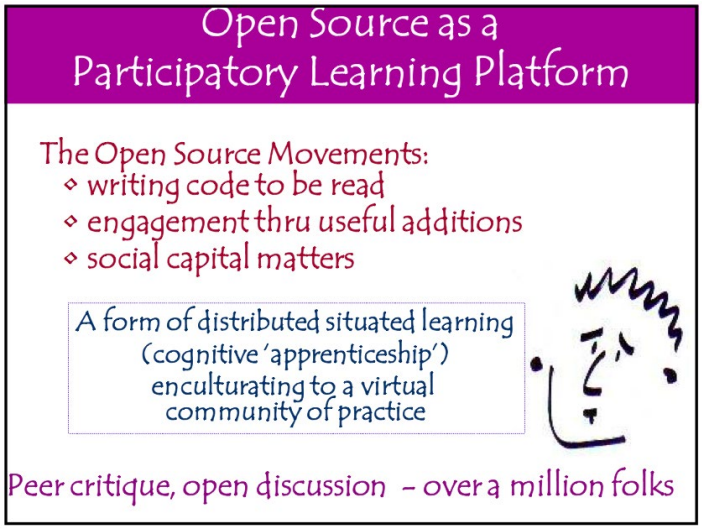
And a nice caveat at the bottom of this legal case:
i.e., unless learning is hard, and is directed by others, it fails to meet the standard of academic rigor.

Now, thank heavens, the faculty did step in after the rulings passed and in a new seven-page ruling the engineering faculty appeals committee found no "proof" that the Facebook group led to cheating. Students had not been using the Facebook group to cheat. Instead, guess what? They had been using it as a collaborative problem-solving tool. The case was dismissed, and Chris was brought back to college. Think what would have happened if that had not been overruled. It is clear that one of our challenges is institutional innovation and it's interesting to see students inventing their own toolsets to learn with and from each other. How can we take advantage of the tools for peer-based learning that already exist?

The Open Source Movement

Now, consider the open source movement as a participatory learning platform. The open source movement is comprised of distributed virtual communities of practice in which people work together voluntarily to develop and maintain open source software.[1] Network technology has made it easier than ever to build on the previous work of others. Similar to *World of Warcraft* gamers mashing-up different toolkits to improve their dashboards, the culture of the open source movement is based on looking around, seeing what other people have done, tearing some parts apart, repurposing those pieces, adding new pieces to construct something new and way beyond what the other person may have ever had

in mind. This makes it possible for participants to get a significant amount more done in a short period of time while expanding their creative prowess, so to speak, and also giving back to the community.



In fact, you become a better member of the community through useful additions and working in the distinctive style and sensibilities of that group. In the open source movement, social capital matters. This is most obviously seen in the fact that in order to participate you need to not only be able to code, but code in a way that can be understood by others. You write code to be read. Otherwise people can't use it, comment on it, modify it, or learn from it.

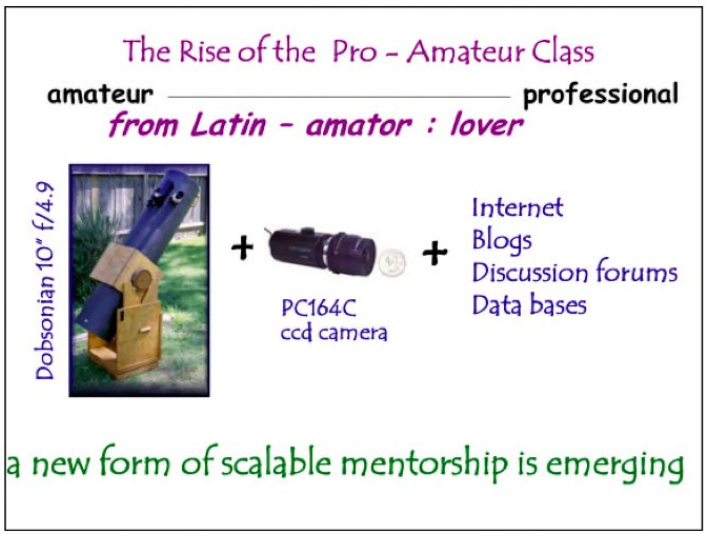
Now think about how this underlying social property has changed over the years. When I grew up studying computer science, I became a hero if I could solve a problem with code that was so obscure that nobody else could make sense of it. The macho behavior back then was to be so clever that no one could figure out what you'd done. Guess what? I would have been thrown out of any of the open source movements today because other people wouldn't be able to read and learn from my code. They wouldn't be able to effectively modify and improve it. The open source movement is a culture of critique. If a code can't be read, you can't give or get a useful critique.

So here we've already found a very interesting social innovation to escalate learning and knowledge creation on the fly. Participants in open source communities work collaboratively to improve on the existing work and create new, useful additions. They learn with and from each other in a rapidly changing landscape. Perhaps most importantly they are comfortable with critique. It's not about always being correct but about contributing, editing and improving together.

Pro-amateur Astronomy

A similar immersive social learning can also be seen in the "pro-amateur" astronomy movement. The term "amateur" comes from the Latin word *amator*, meaning to love. Amateur astronomers dedicate themselves to the night sky because it is their passion. Now, more advanced and available technology has given rise to what we call the "pro-amateur" class. These are more than casual stargazers. They have day jobs, but spend their free time in the evening monitoring the stars with high-tech equipment and sharing their findings with other amateurs over the Internet.

In recent years, an interesting relationship has emerged. All of a sudden, the professional astronomers found a reason to interact with the pro-amateurs. The reason? The global network of pro-amateurs has the ability to diligently monitor the sky 24/7 with a speed and consistency previously unattainable by professionals.



A couple things happened to make this possible. Today, professional astronomers traffic in partial differential equations galore. They actually don't have well-developed practices for seeing through a telescope. Amateurs, on the other hand, master that practice. The creation of the Dobsonian 10" f/4.9 telescope gave pro-amateurs access to advanced imaging power, opening the door to more possibilities to develop their skills and observe the sky. Amateurs could purchase the Dobsonian for a relatively small amount of money, build the telescope themselves and enhance with other inexpensive tools. When paired with a ccd camera like the PC164C and fed into a PC, the digital enhancement was something akin to Adobe Photoshop on steroids; the imaging capabilities were breathtaking given the small investment.

The greater potential of pro-amateurs was actualized when they created a network of stargazers triangulating observations with telescopes as capable as the professional grade 200-inch Hale telescope at the Palomar Observatory. What is so cool about this as a global movement is that it is always dark somewhere in the world, so folks who are currently experiencing daylight can still peer into the night sky. In essence, this means access to professional-level, live-streamed stargazing 24/7. With their online network, amateurs honed their craft by exchanging techniques and coordinating observations across the world. Professionals realized that if they collaborated with amateurs they could solve many astronomical mysteries in a mutually beneficial way.

Some of the most important discoveries in astronomy have come from this collaboration. A great example comes from John Beacom's team at Ohio State University. They've set out to understand what happens inside exploding stars, or supernovae. A critical factor in understanding supernovae is studying particles called neutrinos. These low-mass subatomic particles are formed in the nuclear reactions that make stars like our sun shine.[2] When a supernova occurs, the universe is flooded with neutrinos released from the explosion. The theory was that neutrinos released from a supernova would reach Earth *two hours before* the light from the explosion appeared in the sky.[3] However, the theory had not yet been observed.

On the night of February 23-24, 1987, Supernova 1987A exploded and neutrinos were detected by professional instruments at 7:35 Universal Time (UT, the same as Greenwich Mean Time).[4] If the theory was correct, the light from the explosion should have first arrived at 9:35 UT. Unfortunately, the earliest recorded professional photograph was taken at 10:30 UT. This only confirmed one part of the theory – that light arrived at least two hours after the neutrinos – but did not account for whether or not light appeared earlier than expected. Luckily, a pro-amateur astronomer observing in New Zealand captured a photo at exactly 9:30 UT of

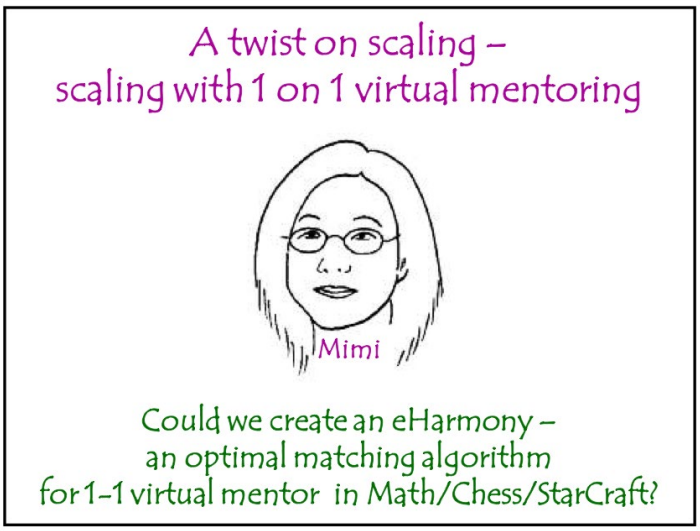
the region of space in which Supernova 1987A occurred. His photo showed no supernova, thereby confirming that its light must have arrived no earlier than two hours after the neutrinos did. This collaboration between professional and pro-amateur astronomers helped confirm a key theory of exploding stars.

After that happened, the game changed. Professionals suddenly became very interested in mentoring the amateurs. A whole new way of doing science started to emerge. Through interactions with professionals, amateurs became legitimate peripheral participants in the field of astronomy. In turn, amateurs started helping the professionals discover discrepancies or insights that they wouldn't otherwise have had the time or motivation to observe. The result was better science and a new form of scalable mentorship.

Mentorship

Scalable mentorship is a critical issue also being addressed by Mimi Ito, a cultural anthropologist studying new media use among young people. Given that mentorship is still so important – and will likely always be important – Mimi has asked a very provocative question: how might we create a scalable system for one-on-one mentoring?

She likes to call her solution "eHarmony applied to tutoring" because it uses sophisticated matching algorithms to take the particular idiosyncrasies of a student and pair them with the perfect person to be their virtual tutor. Virtual mentorship has been happening in chess, *StarCraft*, and now more recently with DIY Camps. Beyond providing access to online tutors, Mimi is researching how to get true scalability of one of the most profound kinds of learning you can imagine: skilled mentorship where there is a perfect match between the mentor and the student. The impact this could have on developing entrepreneurial learners is significant.



Learning to Belong vs. Belonging to Learn

An interesting notion – especially if you come from the communities of practice perspective – is that you might say we used to learn in order to belong. We learned in order to be able to join a community of practice. We created our identity through learning to join. This has been a fundamental force of learning and identity construction. Some of us want to argue today that this has slightly changed. I would like to propose maybe now we belong to learn instead of learning

to belong. It's a different sense of belong. The past sense of belonging was to create an identity. Perhaps now we have transitioned to bringing together different identities to learn collectively.

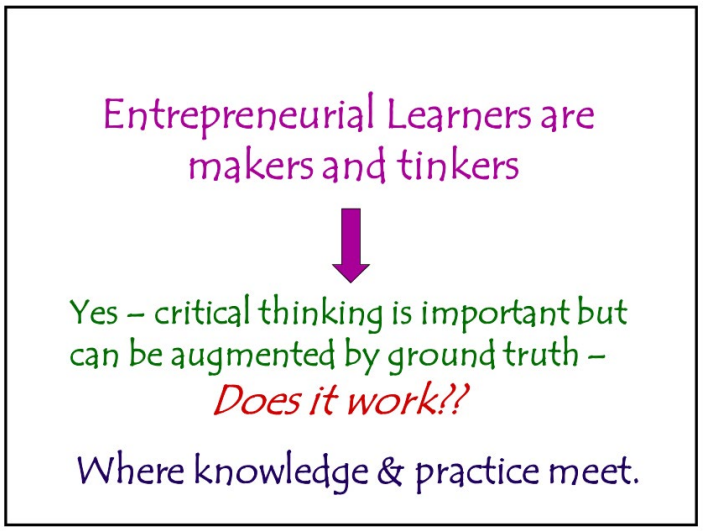
In fact, collectives are a perfect example of belonging to learn. Comprised of folks who share a personal interest such as gardening or photography, you can see collectives in Facebook groups or tools like MeetUp. Curiously, unlike communities of practices, they make no demands on members – no tests, no lectures – yet learning happens all the time. Collectives are focused on enabling individual agency. They are a site for both play and imagination where the personal can mesh with the collective, thereby transforming and enriching both.

Collectives are breeding grounds for many of the entrepreneurial ways of learning we've discussed. Similar to the open source movement, when I go to a collective I learn something but I'm also expected to contribute something, even if it's just through a question that I ask. They have almost unlimited scale via social networks and at their core rest notions of peer and master mentoring. Are there ways we can restructure our institutions of learning to better unlock these entrepreneurial qualities?

At this point, we've explored the potential of many existing scalable learning mechanisms like mobile devices, online games, and pro-amateur astronomy to foster entrepreneurial learners. There is a lot that can be learned and adapted from these existing tools, but let's take a step back. What's the bigger picture?

The Bigger Picture: Making & Tinkering

Each of the examples we've discussed could be categorized as systems of makers and tinkerers. The catch is that entrepreneurial learners are fundamentally makers and tinkerers, and we tend to underplay how important this is. Yes, you might say critical thinking is the most important educational skill, but guess what? Entrepreneurial learners are also strong critical thinkers, because if you are a maker or a tinkerer there is a notion of grounded truth. When I build a piece of software, yes, I'm doing it on my own sometimes, and yes, I may take shortcuts, but the fact is, does it work or not? I'm not just talking functionally, but also socially and contextually. Does what I'm doing resonate with others in my practice? Does it capture the essence of what I'm trying to do or say? This sense of, "I'm building something, does it work?" also applies to poetry. Does this poem hunt or not? If not, I need to keep tinkering with it.

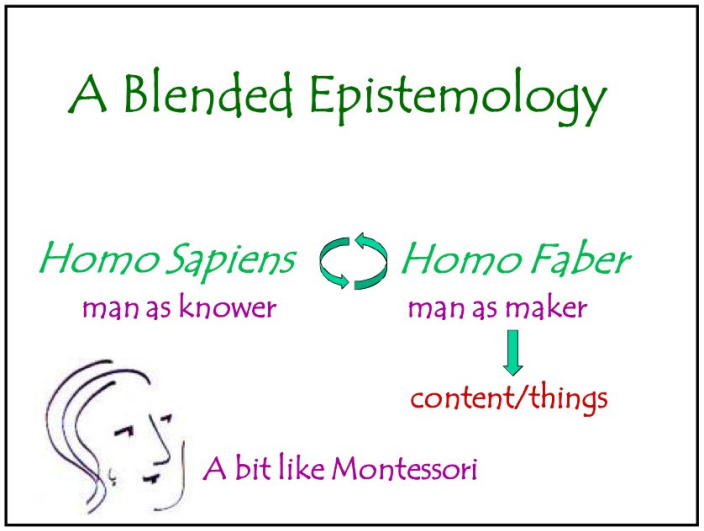


It's not just critical thinking that matters in education – although it's important – but if critical thinking is involved in making something, then we begin to close the loop on what I like to call "where knowledge and practice meet." Thinking

critically about what you make and how you tinker is essential to entrepreneurial learning. This fusion of knowing and making should not be undervalued.

Blended Epistemology

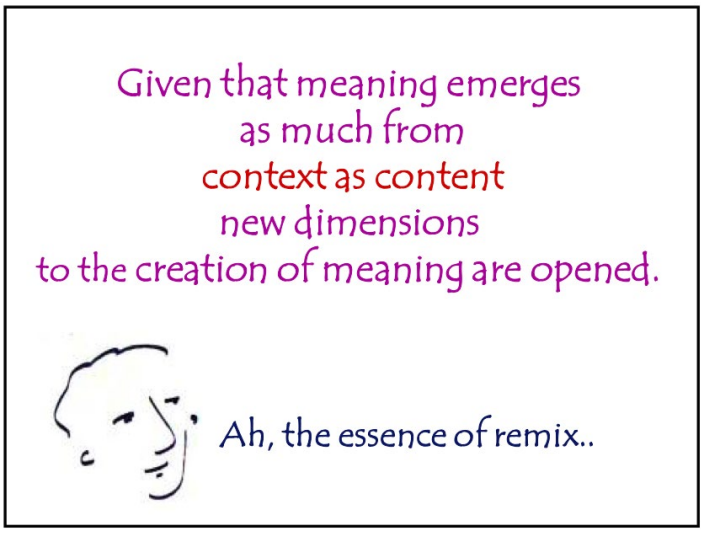
Let's take a deeper look at "where knowledge and practice meet," or in other words, a blended epistemology. Again influenced by Montessori, a blended epistemology combines theories of knowledge like Homo Sapiens (man as knower) with Homo Faber (man as maker).



We've always thought about Homo Faber, or "man as maker," as maker of *things* like goods or content, but the game has just changed. Now, in the networked age and with the tools we have at our disposal, we can also make contexts. It used to be that context was stable and we would create content within it. If we can start to create contexts however, then we have a whole new dimension for creating meaning.

To give a concrete example of this somewhat obscure metaphysical notion of moving from Homo Faber to making both things *and* contexts, in simple terminology what I have just said is the essence of remix. What is remix doing? It often is changing the context of a piece of content.

One of the simplest examples of this is to take a movie and change the music. What happens? By changing music, which is part of the context to the content of the film, you've not only changed the meaning of the film, you've also changed what you see.



Take *Jurassic Park*. You all remember that famous scene of the T. rex viciously chomping on a man. It's one of the most memorable images of that whole movie. It has never left my mind or my memory since I saw that. Well, guess what? That never happened. Do a still frame very carefully through that and when you get to the critical moment, basically the image vaporizes and the sound continues. The sound plays with your imagination and lets your imagination construct and fill in the image in a way that you will never forget. It is a beautiful example of context and content coming together and was much more dramatic than actually showing the final act itself. Yet, I swore I saw it. I really had to go over that single frame many times because I was so convinced I had seen it.

This rich interplay of context and content presents an interesting issue. I think it really gets at – and those of us in certain parts of the academy worry a little bit more about this – the fact that in this very fluid world where we can now change contexts, this may be an example of where critical thinking is now more important than ever. Now when you see something you have to ask yourself whether or not you fully understand your perception. Has the context been modified?

Similarly, how many of you remember the famous scene of Iraqis pulling down the statue of Saddam Hussein in Firdos Square in Baghdad at the beginning of the Iraq war? Well, guess what? That context had been carefully cropped to make you believe it was Iraqis pulling it down. It wasn't. They were American soldiers.

There's also Howard Dean and the scream that basically caused him to lose the 2004 election. The media erupted with clips of Dean screaming during a post-caucus rally in Iowa, painting him as hysterical. It went so far as to become an Internet meme known as the "Dean Scream" or the "I Have A Scream" speech that was relished by comedians and late night talk show hosts. Well, if you went back to the original recording, guess what? He was actually talking to a room three times as long as it seemed from the TV shots. He was projecting his voice, albeit very excitedly, in order to reach the back of the room. But the press had "magically" cut that out to make it seem like he was going hysterical. They changed the frame – they changed the context – which completely changed the meaning. Thus, a new type of critical thinking that we have to instill in our students is recognizing remix. Yes, remix is important, but through remix you change meaning. How can we help students deconstruct a context to understand the intent behind its modification?

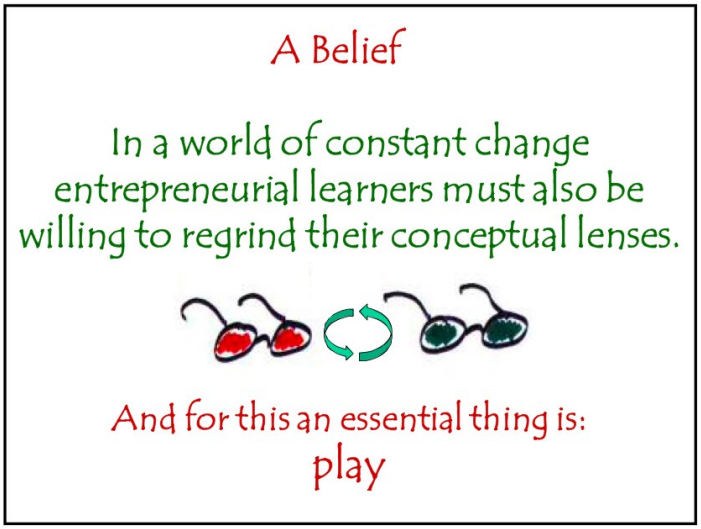
Joint Context Creation

Perhaps one way to call out remix is to actively engage in what I like to call "joint context creation." Blogging is a great example of this. While an experimental and oftentimes messy medium, this new form of writing represents an important shift in knowledge creation and dissemination. Andy Sullivan wrote a beautiful article in *The Atlantic* on "Why I Blog," that I think captures it well. "The blogger," Sullivan said, "is – more than any writer of the past – a node among other nodes, connected but unfinished without the links and the comments and the track-backs that make the blogosphere, at its best, a conversation, rather than a production." People read, write, link and comment simultaneously in the blogosphere in a way that Sullivan likens to jazz music. He says, "Jazz and blogging are intimate, improvisational, and individual – but also inherently collective. And the audience talks over both." This rich interplay is a powerful, playful learning environment with great potential for entrepreneurial learners.

However, the tacit knowledge flowing throughout this environment should not be overlooked. David Weinberger has a beautiful book, Too Big to Know, in which he addresses this new aspect of learning in the 21st century. Think about this a moment: he says, "We used to know how to know. We got our answers from books or experts. We'd nail down the facts and move on...But in the Internet age, knowledge has moved onto networks. There's more knowledge than ever, but it's different. Topics have no boundaries and nobody agrees on anything."

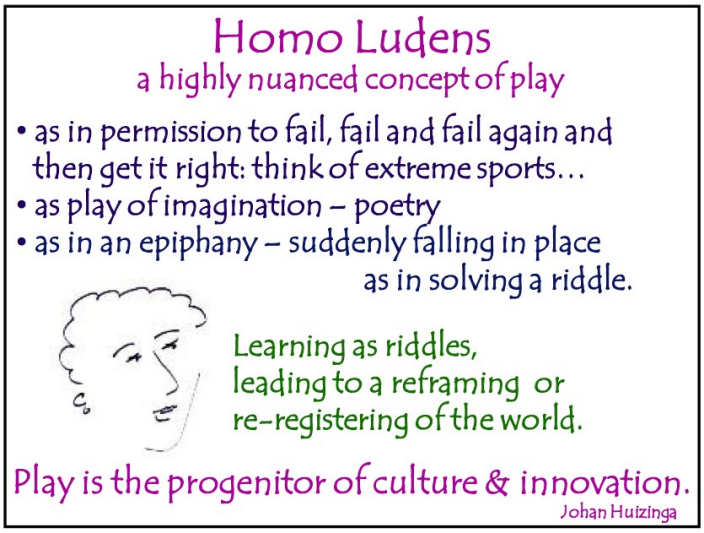
Similar to recognizing remix, it is critical that our students identify and understand the nature of tacit knowledge. Again, this points to how we as learners and educators need new strategies and tools for this world. How do we address tacit knowledge? Within this new era of over-information and rapid change, how can we create new educational tools that are, as Sullivan says, intimate, improvisational and individual, but also inherently collective?

Now, with all these techniques we're talking about – including some aspects of the collectives and the way that the personal and the collective interact – we still might just be pouring, you might call it, new wine in old bottles.[5] In a constantly changing world, sometimes we must be prepared to craft new bottles as well. It's all too easy to try to use old frameworks to understand the world today, but if our initial thesis is right we have to find ways to regrind our lenses or in some cases build new lenses completely. How do we build a conceptual lens? Our argument is play. Play is the essential factor in being able to regrind your conceptual lens in a world of constant change.



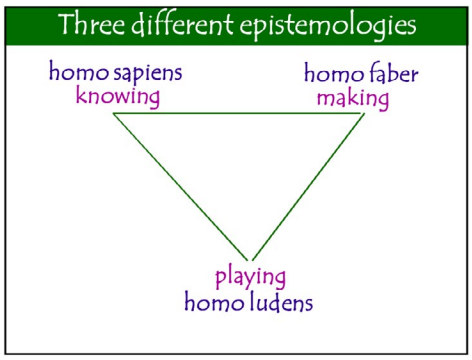
Homo Ludens: Man as Player

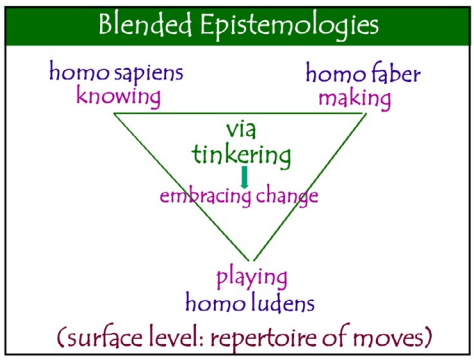
That brings us to a third epistemology. We talked about Homo Sapiens and Homo Faber and now I'd like to add Homo Ludens from Johan Huizinga. The key aspect of play is not that subtle – it's kind of a permission to fail, fail, fail again and get it right. Think of extreme sports. Failure is a critical part of that kind of learning. Also think about the play of imagination in writing poetry. How do you tinker with a phrase, trying one phrase after another phrase after another, to get that phrase just right?

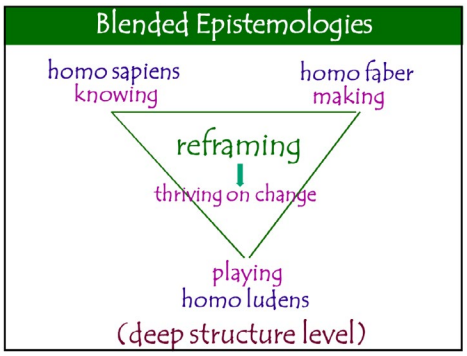


Perhaps most importantly, think about an epiphany. How do you play with something until it just falls into place? That's to say, learning as riddles leading to a re-framing or re-registering of the world, is basically what epiphanies are about. I mention that because if we can create even one epiphany for a child, that epiphany can last a lifetime. Brilliant teachers are brilliant in being able to create epiphanies for kids. How do we think about that and how do we use play as a way to amplify the chance for that to happen?

First, let's look at a very simple example of re-framing. Think of the tension that riddles cause







in your mind and how the answer then suddenly clicks into place. How do you play with an idea a little bit in order to figure out how to arrange the frame in a new way to suddenly make instant sense of everything?

This is the simplest example:

A black dog is sleeping in the middle of a black road that has no streetlights and there is no moon. A car coming down the road with its lights off steers around the dog. How did the driver know the dog was there?

The answer? It's daytime! As I said, that this was a very simple riddle, but there's tension and then you play with it. You play with the context and think, "Aha! This is trivial. If it's daytime, everything falls into place."

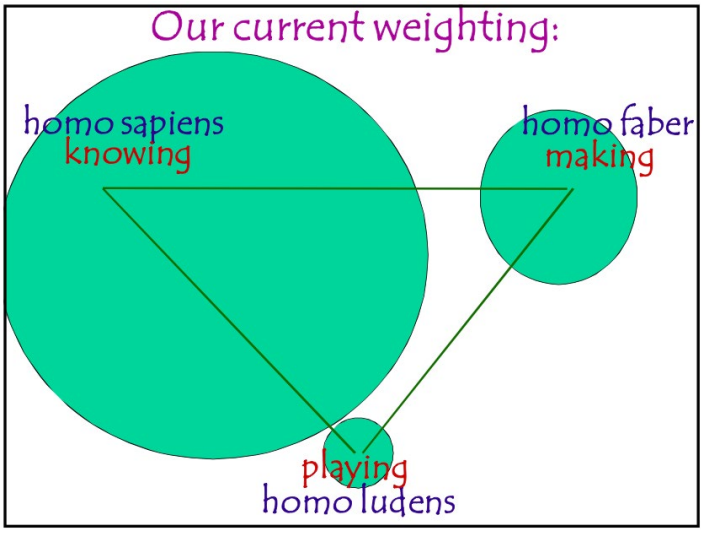
Tinkering: Knowing, Making and Playing

Think about the three different epistemologies – knowing, making, and playing – and how they may be blended together in terms of tinkering. Tinkering brings all three epistemologies together. In fact, tinkering is catalytic to many kids as a way of understanding a problem and the moves that are possible. Now the reason I bring up tinkering in particular is, in a world of constant change, if you don't feel comfortable tinkering, you're going to feel an amazing sense of anxiety. Things don't always work and if you feel you have to run and get a manual to figure out exactly what you should be doing or where you made a mistake, then you can't help but feel a bit frustrated.

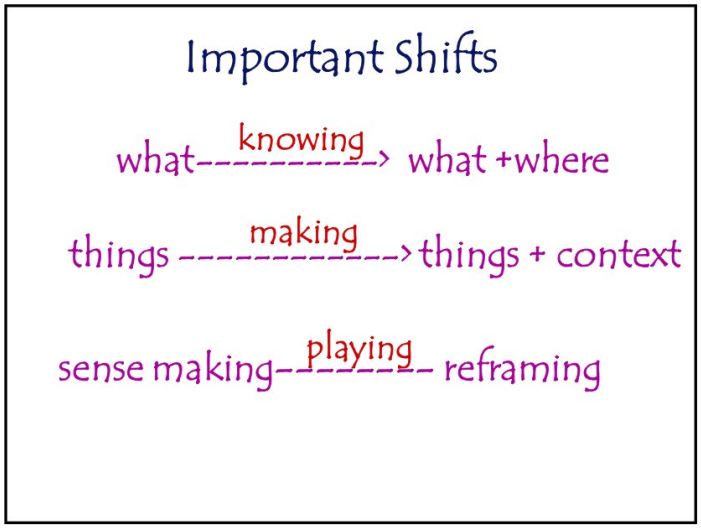
If, on the other hand, you feel completely at home just thinking, "Well let me play around with the situation a little bit and see if I can make it work," and then you make it work, not only have you learned something new, but you feel like you are now in control of things. So, this sense of play in a world of constant change, through the lens of tinkering, becomes very powerful. But tinkering can be more than just that. It really is the case that if you become skilled at tinkering, you begin to get a gut feeling for how systems work. You get a sense for what can be pushed around, rearranged, repurposed, or modified. You get the sense of what the pushbacks are all about. You start to develop an almost intimate familiarity with the system itself and with the material at hand. It is a form of being embodied – an embodied immersion – and you start to develop an instinct that is deeply situated. So, this deep-structure type of tinkering leads to a reframing that is completely aligned with the sense of epiphany we talked about earlier. Tinkering allows you to play with radically changing the context, which starts to build new lenses that you can use.

I want to suggest that if you look at the world

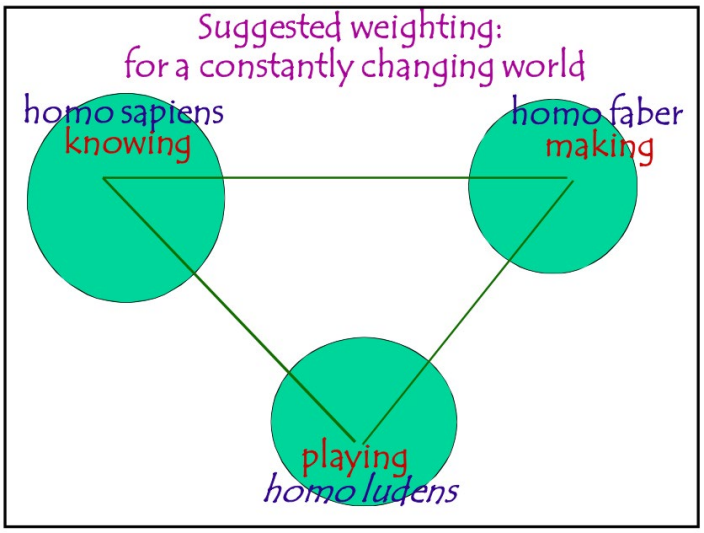
through most schooling systems today and see the weighting of influence, Homo Sapiens is way up here, Homo Faber sometimes sneaks in at the edge, and Homo Ludens – called play – usually gets wiped off the screen.



Yet, if you look at the shifts that most of us already live daily, we have moved away from a world of knowing just "what" to, perhaps even more importantly, knowing "where." Where do you find what you need? How do you tinker with the network to find what you need if you don't know exactly where it is? Tinkering has moved from just making things, to making things in context. Playing now has as much to do with making as it does with knowing. How do I play with the situation to make sense out of it? A profound reframing is the benefit of this deep structure tinkering.



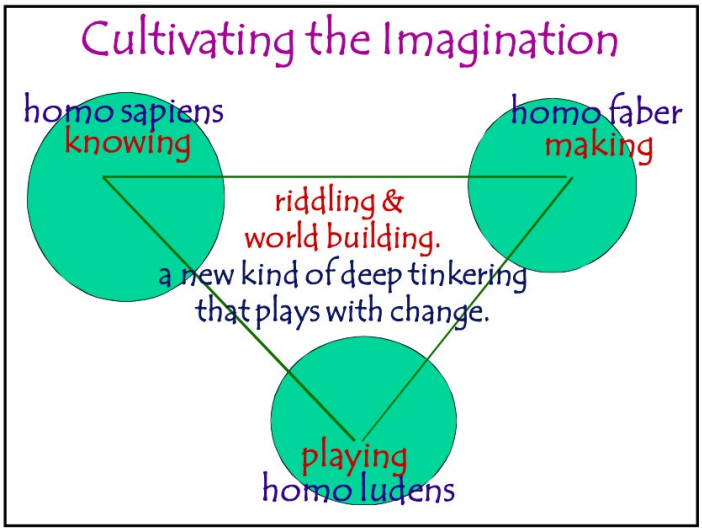
Considering all of this, I want to suggest that the world we're moving into and the tools, institutions, and connections we want to create really ask, "How do we get a more balanced structure between knowing, making and playing?" Homo Sapiens, Homo Faber, and Homo Ludens.



World Building

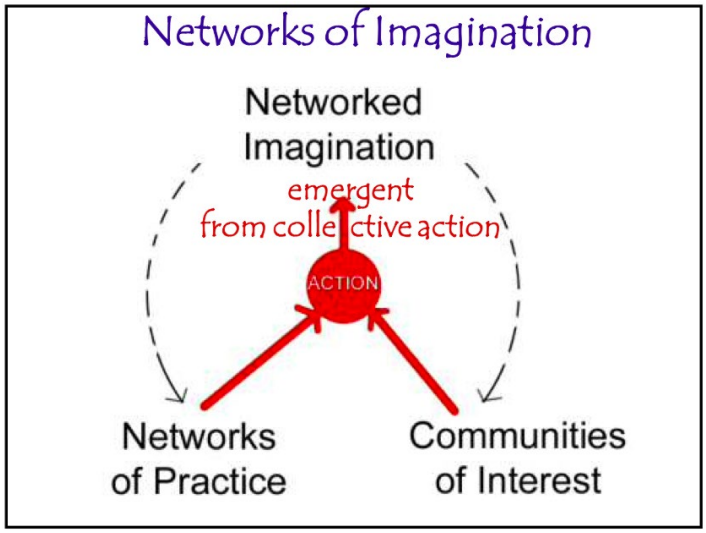
If we're going to build frameworks to support education in this new world, let's think about man as knower, maker and player in terms of world building. Tools for building worlds, whether fictional or real, specialize in making the strange familiar. How do you take a foreign idea and construct a world so that this strange event suddenly makes all the sense in the world? Guess what? That is what *Harry Potter*'s books are about. Take the wand. The magic wand, in some sense, seems so strange. It operates without electricity, how can that be? Now a world gets constructed for you, through the novel, where this strange idea seems so obvious that you never thought it could be strange.

When we can do that, we may finally begin to understand parts of the world that seem so mysterious to us today. Furthermore, we can begin to understand what *could be*. World building unleashes human potential through imagination. It allows us to dream of something that doesn't yet exist and construct the context and content around it so that it could be. The world is only going to get stranger. How do we fill in the spots that we don't yet understand? How can things be completely different? How do these things cohere in ways we never thought of before?



An imagined world – and what is World of Warcraft but an imagined world – gets more fleshed out and richer by people contributing to it. This suggests that the real challenge we have today in the networked age is how to foster networks of imagination. How do we amplify our ability through emergent collective action – and we've seen many examples of collective action – to create a sense of shared imagination?

Communities of practice need to have a sense of co-presence. You see it developing in some of the guild-based game worlds online and in other closely aligned digital ecosystems. It's possible to construct jointly with people around the world a shared imagination that makes it possible to feel totally co-present in the mental space with others. We share a networked imagination. There's something very powerful at stake here that we are only beginning to unpack now.



So let me just say, repeating myself, in a world of constant change, play is essential and entrepreneurial learners must be willing to regrind their conceptual lenses. The key part of play is play as a space of safety and permission. What kinds of permission do we give our students today? What kinds of permissions are required for the tools we're talking about to really have their power? What types of institutional innovations will grant those types of permissions in order to be playful in this deep, epistemological sense? How do we unleash our students' imagination and have them construct new worlds together?

Epilogue: The Global One-Room Schoolhouse

For a final thought, here is an idea that is very much like *Back to the Future*. Again in terms of Montessori – but even predating Montessori – some of the greatest learning environments were actually one-room schoolhouses. Why were they so effective? It's because the teacher wasn't just transferring knowledge, but also nudging the students to learn from each other. The teacher acted as a coach – you could also call it an orchestrator or a mentor – by getting older students to spend time helping younger students. The best way to learn something is to teach it. So, the older kids would teach the younger kids, and then the younger kids would turn around and teach the even younger kids. The teacher was not necessarily a master of the material, but rather a master of the way the students thought, the fears they had, and how to read them. It was an amazing social dynamic. The teacher was responsible for orchestrating the powerful ability for each student to learn and teach simultaneously in the classroom.

This is not dissimilar to what Ann Pendleton-Jullian is doing with the University of 2033 studio classes at Georgetown University and Ohio State University. The course takes a fantastic interdisciplinary approach to envisioning what higher education will look like in the year 2033. Different from other liberal arts courses, Ann has inverted the system from the old way of providing a course with a lab, to providing a lab-based class with courses. She has applied the structure of an architecture studio to liberal-arts education. Instead of placing the focus on writing, the focus is on drawing and design. Instead of learning just from the professor, students work individually and in teams to pull resources to aid in their collective design of the future university. Ann acts as a mentor and just one of many resources available to the students. This is a liberal arts studio structured to make learning contextual, participatory, collaborative, peer-to-peer and peer-to-master. Could this be the first step toward a new model for entrepreneurial learning?

Now, I want to leave us with one simple challenge: If you understand the social nuances and psychodynamics of how the one-room schoolhouse worked and the skills that the teacher brought up to the surface then, let us ask, how can we take the one-room schoolhouse and make it the global one-room schoolhouse through networks of imagination and new forms of mentorship? If we can find a way to build that world, then we'll have found an incredible way to foster entrepreneurial learners at scale and prepare students for learning in the 21st century.

Notes

1. John Seely Brown and Richard P. Adler, “Minds on Fire: Open Education, the Long Tail, and Learning 2.0,” Educause Review (2008): pg. 19, https://net.educause.edu/ir/library/pdf/ERM0811.pdf.
2. Pam Frost Gorder, “Wanted: Amateur Stargazers to Help Solve Supernova Mystery,” Ohio State University Research News (2005): http://researchnews.osu.edu/archive/neuprob.htm.
3. Timorthy Ferris, *Seeing in the Dark*, (New York: Simon & Schuster, 2002), accessed December 21, 2015, pg. 283, via Google Books.
4. Timorthy Ferris, *Seeing in the Dark*, (New York: Simon & Schuster, 2002), accessed December 21, 2015, pg. 283, via Google Books.
5. The metaphor “new wine in old bottles” is not meant to draw connection to the value of old versus new wine, but is merely a phrase for attempting to tackle new problems with old frameworks.