# How Learning Technologies Work

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This is a presentation firstly about technology, what it means, what kind of thing it is. Secondly, it is about what that means when we try to use it to help people to learn.

# Is there a technology in this picture?



hint - yes. Or maybe. There's a stick that could be used to extract termites, scratch your back, draw in the sand, keep a door open, stir paint, etc etc

# Is there a *learning* technology in this picture?



hint - yes. Or maybe. There's a stick that could be used to point to something, rap knuckles, demonstrate physics or biology, write in the sand...

# Is there a learning technology in *this* picture?



hint - yes. When I visit a new country or city, I typically find myself overwhelmed by the sights, sounds, smells etc. It's difficult to get a handle on the culture, to compare and contrast and connect with what I already know. So I visit McDonald's an order a Big Mac and an orange juice (sometimes beer or wine, depending on country, and sometimes a Big Raj if Big Macs are not available). McDonalds should always be pretty much the same, but it's not. Differences in how you are greeted, attitudes of servers, how people behave in the cafe, the decor, the cleanliness, the way people make eye contact (or not), how kids are treated, etc etc etc are easier to spot than outside. It's closer to my zone of proximal development, so it helps me to better understand how things work in that country.

Consider a screwdriver. Can you enumerate all the possible uses of a screwdriver, alone or with other objects or processes? No. The possible uses of a screwdriver is both *indefinite in number and can't be ordered*. This means that *no algorithmic procedure* can list all the uses of such a screwdriver alone or with other objects or processes.

Stuart Kauffman

http://www.npr.org/blogs/13.7/2012/03/12/148462664/information-theory-does-not-apply-to-the-evolution-of-the-biosphere



there is no algorithmic way to list the possible uses of a screwdriver. A screwdriver is not the same technology if it is used to stir paint or lever the lid off a paint tin or stab someone as when it is used to drive screws. It is the same tool, but the technology is something more: it involves what we do with it.

# What is *a* technology?

**tech·nol·o·gy**/tekˈnäləjē/

Nonsense

Noun:
1. The application of scientific knowledge for practical purposes, esp. in industry: "computer technology"; "recycling technologies"
2. Machinery and equipment developed from such scientific knowledge.

Synonyms:
technics - engineering - technique

"A combination of artefacts and what you do with them" (Bill Nye)

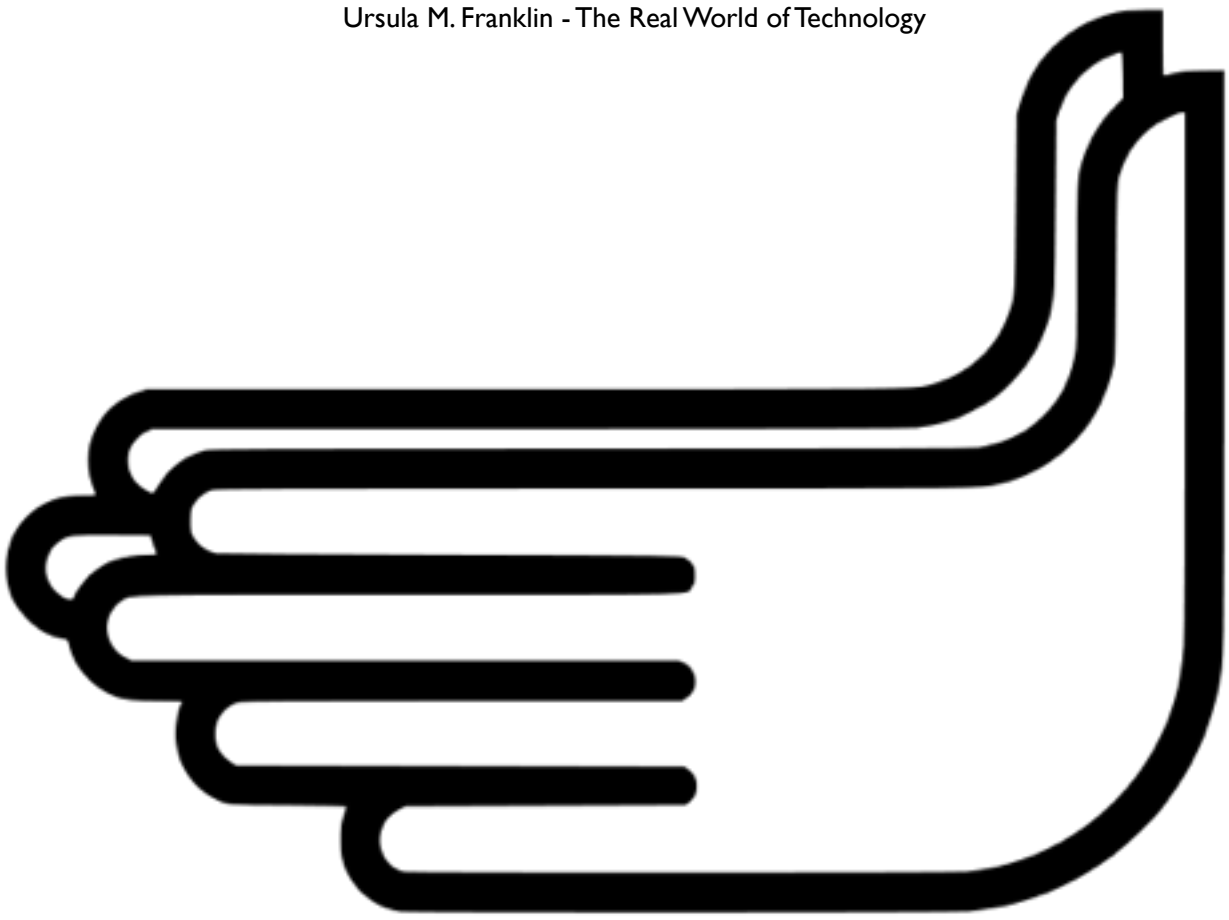
"The way things are done around here" (Ursula Franklin)



The standard dictionary definition is palpable nonsense – always has been but still true now. If anything, science results from application of technology. At best, it's a dance between them, but most technologies are explained by science but do not spring from them

# Praying is a technology - and uses several technologies

Ursula M. Franklin - The Real World of Technology





prayer uses processes that can be taught in order to do something – maybe feel better about yourself, put you in contact with your gods, ask for something from them, whatever. It involves rituals – processes that are used to bring it about

Franklin, U. M. (1999). *The Real World of Technology*. Concord ON: House of Anansi Press.

# technology

"the orchestration of phenomena for some use"

(W. Brian Arthur)



this is the definition I like best. The same object (which may itself be a technology that orchestrates phenomena to some use and contain other things that are the same) is a different technology when orchestrating different phenomena for different uses.

Arthur, W. B. (2009). *The Nature of Technology: what it is and how it evolves*. New York, USA: Free Press.

# pedagogies are technologies

(but pedagogy is not technology

***a*** pedagogy is ***a*** technology)



Pedagogy, an area of study about how people learn and how to teach them, is not thesame as a pedagogy, which is a process of instruction, a set of methods, rules, suggestions and replicable processes

# assemblies



All technologies are assemblies of other technologies – they are constituted in relation to one another, layering one on another, interoperating, acting together (Arthur). Pedagogies are technologies that are virtually always assembled with others (even if those others are as simple as language)

learning technologies

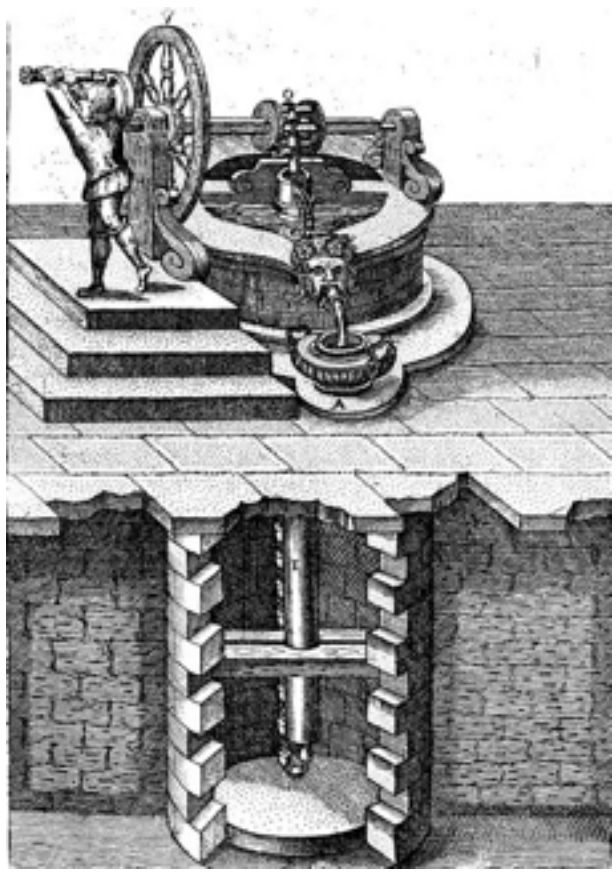
where pedagogy is part of the orchestrated assembly



so, learning technologies include as part of their assembly implicit or explicit pedagogies. An LMS is not a learning technology unless it is being used to bring about learning. A blackboard is not a learning technology without the ways it is used and the greater assembly of which it is a part. We use phenomena such as the fact that people learn from stories, or with scaffolding, or in small steps, whatever, combined with phenomena such as the fact that computers can display rich media and connect with others via TCP/IP, to build a technology for teaching. As learners, we use these and different phenomena (like what we already know) to learn stuff.

# Hard technologies

Orchestration of phenomena embedded in the technology



http://commons.wikimedia.org/wiki/File:Pump5.jpg

May need skill to use them *correctly*



hard technologies reduce choices

Orchestration of phenomena is embedded in rules, laws, physical parts etc - e.g. automatic transmission vs manual transmission

note that laws, rules etc are hard technologies if they are inflexible - it is not about embedding in a machine but in a technology. A computer (to a computer programmer) is extremely soft. A legal system that requires blind adherence to laws is extremely hard.

# Soft technologies

Active orchestration of phenomena by people

http://commons.wikimedia.org/wiki/File:François_Barraud_-_Palette_et_Pinceaux.jpg

## Skill needed to use them *well*



soft technologies are flexible, allowing people to be creative. paint brushes and paint are soft technologies that can be used in many ways. So are computers. Rules and regulations are not, unless they can be broken.

# cyborg

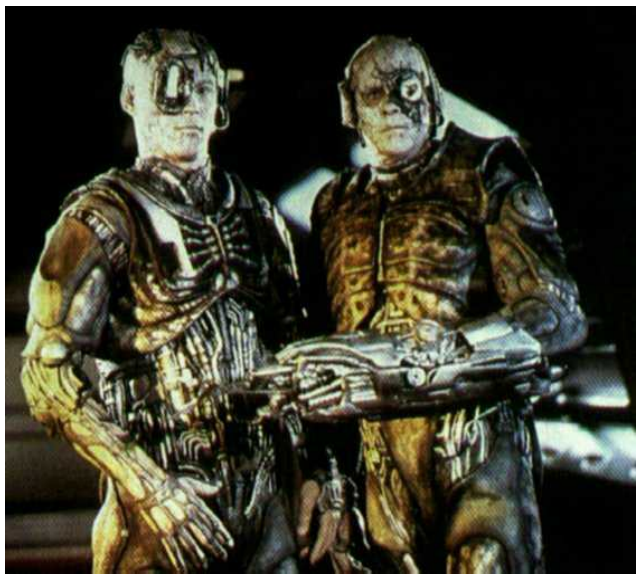
"creatures simultaneously animal and machine, who populate worlds ambiguously natural and crafted" (Donna Haraway, A Cyborg Manifesto)



all soft technologies are cyborgs – we are always part of them (they are sometimes part of us)

# cyborg technologies

we are a *part* of all soft technologies



and some technologies are made *of* us



Soft technologies have no existence unless we make them happen - they are composed of us.
Collectives (in the Borg sense of the word) such as Google Pagerank, collaborative filters, reputation-based systems etc involve us as a part of them

hard is easy
soft is hard



when the orchestration is in the technology it relieves us of the need to make an effort. That's good, as long as the technologies do what we want. We have to perform the orchestration of soft technologies, which is difficult. We have to constantly invent how to use them, to adapt, to create. That's hard (difficult)

# Whose orchestration?



It really matters who is orchestrating what and for what purposes.
http://commons.wikimedia.org/wiki/File:Zoltan_Rozsnyai,_conductor,_Family_photo.jpg

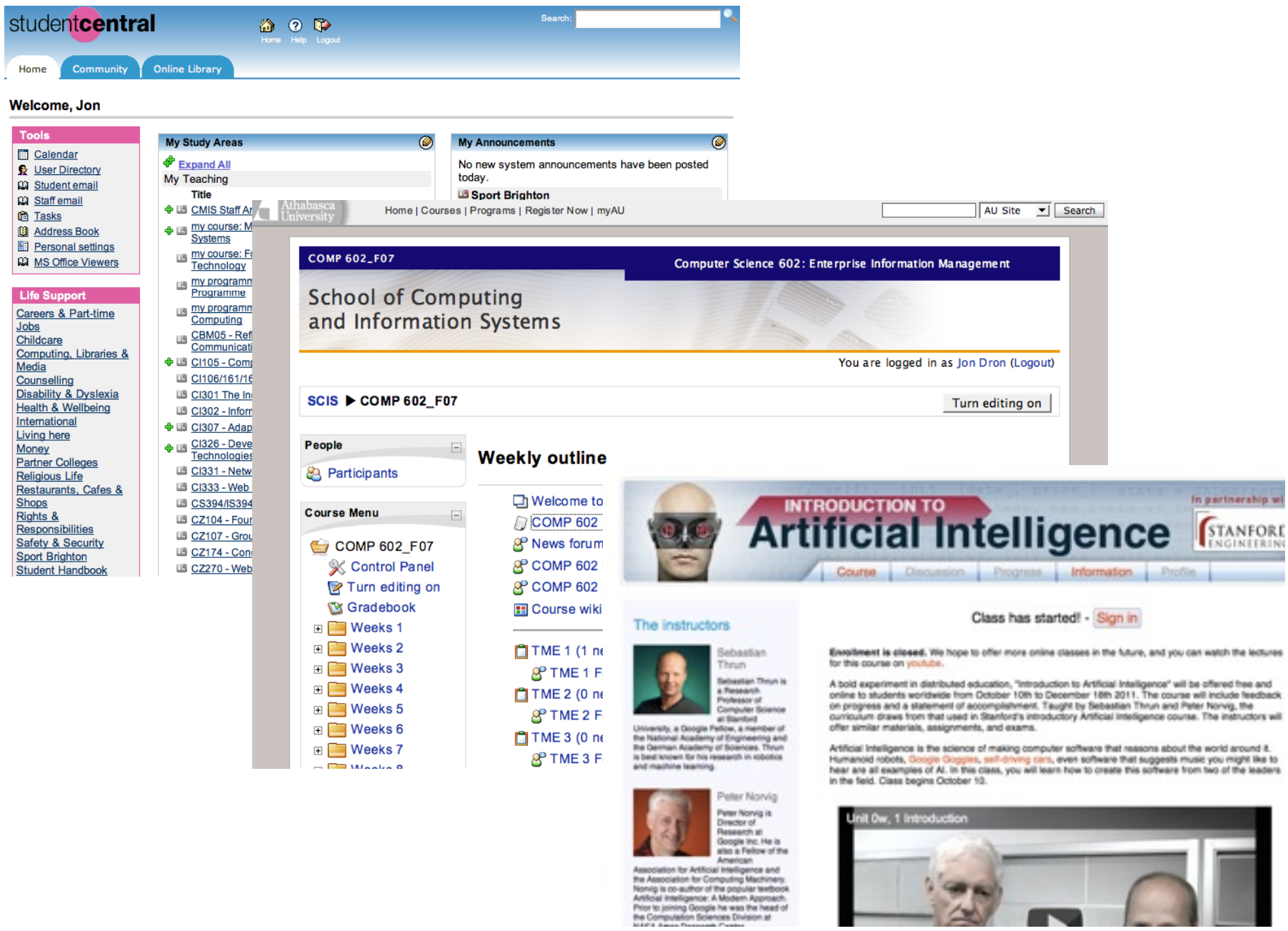
# points of view

Image by Jules Feiffer, from The Phantom Tollbooth, by Norton Juster



Alec Bings comes from a land where everyone has the same point of view – their feet grow to the ground (unless they are born upside down, in which case their feet reach the stars). It all depends on your point of view – to an elephant a bucket is a cold drink, to an ant it is a swimming pool. Technologies are soft or hard depending on the orchestration. Just as the screwdriver can be many technologies, an LMS is hard for a student, softer for a teacher, very soft to Martin Dougaimas.

# hard technologies (for students)






Note that this is a different technology when used by a teacher than when used by a student – different phenomena (e.g. the way the tool allows writing and structuring vs its capacity for reading and discussing) are being orchestrated for different uses – to learn for students, to teach for teachers.

remember that hard is easy – the important issue here is making the right things hard (to simplify and automate things that do not need to be learned) and the right things easy

# structure and behaviour

- we shape our dwellings then our dwellings shape our lives (Churchill)
- large and slow influence more than small and fast




Actually also hard for teachers, because they embed pedagogies and assumptions about how, when and where learning happens.

# defaults

make things easy


but can make us stupid



Defaults are powerful things, for instance. When writing these slides I realised that I was unthinkingly using the default slide dimensions even though I knew this was not going to be displayed in a lecture hall or full screen. That was silly. The slide format is a skeuomorph, a design feature that used to be essential but that continues to be preserved when it is not.

At University of Brighton, 99.15% of over 7000 courses used the Blackboard default of showing announcements as the first thing students saw in the course. This emphasises a power structure that may not be great – even though it took a handful of clicks to change this, hardly anyone even knew that it was possible. When informed of the fact, 17 out of 33 tutors said they might now change the default and 5 said they definitely would.

Path dependencies also lock us in to patterns that make little sense.

# pedagogies are *soft* technologies



a pedagogy, is a process of instruction, a set of methods, rules, suggestions and replicable processes.
Trouble is, it's soft. It is a potential victim to the hard and slow moving - the structures of our hard technologies be they LMSs, regulations, timetabling processes or whatever.

# How to make technologies


- Adapt
- **Aggregate**
- Recommend
- Extend
- Automate
- **Replace**
- Filter
- Limit



The general principles of softening involve making things adaptable, using signposts rather than fence posts, opening up new uses and, above all, aggregating: adding new technologies to increase the adjacent possible. These may involve automation but, if so, not involving the loss of previous capacities.
To harden typically involves automation of things that were formerly manual but not just automation per se – it has to replace something softer. Automation that forces a particular way of doing things is hard. Filtering means removing of possibilities (good example: adaptive systems that only show what they think is relevant, rather than those that suggest possible alternatives or highlight things of value). Hard technologies explicitly limit choices.

# How (not?) to make technologies

http://www.flickr.com/photos/nationaalarchief/2948560477/sizes/o/

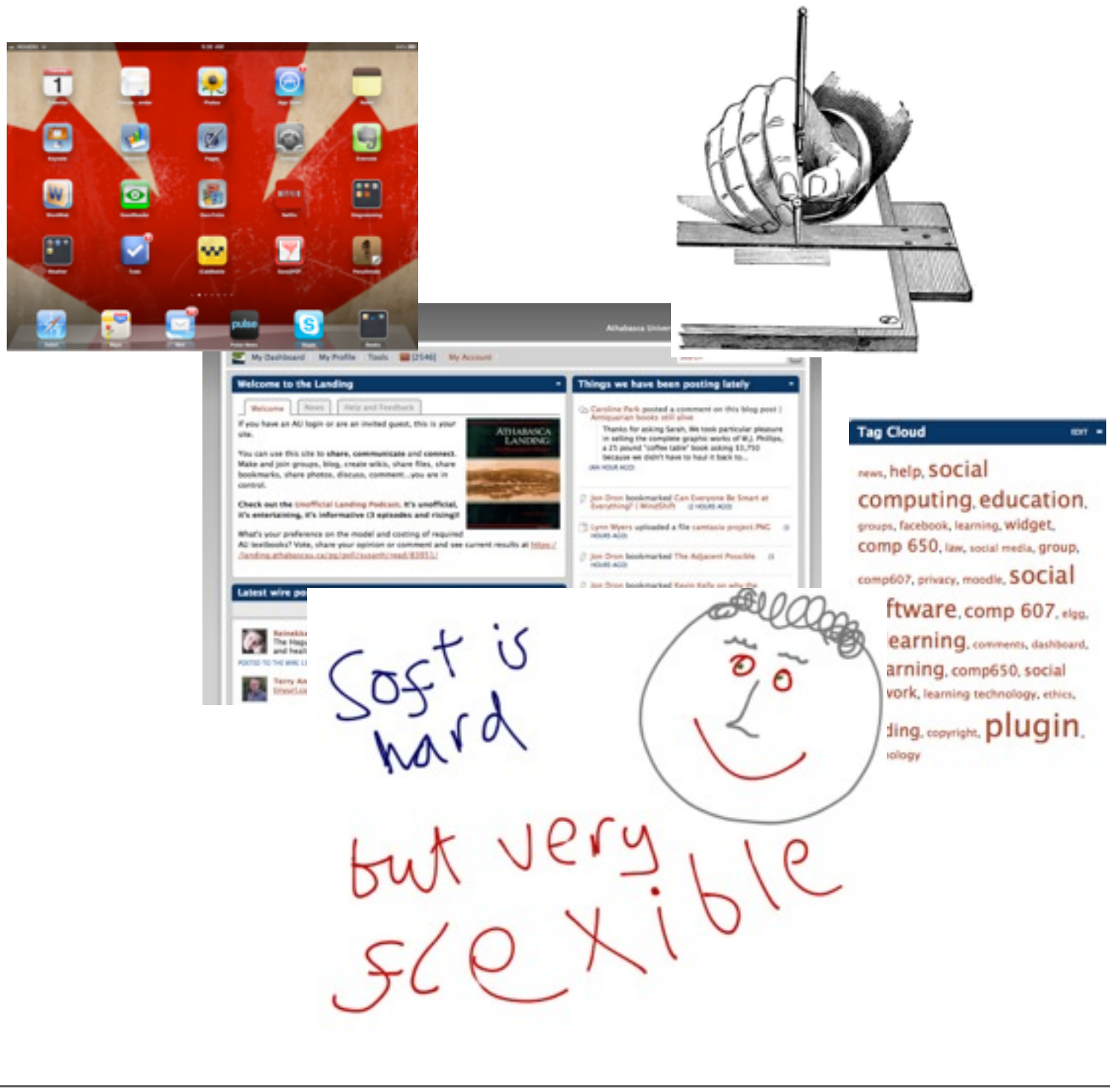


All depends on context.

This demonstrates the power of assembly - you can overcome the restrictions of a hard technology that doesn't do what you need by amalgamating it/assembling it with another

On the other hand, using pedagogies designed for a different age and a different technology is a bad idea, on the whole. If we try to lever in pedagogies that are codetermined by the exigencies of classroom instruction, we may make the wrong things hard and the wrong things soft. But it might work. It's a starting point anyway. At AU we have tried to use Moodle, a technology designed for closed-group working and traditional synchronous classes, but we use it in self-paced courses. Things like weeks, collaborative tools, etc make no sense. It also locks us into a course-oriented view of the world.

# soft learning technologies






Soft technologies are a) flexible and b) harder to use than hard technologies because of the need for orchestration by people.
Key design pattern is assembly – we can soften hard things by adding other hard things (or soft things).

# three bears

Steel, Flora Annie. *English Fairy Tales*. Arthur Rackham, illustrator. New York: Macmillan Company, 1918.



not too hard, not too soft, just right. The important things to remember are that hardness is good if it makes what you want to do easier. If you have to bend to the technology, it is too hard. If too much skill is needed to use it correctly and without error, then it is too soft. We need to think




there is a balance between soft and hard. We need to actively seek that balance and decide which things to harden, which to leave soft, not just for us but for our students.
It's about control: if we make it too soft, we take away control of the things that matter. If we make it too hard, we take away control of the things that matter.

# thank you

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These slides:

*https://landing.athabascau.ca/file/view/168446/cider-presentation-2012*