The Entrepreneurial Learner
in the Network Age

IDEA SPARKERS

JSB

Enabling Scalable learning
thru innovation

JOHN SEELY BROWN

CULTIVATING THE ENTREPRENEURIAL LEARNER IN THE 21ST CENTURY

dml

BEYOND EDUCATIONAL TECHNOLOGY 2012

You know you're at a tech conference when there's three computers, five personal devices and two people. So, I'm truly, truly thrilled to be here. I've been, as David mentioned, fortunate enough to be a member of the DML community for the last five years or so, and it's been an incredible experience and ride. I remember when we were just a small group with big goals. We could have fit in one meeting room at a Holiday Inn in Mattoon, Illinois. Anyone here from Mattoon? Now look at us. We number close to a thousand. We hail from North America, including Canada, Mexico, and of course, Mattoon, South America, Brazil, Europe, including England, Italy, the Netherlands, Asia, Bangladesh, and India. We represent institutions of higher education, K-12 schools, museums and libraries, communities and organizations, private companies and entrepreneurial start-ups, governmental agencies and offices, including the US Army and even the Federal Reserve, as well as Lady Gaga. Now you tell me another community that has that diversity. So we are now officially a big movement, with audacious goals, here at the Wyndham in San Francisco. So, to the MacArthur Foundation, to the DML Hub, to all of you, congratulations, you have arrived, and the time is now.

So, why are we all here? What are these audacious goals, and what is this historical moment about? Well, it was in Silicon Valley -- just about a half century ago -- that microcomputers among many other key technologies were first developed. It was with the emergence of these microcomputers and other technologies that for the first time in US history, people began to contemplate seriously the potential of computer technologies for education. In the last 40 years, the exponentially increasing powers and dramatically decreasing cost of computer technologies has surpassed even our wildest dreams of those early days. Yet, there is still very little evidence of any major, successful, tech-enabled innovation or disruption, altering the structure in school of mainstream education, in my humble opinion. That change has been constrained less by the lack of technological innovation than it has been by the limits of our sociological imagination. So what do I mean by that? In the last decades of the 20th century, the kinds of education technology products and promises, let's say school information management systems, courseware programs, managed learning environments, all of these that came out of the Silicon Valley as well as other centers of innovation tended to focus primarily on increasing the efficiency of schooling as we know it, rather than reimagining and improving efficacy of learning as it could be. Now the first instinct when new technologies are introduced into any field is to automate and accelerate existing activities. The same has just been simply true in education. Thus in the past, enticing looking technologies have led many innovators and entrepreneurs to build tools for schools, backrooms, and classrooms without thinking about how they could or should change teaching and learning. They were just simply trying to make them faster and easier. More recently, in the first decade of the 21st century, a wave of newer "digital learning" products have emerged on the scene, promising new game-based, mobile-enabled, geo-locative, platform-driven teacher and learning experiences. Compared to many of their predecessors from decades ago, this new cohort of entrepreneurs and innovators have focused largely on products seeking to serve the learner outside of the school. As someone who has helped to create the conditions that drive this kind of outside-in grassroots

innovation, I have to say that I believe that for education innovation to ultimately benefit the majority of kids in this world, which is why I hope we are all here, it must eventually travel to the center of kids' lives. And today, for the good or the bad -- wherever you stand -- schools continue to occupy the center of many children's lives. That's certainly here in the US.

Given that, as long as we constrain ourselves to thinking about this notion of schooling -- this gets to my sociological imagination point -- as something that can only happen between 28 students and one teacher, within 1500 square feet and from the hours of 8:00 am to 3:00 pm, then I don't care what an entrepreneur or an innovator from Silicon Valley, Silicon Alley, or Silicon Roundabout develops, we will never fundamentally change the future of teaching and learning. And those entrepreneurs will have a hard time getting the opportunity, and most will die trying.

Thus, in a world where the lower cost and greater ubiquity of digital media and personal devices, the opportunity to create new models of anywhere, anytime learning, including but not limited to schools, is greater than ever, as is the responsibility. When 30% of our high school students here in the US drop out, and as high as 50% in the city in which I live, and 93% of them are online, and 78% of them have cellphones, and steadily increasing 40% have smartphones, we need to reach these kids where they are, when they need it, and with whatever tools. This moment is more important than ever. So, while there are fundamental differences between the older school-centered education technology and newer learner-centered digital learning perspectives, these communities need not be in conflict as they have been in the past. In fact, I believe they are complements to one another, and they are critical and necessary synergies of one another. And I believe that the time for that groundshift is right now, right here, with the convergence of different communities and perspectives, coming together in this room. Building a new future through teaching and learning in a connected world not only allows but requires bridging in-school and out-of-school learning practices and philosophies through networks of institutions and opportunities. In a world where DC-7s have given way to Dreamliners and telegrams to smartphones, don't we owe it to our kids that schooling should give way learning?

So now I'm going to pass the mantle to John Seely Brown, but before, please let me introduce him. John Seely Brown, aka JSB, is a visiting scholar and advisor to the Provost of the University of Southern California and the independent co-chairman of Deloitte Center for the Edge. Prior to that, he was the chief scientist of Xerox Corporation and Director of its Palo Alto Research Center -- otherwise known as PARC -- right here in Silicon Valley. He held this position for nearly two decades, and while head of PARC, he expanded the role of corporate research to include topics, which are radical innovation, organizational learning, complex adaptive systems, and nanotechnologies. I'd say most of those are relevant to the future of teaching and learning and maybe nanotechnologies will be a part of your talk too. It's too late, let's wave this over. His personal research interests include digital youth culture, digital media and institutional innovation. I have had the pleasure of knowing JSB for the last 15 years. We met when I was about 12 years old. Since that time, he has been an incredible friend, an amazing colleague, and an incredibly necessary

mentor. Today he's going to talk to us about a world where we imagine the constraints of classrooms and chalkboards, giving way to the expansiveness of networks and web searches, a world where entrepreneurial learners find not only the resources, but the peers and experiences to learn, make, play, anywhere, anytime. And with that, on to you.
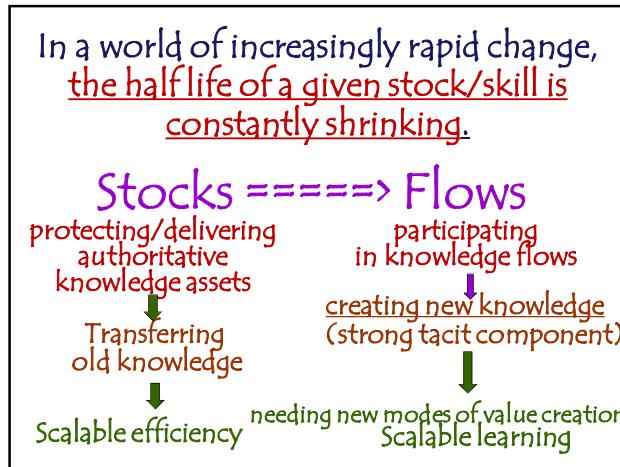
[14:00]

Actually, Diana, let's just take questions. Get up here. Your introduction about the whole DML movement was inspiring. I think it really did nail the issues that we have to think about. I became interested in this more around the notion of rethinking what does it mean to be a entrepreneurial learner? This does not mean how to become an entrepreneur. This really means, how do you constantly look around you all the time for new ways, new resources to learn new things? That's the sense of entrepreneur I'm talking about that now in the networked age almost gives us unlimited possibility. But as Diana said, just being able to learn as individuals is not enough, the real question is, how do we start to scale these types of learning systems that we've all come here to talk about? I think scalability is a critical issue. So I want to give you first a preamble, and then we'll kind of move into the core of this topic.

We're all used to seeing charts like this:
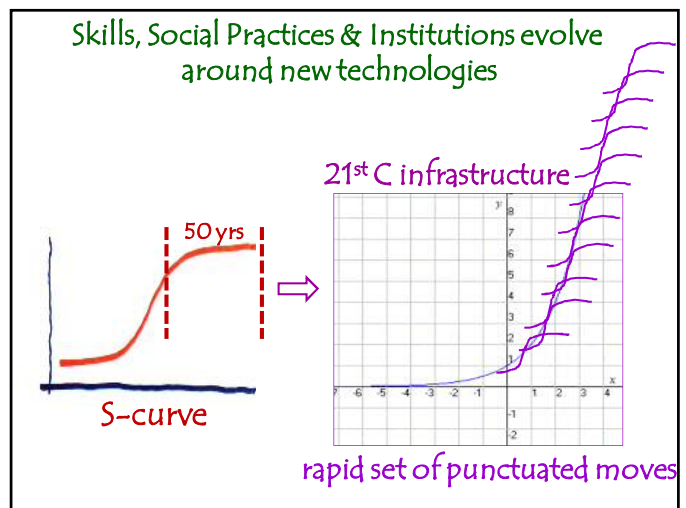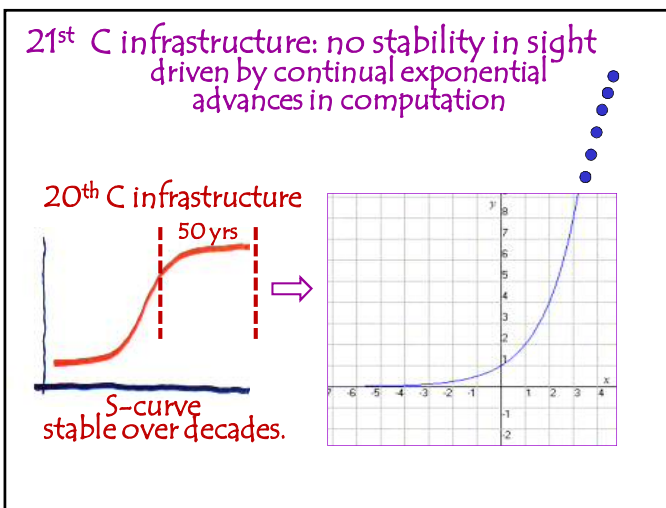
The whole notion that our digital infrastructure, what you might characterize as the 21st century infrastructure, is really radically different than anything civilization has ever seen before. In the past, basically, we always had these S curves, we had brief moments of radical disruption, and then forty, fifty, sixty years of stability, in which we actually invented the institutional practices, the institutional forums, the work practices, and the social practices that knew how to grow up and use those relatively stable infrastructures. Electrification has not changed an iota in the last hundred years, as just one example. But as you all know today, in the digital infrastructure, we are now engaged in a world in which every year we're having doubling, and these exponential curves are wonderful and also driving us crazy. They're driving us

crazy in a good way because it's not the technology that matters, as Diana carefully pointed out, but truly, how do we take these technologies and invent new types of institutional forums, new types of social practices, and in fact, new types of skills, to be able to leverage the capabilities of the technology? The technology is the easy part. The hard part is, what are the social practices around this, and also the institutional structures? We have to ask ourselves what will the institutions of schooling, universities, and research universities, actually look like five or 10 years from now? If they look the same as they do now, we've got problems. So I want to just kind of characterize these changes. I've just come from actually talking to the presidents of many of the research universities in a meeting three days ago on this. In fact, one of the keys of these exponential changes is you can now expect the half-life of a skill, most skills we pick up, to have about five years. It used to be, not too long ago, when Diana was just a child, that you could count on picking up a set of skills, and basically hold those for life. Today, that no longer works. You're constantly reinventing, augmenting those skills. And in fact, I think it's fair to say that we

In a world of increasingly rapid change, the half life of a given stock/skill is constantly shrinking.

Stocks =====> Flows

protecting/delivering authoritative knowledge assets

participating in knowledge flows

creating new knowledge (strong tacit component)

Transferring old knowledge

Scalable efficiency

needing new modes of value creation Scalable learning

are now moving from a 20th century notion of looking at how you pick up a set of fixed assets that are authoritative, transferred to you in delivery models, often called schooling, that have wonderful scalable efficiency because we could talk to 100 people or 100,000 people basically simultaneously. How do we move from that transfer model to the model of how do you participate in the ever-moving flows of activities, knowledge, and so on and so forth? How do you move from being like a steam ship that sets course and keeps going for a long time, to what you might call whitewater kayaking? You have to be in the flow, and you have to be able to pick

In a world of constant flux learning has as much to do with creating the new as learning the old and hence the tacit starts to take on a increasing importance

things up in the moment. You have to feel it within your body, you have to be a part of that, you have to be in it, not just above it and learning about it. We want to argue that in this new world of flows, participating in these knowledge flows is an active sport, and the whole catch is, how do you participate in these flows, and how do you actually [participate] in these flows of constant change? It's no longer learning the old that matters so much; it's how do you constantly create the new? Here's

the catch. In a world of constant change, constant flux, learning has 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 been increasingly important and virtually none of our theories of transfer of learning, or of schooling, really direct the notion of how you cope with the tacit knowledge that kind of flows hidden beneath us all the time. And so I think we're going to see, and I'm going to talk a little more about, the tacit is becoming increasingly important, but as Diana suggested, we are at an amazing moment.

I like to think of it as a Cambrian moment. I think it's very much like, actually, well, you weren't yet born, when I first went to Xerox PARC, it was actually in the early 70's, mid 70's. Basically everything was up for grabs. It was a new world. We could basically build anything we wanted and we could try anything we wanted. Well, basically, this Cambrian moment now in this age and the network, really, I have a feeling, again, is kind of like that

A Cambrian Moment

The world just came together so quickly. We have little understanding of its true diversity . . .
Tim El-Hady (Aspen 2010)

The past as a solution set is no longer a viable option. We need a new tool set.
John Rendon (Aspen 2010)

Yet, we can still learn from the past.

Cambrian moment. That everything was up for grabs. We are here to shape that future, and I think that is our real goal. I was really struck by a couple of quotes that have always driven me. One by Tim. "The world just came together so quickly in this networked age. We have little understanding of its true diversity. Yet in these periods of radical change, which are always going to now be with us, understanding how to leverage diversity is going be increasingly important." And my buddy John Rendon, in Washington. "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.

What do these guys have in common besides being a bit creative & out of the box thinkers, doers and tinkers??

In fact -- uggh -- learning from the past, let me give you all a quiz. Sorry Mimi, but, what do these guys have in common besides being what you might call a bit creative, and a bit out of the box thinkers, doers, and tinkerers? Now, you probably recognize most of these kids: Jeff Bezos, Will Wright -- what I call the Google kids down the street -- Jimmy Wales. Now the obvious answer is that they have a lot of money.

Somehow, I overlooked that fact, as a matter fact, when I first put this collection together. There is another unifier for this entire collection of guys. What is it? "There's no women." Pardon me? Yes, you might ask that. We might just come back to that. But here is the answer. Let's step back a moment. Look at the heroes, at least my heroes, back 75 years ago or so, that really drove a phenomenal movement in education. Montessori -- Maria Montessori -- a first woman, and John Dewey.

Our heroes
who really understood learning environments
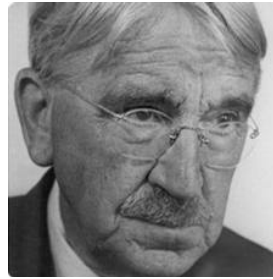
Maria Montessori   John Dewey

The answer to that quiz is that every one of those folks in the earlier page went to Montessori schools. Now, there may be a lesson there about what's the importance of play, what's the importance of embodied learning, and so on and so forth. There are women, but they're not quite as famous as those guys in Silicon Valley, so I put their images up, so you would get it. But nevertheless, here are our heroes -- my heroes at least -- from the past, but, sadly, as Diana was suggesting in a slightly different way, 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, they can now. And so it becomes interesting to say, how might we relook at scaling?

Their methods didn't scale!!

They were 75 years ahead of their time!

But they can now.

So how is scaling now happening?

Let's look at some examples

Let's look at some examples and see even how many of the Montessori ideas, for example, could be recast in the networked age that might provide us a way to create, one might call, an arc-of-life learning that scales. So let's step back a moment. Here's an example, when I came across it, with the father sitting in the audience here, actually is it the grandfather? I'm not sure. But here is a 2-year-old looking over the shoulder of his 5-year-old sister. Totally transfixed, looking at her surfing something on the web on her little iPhone. I don't think of the iPhone, and nor I think does she, as basically a communication device. I think of it as a device to amplify curiosity. It is a curiosity amplifier. And this curiosity amplifier, for a rapidly changing world and turns out to be an

affording curiosity in a constantly changing world.

Ages: 2 & 5

amazingly important tool. And every one of us in this audience is so used to using the iPad or the iPhone, or some equivalent device, for constantly looking up things. And in fact, I have a hard time having a phone conversation today without having my iPad there, constantly looking up what that word means, or that's an idea I've never heard of. What school did that person really go to? Did he really go to Montessori? That's the question I had, but the answer is kind of yes, in the previous slide. I better

Harry Potter Worldwide Movement

Fanfiction.com
65,000 stories & podcasts

forums
wikis
videos
podcasts
contests

HARRYPOTTERFANFICTION   THESTORYCONTINUES...

Fanfiction.net
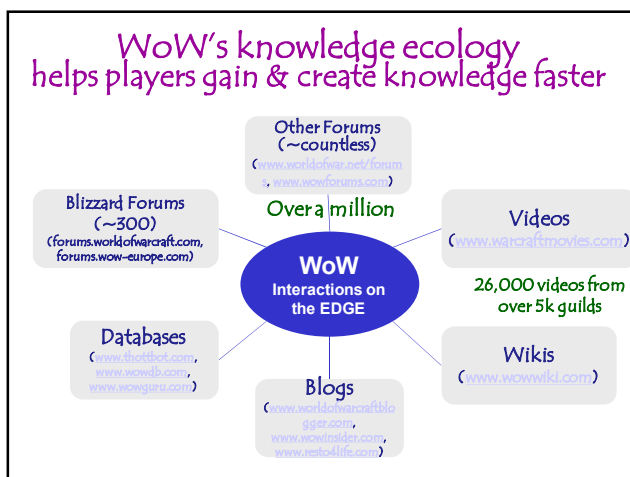6,314 communities of interest
1,774 discussion forums
386,000 stories archived

Are we prepared for students used to creating their own global collective, intertwined with a networked imagination?

put up that Bill Gates -- well -- he was actually more of the associated movement of Montessori.

Let's look at some more examples of scaling. I wanted to go through a bunch of very quick examples. I'm very fond of thinking about the Harry Potter World Wide Movement in terms of the fan fiction networks and fan fiction dot com, etc. The numbers there, and people in the audience know a hell of a lot more about this than

I do, but it's very interesting to see that because of the networked age, now there are over 6,000 communities of interest that have been created around Harry Potter.

There are thousands of discussion forums. There are, in some ways, 386,000 stories that have now been written, but perhaps more surprising to me, is there are the equivalent to at least, I would say, a hundred, maybe more, equivalent of 400 page novels, have been written by kids joining this Harry Potter movement. Writing is back. Writing is here in a major way, and we have the tools and social networking to incite and to incent people to do amazing pieces of work. I keep being blown away by people telling me, oh no, no, no. These 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 actually that the most recent data is about a thousand, you'd probably know. A thousand books of more than 400 pages per book, have now been written in this fandom.

Something that I know a little bit more about -- I grew up with this -- is World of Warcraft. It's very interesting to me to notice that -- I didn't check last night, but a couple of nights ago -- there were over 14,000 new ideas created in one night on better ways to play some of the new high-end raids in World of Warcraft. Knowledge production and knowledge dissemination is happening at an unbelievable rate. In fact, if you think about the social life around the edge of the game, I'm not arguing that the World of Warcraft as a game is all that important, I'm arguing that the social life around the edge of the game, the learning ecologies, the knowledge ecologies being created on the fly as emergent properties of playing this game better and better, created by the kids themselves, is something we ought to understand because the social dynamics of that is very very important.

WoW's knowledge ecology
helps players gain & create knowledge faster

Other Forums
(~countless)
(www.worldofwar.net/forums, www.wowforums.com)

Blizzard Forums
(~300)
(forums.worldofwarcraft.com, forums.wow-europe.com)

Over a million

WoW
Interactions on
the EDGE

Databases
(www.thottbot.com, www.wowdb.com, www.wowguru.com)

Videos
(www.warcraftmovies.com)

26,000 videos from
over 5k guilds

Wikis
(www.wowwiki.com)

Blogs
(www.worldofwarcraftblogger.com, www.wowinsider.com, www.resto4life.com)

Managing Knowledge via Guilds

› Structure of filtering and feedback loops
  – Problem: Knowledge is constantly changing
  – Problem: Too much information to reliably manage. (around 12k new ideas just last night.)

› Guild structures allow for small groups (20-200) that self organize in order to seek out, test, filter & disseminate information for the high end raiders.

When you look at the infrastructure being created to support the videos, the forums, the wikis, the blogs, and so on and so forth, and if you really think about it -- this is a week ago -- how does this work? How can 12,000, 14,000, 15,000 new ideas a night be processed? Well again, you want to talk about institutional innovation. What are these kids inventing? New institutional forums, in forms of the ways to structure guilds that turn out to be knowledge processors. And basically a guild is going out to high-end raids, you will basically have many sub parts of that guild that will take on responsibilities for processing this chunk of knowledge, this chunk of knowledge, this chunk of knowledge, they get these ideas, they try them out that afternoon. The things that actually work they pass up to a high-end leader sub guild, and so on and

so forth. And 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, that form of knowledge creation? It's something I think we have an opportunity to study and better learn as we try to figure out, Diana, the new ways to scale some of this. And what I find so beautiful about the social life around the edge of World of Warcraft is what you do when you play that game because it's moderately complicated, like a lifelong pursuit to some, that's another problem, is that these kids craft their own dashboards in order to measure their own performance, and to amplify their ability to learn new skills more rapidly than anybody else.

Now think about this. What would it mean in the workplace? 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? They would get constant readouts, for the sole purpose of helping them become higher performers. And you would find competition about who was building the most interesting toolkits. I found this tool to be particularly great for this. And in fact you will find in this social life, around the edge of some of these games like World of Warcraft, basically an amazing mashup community that are constantly mashing up new tool kits to measure themselves so they can get better and faster. And I keep thinking, what would the workplace be like, if in fact, instead of having managers superimpose measurements on us in the workforce, what if we actually crafted our own measurements in order to figure out how much time am I spending in email, how much time am I wasting in random phone calls, and so forth? How do I actually start to have tools to reflect on how I'm spending my time, so I can be more effective? These are what these kids on the social life on the edge of these games have figured out how to do it. We have a lot to learn from them.

social life & social networks of learning
Ryerson College

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

But let me look at another example in terms of the power of the social life amplified or made possible in part through the social networks of learning. Let's go to Ryerson College. Little school in Toronto, it's not that little. And look at what Chris did. Chris, having to learn organic chemistry, organized 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. 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*. However, beware.

Implementing new tool sets can be problematic. Chris was thrown out of Ryerson College for inventing/using this new tool kit for learning. Many charges were brought against him, and in fact, if you distill it all out, three fundamental cases were brought.

The argument was:

- Learning should be hard.

- There's no structure of regulation for online behavior, and that makes it incompatible with academic work.

I kid you not, this comes from a law case.

- 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.

But (and thank heavens):
In March of 2008 Avenir was cleared of all charges.

"In a seven-page ruling, the engineering faculty appeals committee found no proof the Facebook group led to cheating." Students had not been using the Facebook to cheat, instead they had used it as a collaborative problem solving tool.

So going back to Diana's point, one of our challenges is institutional intervention. 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, quote unquote, that the Facebook group led to cheating. Students had not been using the Facebook 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 into college.

Think what would have happened if that had not been overruled. But it's interesting to see that these kids are inventing their own tool sets to meet with somebody's problems.

Let me take a couple more examples. Consider the open source movement as kind of a participatory learning platform.

Open Source as a
Participatory Learning Platform

The Open Source Movements:
◇ writing code to be read
◇ engagement thru useful additions
◇ social capital matters

A form of distributed situated learning
(cognitive 'apprenticeship')
enculturating to a virtual
community of practice

Peer critique, open discussion – over a million folks

It's very interesting if you look at what are some of the ongoing social properties of an open source movement. In that movement we write code to be read. You have to make code to be read, because otherwise people can't read it, can't comment on it, can't modify it, and so on and so forth. And in fact, you become a better member of that community through basic making and useful additions. And in this community, social capital matters, and so on. Now think about it a moment in terms of the changes. I don't know about a lot of you folks, but when I grew up, and I actually did study computer sciences, not 12, but after University of Michigan, basically, I became a hero if I can write code to solve a really hard problem that nobody could read because they were so obscure. The macho behavior back then was to be so clever that no one could figure out what the hell you'd done. Guess what? I would have been *sound effect* thrown out of any of the, kind of, open source movements that aimed for legitimate social behavior because other people can't read and learn from my activity, my code, and can't effectively modify and improve it. And so we found already a very interesting social innovation to escalate learning and knowledge creation, on the fly in terms of social movements. You kind of form a pure critique as well, but if a code couldn't be read, you couldn't get kind of useful critique.

The Rise of the Pro – Amateur Class

amateur ———————————— professional

from Latin – amator : lover

Dobsonian 10" f/4.9

PC164C
ccd camera

+

Internet
Blogs
BBSs
Yahoo groups
Data bases

+

a new form of scalable mentorship is emerging

Perhaps my last example has to do with the pro-amateur movement in terms of, in my particular case, astronomy. I bring this idea up, I first got from Mimi, the word amateur comes from the word *amator*, meaning to love. And the catch in this astronomy community is that in fact an interesting relationship has emerged between

professional astronomers and the kind of amateur ones. Because all of a sudden, the professionals found a reason to interact with the amateurs because the amateurs were developing, kind of, very interesting, watching or looking practices. And today, to be a hotshot professional astronomer, you traffic impartial differential equations to the galore. You don't actually know much about looking through a telescope, I kid you not. But these amateurs know a hell of a lot about how to actually see things through a telescope that are honest to God practices for how you see things through a telescope. This amateur community masters that, and basically it's 24/7 because the amateurs all over the world, some of the most important discoveries even in fundamental physics have been known to the verification of the standard model, comes from the amateurs being able to in fact prove when a certain supernova, 1987a, actually the photons hit the earth, because they were monitoring in New Zealand when this happened. They had taken photographs just before and just after these neutrinos have been detected elsewhere in the world, and that was the missing link in the proof of the standard model of physics. 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.

And finally, a last example of scalability, an example under development that we may hear, just maybe, a little about later today or tomorrow, comes from Mimi. The whole notion of how, given that kind of mentoring is still so important, maybe will always be so important, how might you actually get scalability in terms of one-on-one virtual mentoring? And she's asked a very provocative question: how do you build really sophisticated matching algorithms? She likes to call it eHarmony applied to children that actually knows how to take the particular idiosyncrasies of this student, this kid, and figure out, who is the perfect tutorer, some place in the world, a virtual tutor, to work with this kid. And you can see this being developed in things like math, where I first saw it happening in chess, I think I got that from Connie, actually, Julia. And then Starcraft. But here is an example of saying, maybe we have the simplest way to get true scalability, of one of the most profound kinds of learning you can imagine, that is really skilled mentorship, where there is a perfect match between the mentor and the student.
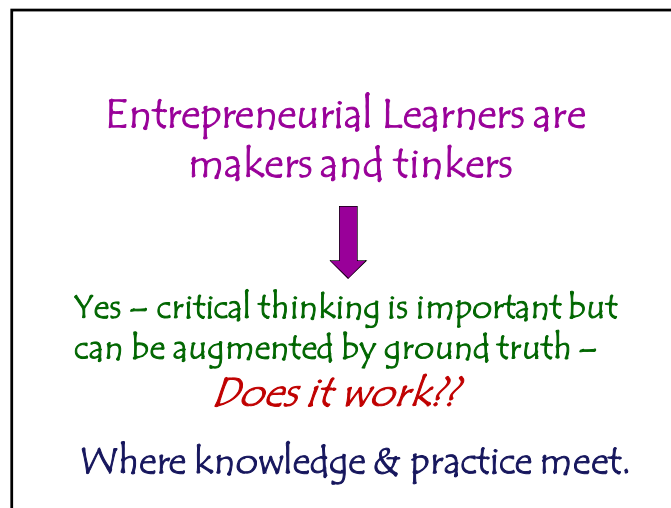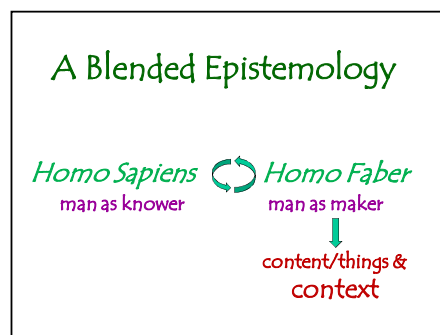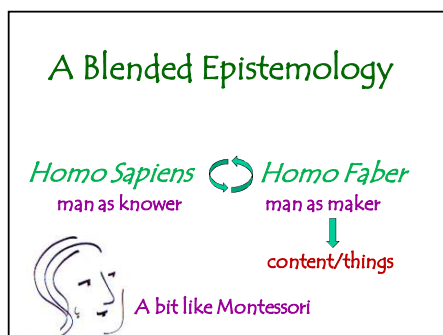

A twist on scaling –
scaling with 1 on 1 virtual mentoring

Mimi

Could we create an eHarmony –
an optimal matching algorithm
for 1-1 virtual mentor in Math/Chess/StarCraft?

So let's step back. What's the bigger picture?

The Bigger Picture

I think the catch is that entrepreneurial learners are basically fundamentally makers and tinkerers, and we tend to underplay how important this is. Yes, you might say critical thinking is important, but just the make movement, and tinkerers, guess what? They also understand critical thinking, because if you are a maker, or if you are 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, yes, I'm kind of making shortcuts, but the fact is, does this sucker work or not? This sense of I'm building something, does it work? That also works in poetry. Does this poem hunt or not? And so there's a sense of saying it's not just critical thinking that matters, although it's important, but if critical thinking leads to making something, then the question is, what's the response structure of the thing you just made? So we're kind of trying to find ways to close that loop as well. And I like to think of it as where knowledge and practice meet.

> **Entrepreneurial Learners are makers and tinkers**
>
> ⬇
>
> *Yes – critical thinking is important but can be augmented by ground truth –*
> *Does it work??*
>
> *Where knowledge & practice meet.*

So let's step back a moment. Let's look at what you might call a blended epistemology, coming again very much from Montessori, that is to say how do we begin to look in ways to combine Homo sapiens, man as knower, with Homo faber, man as maker? Curious thing is, we've always thought about Homo faber as man as maker, maker of things, maker of content. But the game has just changed. Now, today, in the networked age and the tools we have at our disposal, we can now not only make things, but we can make context. It used to be that basically context was stable and recognize the fact that meaning often emerges as much from context as content. And if we can start to create contexts, then we have a whole new dimension for creating meaning. We have a whole new way to create meaning, and we have a new type of interplay, and in fact, to take a very concrete example of this somewhat obscure metaphysical notion of moving to Homo faber to making context as well as content, of course, in simple terminology, what I have just said is this is the essence of remix. What is remix doing? It often is changing the context of a piece of content.

> **A Blended Epistemology**
>
> *Homo Sapiens* ↻ *Homo Faber*
> man as knower   man as maker
>
>   content/things
>
> A bit like Montessori

> **A Blended Epistemology**
>
> *Homo Sapiens* ↻ *Homo Faber*
> man as knower   man as maker
>
>   content/things &
>   context

Maybe one of the simplest examples, and this is a beautiful exercise that I first actually did at USC, is a wonderful exercise for students to think about is take a movie, or a movie trailer if you want to be legal. Sorry. And change the music. And guess what? If you change the music, which is the context, to the content of the film, you've not only changed the meaning of the film, you actually changed what you see.

Let me give you a precise example. I'll just suggest you do this, I won't tell you to do this, but take Jurassic Park. You all remember that famous scene of the dinosaur chomping that guy. It's one of the most memorable images of that whole movie. It has never left my mind, my mind, my memory or whatever since I saw that. Well, guess what. That never happened. Do a still frame very carefully through that and 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. A beautiful example of context and content coming together and was much more dramatic than actually showing the final act itself. And yet I swore I saw it. I really had to go over many times single frame because I was so convinced I had seen it and it just changed it on me or something. But it's an interesting issue of how do you actually kind of think about this rich interplay? And I think it really gets at, and those of us in other parts of the academy worry a little bit more about this, is in this kind of very fluid world of where we can now change contexts, this may be an example of where critical thinking is now more important than ever because you have to ask yourself when you see something, maybe the thing you saw is right but maybe the context itself has been modified.
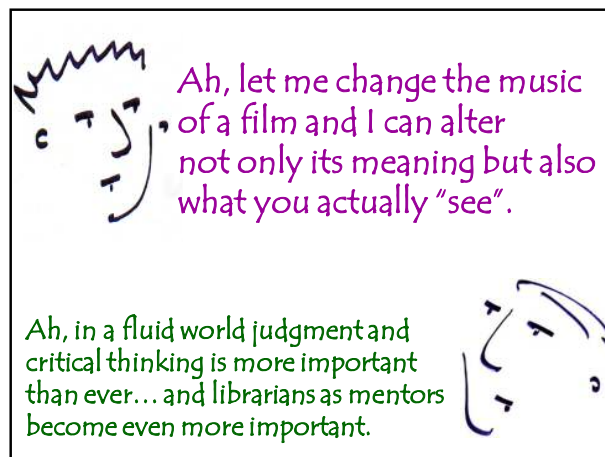
So how many of you remember the famous pulling of the statue down in the square in Baghdad in the beginning of the Iraq war? Well, guess what? That context had been carefully cropped to get you to believe that those were Iraqis pulling that down. They weren't. They were American soldiers. And that had been clipped. Or remember Howard Dean and the scream that caused him to basically lose the election? Well, if you went back to the originals, one of the beauties of actually being at USC where they have a film school and a communications school, you can find the original shots. Guess what? He was actually talking to a room three times as

long as this, he couldn't see the back, and he was talking to somebody in the back, and he was actually screaming at the person at the group in the back. 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 of that. So one of the kinds of new types of critical thinking that we have to make sure our students do, is yes remix is important, but yes you also begin to realize how through remix you change meaning. And now, how do you decide to deconstruct how much of a context has been modified in order to communicate or miscommunicate that point?

So I was saying, we used to focus on content. But you know, let's also consider blogging. Blogging is in fact in a very interesting way of constructing a context as much as content. I'm very struck by Andy Sullivan. He wrote a beautiful article on why I blog in the *Atlantic Monthly*. Let me just kind of read a little bit of it. In his point of view, blogging is something that engages I would call joint context creation. Let me explain. The blogger, as he said, the blogger 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 blogosp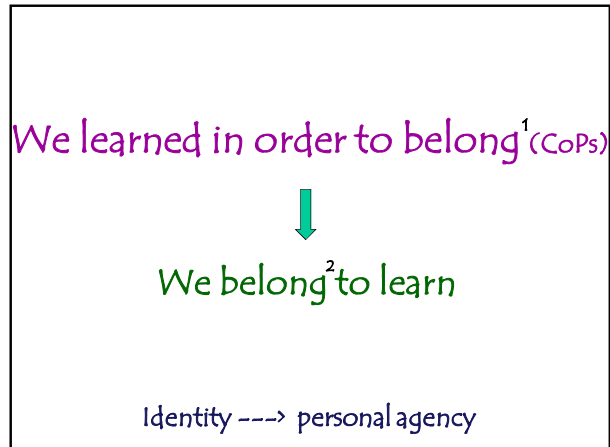here, at its best, a conversation, rather than a production. Jazz, David, listen, jazz and blogging are intimate, improvisational, and individual but are also inherently collective. And the audience talks over both. This sense of a new kind of conversation that happens in this joint context construction of an ongoing conversation is a whole new mode of context construction meaning creation. And one last example of this beautiful new book by David Weinberger, *Too Big to Know*. Think about that a moment. We used to know how to know, back to the slides on epistemology, we got our answers from books or experts. We'd nail down the facts and move on. We after all had canons. (No comment there). 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 -- guess what -- agrees on anything. We, as learners, need new strategies and new tools for this world. And a lot of us in this room are here to create those.

An interesting notion, if you come from our movements ten years ago, in terms of the communities of practice, some of Jean Lave's beautiful work as well, you might say we learned in order to belong. We

> ## Blogging as joint <u>context</u> creation
>
> "The blogger 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."
>
> Jazz and blogging are intimate, improvisational, and individual—but also inherently collective. And the audience talks over both.
>
> <u>Andrew Sullivan – Atlantic Monthly/ The Daily Dish</u>

> ## We learned in order to belong[1] (CoPs)
>
> ⬇
>
> ## We belong[2] to learn
>
> Identity ---> personal agency

learned in order to be able to join a community of practice. We've created our identity through learning to join. And that we believe is a fundamental force of learning through and for identity construction. Some of us want to argue today that this has slightly changed, but Thomas and myself would like to propose maybe now we belong to learn instead of learning to belong. But it's a different sense of belong, the initial sense of Jean Lave, and Etienne Wenger, Paul Dogood, and myself and others. That sense of belonging was to create an identity. Perhaps now, we belong to learn, that sense of belonging is a sense of personal agency. We now belong to learn in order to make things actually happen. So I want to kind of just allude to these notions of collectives, as a whole new form that we all use in this room as a major source of this learning. Collectives are made up of folks who share an individual's personal interests, gardening, astronomy, seen it all on Facebook groups, etc. But curiously, unlike communities of practices, they make no demands on its users, 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, transforming and enriching both. So when I go to a collective, I learn something but I'm expected to contribute something, maybe just as a question that I ask. They have almost unlimited scale via social networks and at their core rest notions of peer and master mentoring. We have already invented amazing techniques that scale, if you kind of understand this. Sounds cool. On the other hand, in this world of constant change, 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 be just pouring you might call it new wine in old bottles. 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 frames to understand the world today, but if our initial thesis is right, we have to find new ways to regrind our lenses.

> ## Collectives
> Collectives are made up of folks who share an individual's personal interests (e.g. gardening, astronomy). They make no demands on its users, no tests or lectures, yet learning happens all the time.
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> ## Homo Ludens
> ### a highly nuanced concept of play
>
> • as in permission to fail, fail and fail again and then get it right: think of extreme sports…
> • as play of imagination – poetry
> • as in an epiphany – suddenly falling in place as in solving a riddle.
>
> Learning as riddles, leading to a reframing or re-registering of the world.
>
> Play is the progenitor of culture & innovation.
> Johan Huizinga

So a simple belief in a world of constant change, entrepreneurial learners must also be willing to regrind their conceptual lenses. How do we build a conceptual lens? Our argument is play. Play is the essential thing for actually being able to rebuild your lens. That brings us to a third forum of epistemology. We talked about Homo sapien and Homo faber. Now I want to talk about Homo ludens from Johan Huizinga. The

highly nuanced concept of play, and I want to argue that our job in part is to go back and reflect on the more nuance aspects of play. Now the key aspect of play is not that subtle, it's kind of a permission to fail, fail, fail again and get it right. Mimi, think of how you learned how to surf. Think of extreme sports. Failure is a critical part of that learning. But also think about the play of imagination in writing poetry. How do you kind of tinker with a phrase, trying one phrase after another phrase after another phrase to get that phrase just right? And perhaps most importantly, think about an epiphany. How do you play with something until something just falls in place? That's to say, learning as riddles, leading to a re-framing or re-registering of the world, is basically what riddles and epiphanies are about. I mention that because if we can create one epiphany for one child, that epiphany lasts the life of that kid. 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 and think of the kind of tension in your own mind -- this is a very simple example -- and then suddenly how it clicks into place either by yourself or when somebody shouts out the answer. Now how you had to play with this idea a little bit in order to figure out how to gel the facts in a new way to suddenly make instant sense of everything that was just said. So this is the simplest example. It blacked on. [sound effect] You're sleeping in the middle of a black road that has no street lights and by the way there's no moon. A car [sound effect] coming down the road with its lights off magically steers around the dog. How did the driver know the dog was there? It's daytime! I said that this was a very simple riddle. But there's tension, and then suddenly you play with it, you play with the context by the way, and think, aha, this is trivial. If it's daytime, everything falls into place. That is a very simple example. Now take yourself into the CIA and think about what the riddles are there and how they have to tinker with context in order to make sense. We may come back to that.
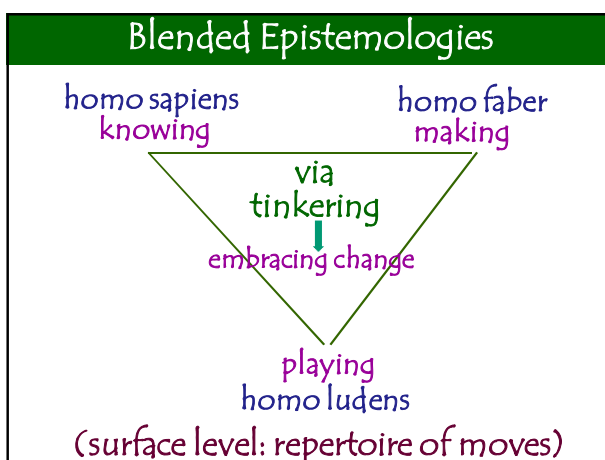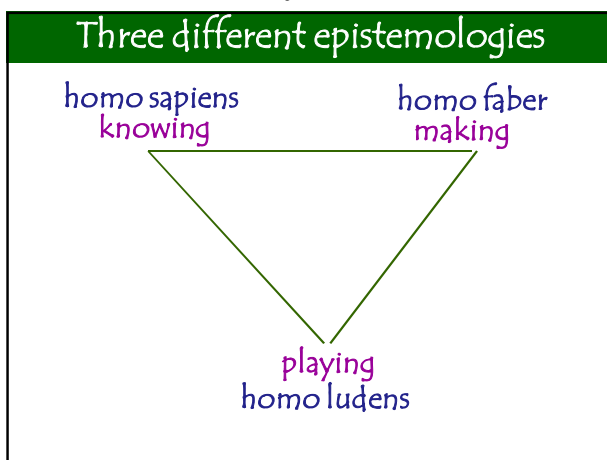

But let's look at these three different epistemologies: knowing, making, playing and think about how they may be blended together first of all in a very simple way in terms of tinkering. I mean, tinkering brings knowing, making, and playing all together. In fact, tinkering is catalytic to many kids as a way to understand 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 state of anxiety, because they used to say, as you saw us here a moment ago, things don't always work. And if you feel you have to run and get a manual and figure out how to read exactly what you should be doing and you made a mistake somewhere, then you can't help but be a little bit pissed off. If, on the other hand, you feel completely at home just saying, well let me kind of play around with the situation a little bit and see if we could kind of 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. And so this sense of play in a world of constant change, through the lens of tinkering, becomes very powerful. But tinkering could be more than just that. It really is the case if you get skilled at tinkering you begin to get a gut feeling for how systems work. You get a sense for what can be pushed around. 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, you're embodied, a kind of a form of embodied immersion and you start to develop an instinct, and of course, is deeply situated. So this is kind of a deep structure type of tinkering that I think we're looking at that leads to this re-framing that is completely aligned with this sense of the epiphany stuff, and how do you kind of play with really radically changing the context, which starts to build new lenses that you can use.
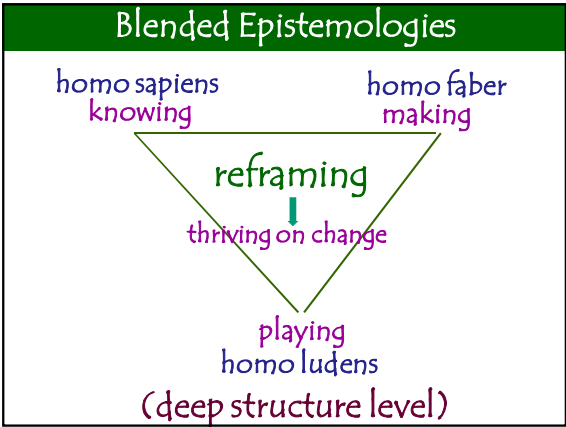
I want to suggest that if you look at the world through most schooling systems today, if you look at the weighting of influence, Homo sapiens is way up here, Homo faber sometimes sneaks in at the edge, and Homo ludens -- called play -- usually gets wiped off the screen.
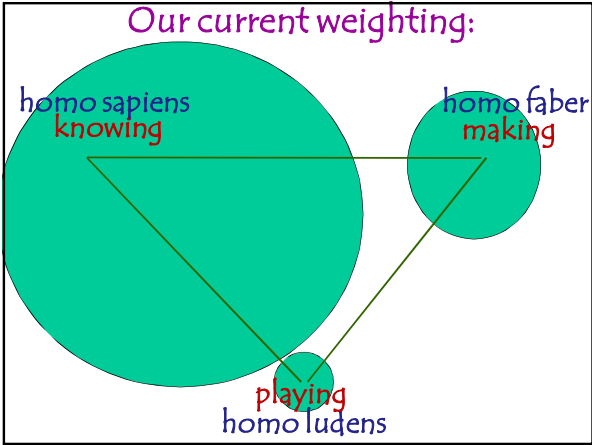
But if you look at the shifts that every one of us in this room kind of already lives daily, is we have moved from a world of knowing just what, but perhaps even more

important, knowing of 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. And thinking has moved, as I said, from just making things, to things in context, and playing now has as much to do with sense making. How do I play with the situation to make sense out of it? That's why I talked about this kind of deep structure tinkering.
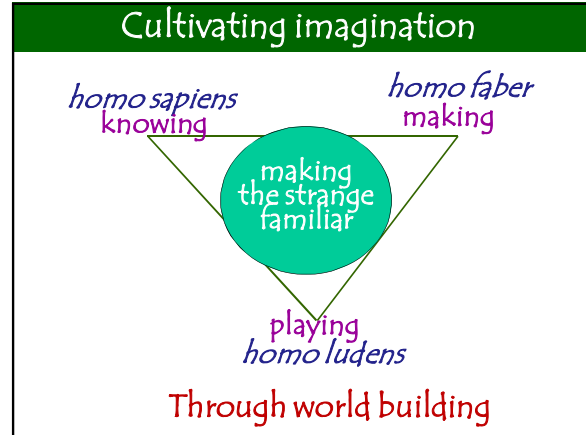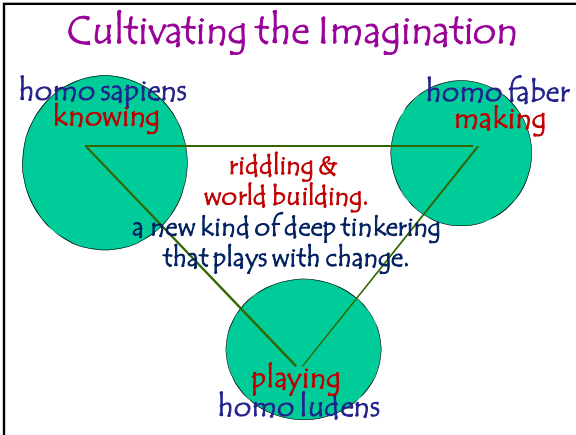
So I want to suggest that the world we're actually moving into and the tools we want to build and the institutions we want to create, the different types of connections we want to make, and the different types of institutions that already make up our context and maybe make some new institutions, really says, how do we get a more balanced structure between knowing, making and playing. Homo sapien, Homo faber, and Homo ludens. And think about this in terms of riddling and world building.
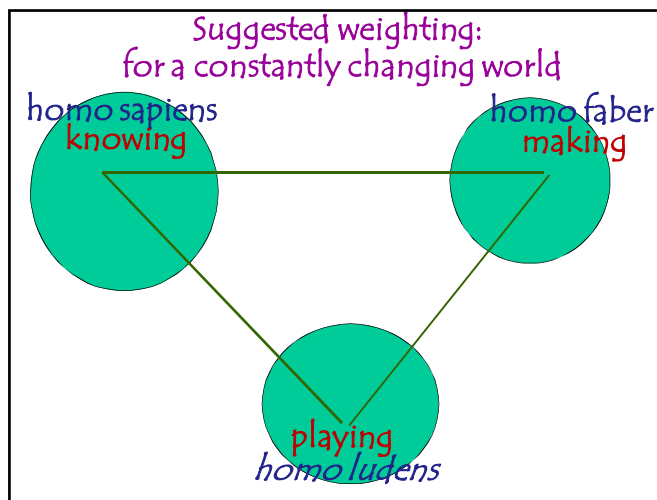

How do you actually start to kind of build new worlds with the network tools that we actually have, which is the deepest kind of tinkering. And I said that in some deep way, in terms of the crisis of our imagination, or thinking about imagination, you know the catch, and this comes back to working intelligence as well, how do you take something that's really strange, 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. Taking the wand, the magic wand that seems in some sense so strange, operates in a world of no electricity, how can that be? And now a world gets constructed for you, through the novel, through the set of novels, where this strange idea seems so obvious, you never thought it could be strange.

I want to suggest that we have to go back and think much more about the tools today for building worlds. It's going to completely change the notion of film, change the world of games, it's going to change a lot of things about how do we think about world building, such that I can take a strange event and make it seem so natural. In fact some of the deepest challenges we have in intelligence is how do you take some strange event, and let me construct a set of scenarios, a set of personal motivations, etc., that takes that strange event and says, well, how else could it be?

When we can do that, we may finally begin to understand parts of the world that seem so mysterious to us today. And this suggests that the real game that we have today in this networked age is new notions of networks of imagination. How do we amplify our ability, through kind of emergent collective action (and we've seen many examples of collective action) to create a sense of shared imagination?

Cultivating the Imagination

homo sapiens
knowing

homo faber
making

riddling &
world building.
a new kind of deep tinkering
that plays with change.

playing
homo ludens

Cultivating imagination

homo sapiens
knowing

homo faber
making

making
the strange
familiar

playing
homo ludens

Through world building

The reason I personally bring this up is because I was one of the original people that argued back in 19...(long time ago)...that communities of practice had to have a sense of co-presence. If they were going to be distributed we tended to call them networks of practice.

Networks of Imagination

Networked
Imagination

emergent
from collective action

ACTION

Networks
of Practice

Communities
of Interest
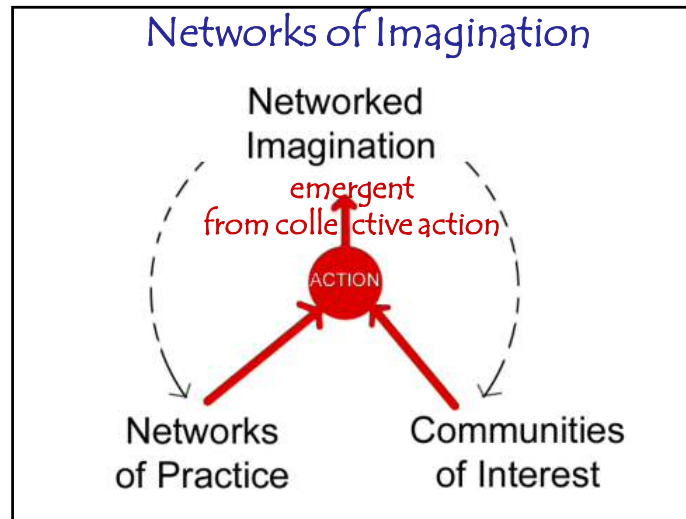
But possibly, just possibly, and you see it developing in some of the game worlds as well and some of these imagined worlds that you start to construct, I can construct jointly with people around the world a shared imagination that makes me feel totally co-present in the mental space with the others. There's something very powerful at stake here, that we are only beginning to unpack now. So let me just kind of say, repeating myself, in a world of constant change, entrepreneurial learners must be willing to regrind our conceptual lenses, with which we make sense, and play is

essential. But 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? And what types of institutional innovations do we need to think about that grant those types of permissions in order to be playful in this deep, epistemological sense? I was going to end, but there is a brief, very brief epilogue, and Mimi, I know what you're thinking, JB, what are you doing, this is

Back to the Future –
the one room school house

a talk not a book, but two slides on epilogue, I like to think about Back to the Future, again in terms of Montessori, but even predating Montessori, some of the greatest learning environments were actually the one-room school house. Why were they so effective? It's because the teacher wasn't transferring knowledge, but the teacher was acting as a coach, a coordinator, a mentor, then getting older kids to spend some time helping younger kids, so the older kids would also teach the younger kids, and then the younger kids would turn around and teach the younger younger kids. It was an amazing social dynamic in that classroom, and the teacher was responsible for orchestrating that amazing ability to learn and to teach simultaneously by each student in that class.

The global one-room school house:
Networks of Imagination

Now, I want to leave us with one simple challenge. If you kind of understand the social and psychodynamics of how that classroom worked, and the skills that that teacher brought up to the surface -- by the way -- that teacher was not a master of the material, but a master of the way the kids thought, the fears they had, how to read them, couple into their interest, and so on and so forth. But, now, let us ask, is it possible, we're getting in a position to take the one-room school house, and make it the global one-room school house through these networks of imagination and new forms of mentorship? Thank you!

[Q&A]
Question: Hi, that was a great talk. I mean, wonderful. Umm, I'm Donald Brinkman from Microsoft Research. You gave us some wonderful vehicles to kind of take us in places to think I would like to commandeer one of those vehicles and see if I can drive it off a cliff. You talk about guilds, and you know, World of Warcraft and

communities around that and the production. And these communities, they do work wonderfully together to solve these complex problems, but they also, they're very specialized, and there's a differentiation in the levels of labor and levels of knowledge that go with that. In similarity with the dashboards, you mentioned that people custom make those dashboards that I would argue that, the majority of them are actually downloading and tailoring them a little bit. These are what we call script kiddies, which make up a lot of that. In a traditional education system, I think that we use standardized tests to try to kind of bring everyone in line, but in unorganized gaming environments we don't do that. So we allow people to specialize and this makes me think back to some of the original intentions of education institutions, to prepare the majority of people for unskilled labor, maybe some craftsman and only allow a select few to truly excel and so my question is is that the future that you see? Or, are we trying to boil the ocean and bring everyone to this level of being visionary creators and Bezos? Or are we looking for a system that allows people to percolate to their level and stop putting demands that everyone become a liberal technical conceptual humanist?

Answer: You know, it's curious because I started getting a lot of my ideas actually on the factory floors of Toyota. I was called in by General Motors to explain Toyota to General Motors. I, by the way, failed. This was some time ago. And, what I saw developing on the factory floors of Toyota was amazing. I felt like I'd just walked into a choreographed, like, ballet. And when anything went wrong, the cord was pulled, and that entire factory became instantaneously problem solving, and it was designed so that basically, talent was being created and being augmented every moment of the day. And so I think that for our move into the 21st century, we have to completely rethink the workscape as a learningscape. We have to find ways that each of us get more talented by working. And so, in the schooling example you gave and in any corporation I've ever been in, basically managers assess me, and they build the monitors to do that. What we're suggesting is how do you flip that thing upside down, and say, no no, let us the employees build the tools to measure our performance and as a group we'll agree on what those tools will be and so on and so forth. So we're really trying to amplify the emergent rather than figure out how to lockstep into the top. Now it helps to have a vision in the top, but I'm getting kind of tired of vision. But it still helps to create some alignment, so I think anyone in this room is really actually looking for tools to amplify the emergent, bring some kind of alignment amongst that emergent, bring the kinds of negotiations that have to happen in any group, and is a whole new style of working. And if you look at even how some of the newest ideas, as Mimi and Scott know, now looking at making movies when they don't start with a script. All the players come together and actually start to construct the movie as a whole new theory of how to make movies driven by Alex McDowell, the guy that did Minority Report and some more recent movies. And so I think we're really finding that we kind of have to shake up our institutional structures. And I would call the way we made movies in the old an institutional form, and so I think that yes we were trained and we were assessed in the old days in order to fit not a low skill work necessarily, but to fit in any kind of bureaucratic structure, be it a factory or be it a big box, and in today's 21st century, it ain't going to work. And I've spent a tremendous amount of my life, as a couple of you know, in Asia, and this sense of the entrepreneurial learner I picked up in Asia. You think they do the lockstep we're talking about. I'll tell ya, those kids are so hungry for inventing things

themselves, that they're constantly doing amazing things that if you go into the factories over there you'd be surprised now what you see going on there. I could talk forever on that topic but there's other people....yeah.

Question: My name is Jonathan Dougan. My question is on those institutional structures, and I was hoping you could talk about time scales? So the networked systems you're talking about move on incredibly fast time scales because of all the different interactions, but if you look at schools at the local level, or universities, or workplaces, they seem to be throttled at moving at very much slower time scales. And so, do you think that it's going to become one where we change those structures or the structures themselves change to meet the speed at which progress is happening?

Answer: I'd tell you my dream, but it actually comes from the work I do with some of my colleagues here at Center for the Edge. You know, what's happened, how DML got started in the first place is kind of a shift of focus from the core to the edge. And realize that if you work with the edge, you can get a lot more action for the same amount of effort, and actually find the ways to deploy brand new tools on ideas and so on. So, connected learning to some extent is how do you do things on the edge? look at all the things happening in your community, as parts of edge resources, connect those together, and how do you actually build a learning environment outside of school, where kids that take advantage of it actually start to become a productive force to suggest that the core actually start modifying itself? So, when teachers suddenly see kids come alive, in their class because of the experiences their doing outside, then lo-and-behold, they start asking questions and so on and so forth. So I think there's some interesting social dynamics that can be brought to play here. My guess is, in the corporate world that I've spent at least half my time thinking about, we're now beginning to say that in the old days, we had places on the edge like Xerox PARC, and we would invent a future and try to push it into the core, and the core developed brilliant immune systems to kill us. That technique turned out not to be too effective. A lot of companies got started but Xerox didn't necessarily change. The real catch now is can we invert that whole process by saying it's trying to take these great things happening on the edge, instead of pushing them into the core, can we flip, and say can the edge pull things from the core to the edge because now we have tools so powerful on the edge that we can build our businesses, and we can build our schooling systems that are highly specialized in ways you never could before. So, basically, from the corporate world, these tools of social networks that have infinite reach outside also had much deeper reach into the core through the social networks you build from the edge to the core. So I think we're finding fundamentally new ways to bring about change, and I think a lot of you are going to see here at DML around connected learning is really now looking much more carefully at how you build webs of connections outside that actually become so powerful that it actually starts to change people in the core. Not through terror, not through push, but through seduction and pull.

Question: Hi, I'm Robert Clegg, Co-Founder of Tabula Digita. We're one of the first venture capital based start-ups back in 2002. So my question to you is, it turns out that the funding mechanisms for creating high quality, capstone project, project-

based learning linked to core standards here for multi-player environment networks with great contents that the kids learn and explore and play is not a scalable funding model. How do you see funding start-ups in this really, and entrepreneurs, in this really difficult funding environment, and how do you see this playing out over time when only limited sources of capital really have the basis to make compelling products in the space.

Answer: Yeah, as you know that I know, there's no easy solution to that problem. I would look a little bit to places like India and China, because what you now find is start-ups over there are enrolling parents, left, right, and sideways to take the added advantages of some of the techniques you're talking about to give their kids extra chance. And so for example you find a massive tutoring business over there. An interesting question is how much of that can be automated today? And so I think you're going to find that there are ways to attract parents, and maybe even kids themselves to want to put up even some of their own money to do some of the stuff. Now, you know the other side of the coin is, there is going to be part of this Cambrian moment, a place where, if we want to, for example, return manufacturing seriously to this country, you know the argument we're making is a key part of that, is how do you accelerate in tinkering, and I think you're going to suddenly find some start-ups that are going to be aimed toward creating a skill base that actually facilitates that and I think we need to find ways to work with community colleges and new funding methods in there. So I think that this Cambrian moment, we're throwing a lot of things up in the air and they're going to come down differently, now that you know the venture game, we don't expect very many of our bets to work. Sorry to say. But I think that we've got to change the conversation and there are some people that put serious money into this and there are some brilliant new ideas coming out, I think the New York Times this week had a whole article on prizes. Read that article and there are some institutional innovations coming along there because they think there's a market failure, and what you're talking about is a potential market failure. A structural hole. There may be some new clever ways to how to start to find new ways to fund and fill those structural holes.

Question: [Mimi Ito] First, thank you for so beautifully laying out the vision that I know you know we share about the potential of these new networks to really transform learning and expand the school house to be much more than I think what we've seen in recent history. Sort of linking back to some of Diana's opening comments, I was thinking or wondering if you could speak to some of the barriers and risks that we're facing in doing this because at the same time that I totally recognize the potential of these new networks for this expansive model of learning, and for promoting tinkering and play and that spirit of experimentation, I'm also seeing these very threatening trends towards an arms race of achievement and getting into traditional avenues of education, in getting certain jobs in a contracting economy, and the fact that the kids who are aspiring towards these trajectories are leading incredibly over scheduled, hyper achievement oriented lives that are the antithesis of the kind of play and experimentation you're talking about, at the same time that new technologies are actually not about expanding the doors of the classroom, but about colonizing every moment of kids' lives with the logic of precisely the forms of learning that we might want to keep at bay, and so I see these countervailing trends and I think we have a

lot of reason to be hopeful, but I also was wondering if that you could signal for us some of the things that we should be wary of or concerned about.

Answer: Yes. Next question.

Diana: Coming from New York City, I'm not at all familiar with what you're talking about, kids being overscheduled.

JSB: You know, it was ironic, but I keep bugging Mimi, please write your next book, please write your next book. And your connected things, are you going to release that here? Well, you have half those answers there, where I think you go at least. The two issues I think that are going to be forcing functions on the horizon is one, believe it or not, is Asia, is finally waking up to the fact that their methods of education, which we are now systematically trying to copy, are so 20th century, that they're going to overthrow them. And I'll tell you, countries like Singapore, parts of Singapore, Korea, I just came from, you know, are kind of laughing at America, saying what are you guys, crazy? I mean, we excel at all those tests and we know we're not successfully preparing people for the 21st century, we're now going to completely revamp our game. But the bigger problem you have is this notion of permission to fail, which is why I brought up play, and this perverse notion of safety. Because in fact, the most unsafe thing you could do is not let your kids actually start to understand how to interact with the real world. And I think we have a huge problem there. And I think it's part of the media's problem, of creating a fear-based culture, and that fear-based culture has very little backing to it.

Question: Hi, I'm from Malaysia. I think I'm one of the examples that you mentioned, an Asian that can create things. So that's why I'm here. So my question is how the assessment or evaluation could be blinded in the proposed blinded epistemology. How, because in Asia, we want to see proof.

Answer: Right. Not just Asia, by the way. Everybody I run into, especially in Washington, wants proof, because proof is the eye of the beholder. I keep thinking, you know, going back to the question from the entrepreneur here, also being a venture capitalist to some extent, more of an angel, that's a technical term, is the proof your putting is show me your portfolio. You know, if I hire an artist, I want to see the portfolio. If I hire a writer, I want to see the writing. If I hire a coder, I want the code. And so, you know, and then I'm going to talk. And I want to talk through that. And so, as Diana said, I ran Xerox PARC, actually, I hired a lot of people at Xerox PARC for now 35 years there. I never once had ever looked at a transcript of a student. To me, for what I was looking for, the transcripts are meaningless. The game is, let's have a conversation around something you've done, and then I will get a sense for what are your sensibilities? What are the nuances that you bring to the table, and so on and so forth. And David, I don't know if you knew this but I did also grant admission for a little while but I ran into too much trouble at UC Irvine and the computer science department. I instituted a policy, I was allowed to, they took me out of that job, where, you know, if an undergraduate applies to you gets A +++ average, you kind of, unless you want to go to law or court, you admit them. But if you get a B+ student, I look for the highest variance. So I get a B+ student that

consists of all A+'s and a few F's. I say that kid has research potential, because that kid is willing to say screw off, and I like that.

Question: Hi, I'm Eva Wong from Michigan State University, I'm a PhD student and I was really interested in your tacit learning trends for argument, especially because I feel a lot of the research that we do is in academic silos, and as a young scholar, I am encouraged to stay within my own field. However, going to conferences such as this one on HCI and communication, I feel like my work speaks to a broader audience. Could you give any advice to a young scholar as in terms of how to disseminate our knowledge to different communities?

Answer: You know, first of all, coming to conferences like this is critical. And getting your work out and speaking about your work is critical. I don't know how much you blog about your work, but you don't get a lot of cred inside the academy for blogging, but you get a lot of visibility outside, you build connections, and don't just look at the academy looking at itself. I mean if you actually start to engage folks outside, you know we're looking more and more for how do you have a dialogue between the outside universe and inside. That dynamic is slowly happening. But, my best advice is don't give up.

Question: Hi, I'm Sarah Field from New Tech Network, and I'm actually curious. There have been a couple of articles lately one, in *The New York Times*, and one of *The New Yorker*, I'm sure there are others in other places kind of pushing back on the notion of collaboration as the answer to all of our problems, or to many of the problems that we're facing and kind of talking about how we might be losing something in not also focusing on the power of individual work and individual reflection and kind of the learning that happens on your own as a human being. So I'm curious about, I'm a huge fan of collaboration and crowdsourcing, but also, wondering if you have perspective on whether we're overcollaborating in certain areas and whether there's anything lost in that process.

Answer: I don't think we know how to do collaboration very well. I would call on us to look much more carefully at what happens in our architectural studios, and how you have much more productive forms of critiquing, not criticism, how the mentors play out in these studios, and I think that we confuse collaboration with crowdsourcing and a few things like that, and don't understand productive friction and how great ideas come from productive friction, not just brainstorming. So there's a whole long story here, but Diana's going to kill me if I go into it. Thank you.

Diana: There is a long story there, and you can find many, and most of JSB's thoughts on a whole array of topics I'm not sure if nanotechnology is there, but on his website. So if you would like to read more of his work, follow more of his thoughts, you can find him on his blog. Thank you everybody.