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The education spring: Why educational systems will have to change and the technologies that might enable and shape those changes,

Today's discussion.

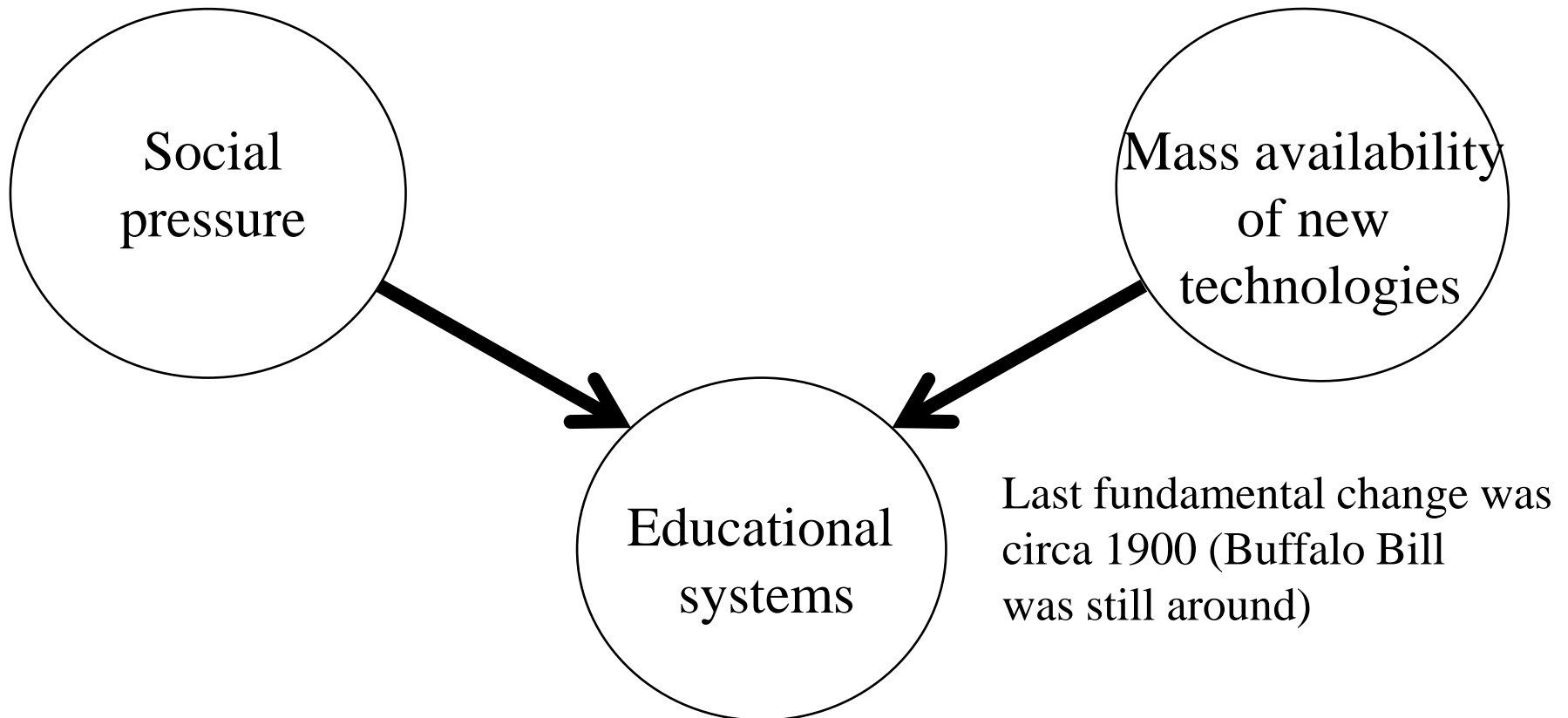
We have reached a point in which educational systems must and might finally undergo fundamental change.



*“There's a tsunami coming“, John Hennessy;
President of Stanford*

Why must educational systems change and why might this happen after all these years?

Forces leading to fundamental change in educational systems.



Social forces shaping changes in education.

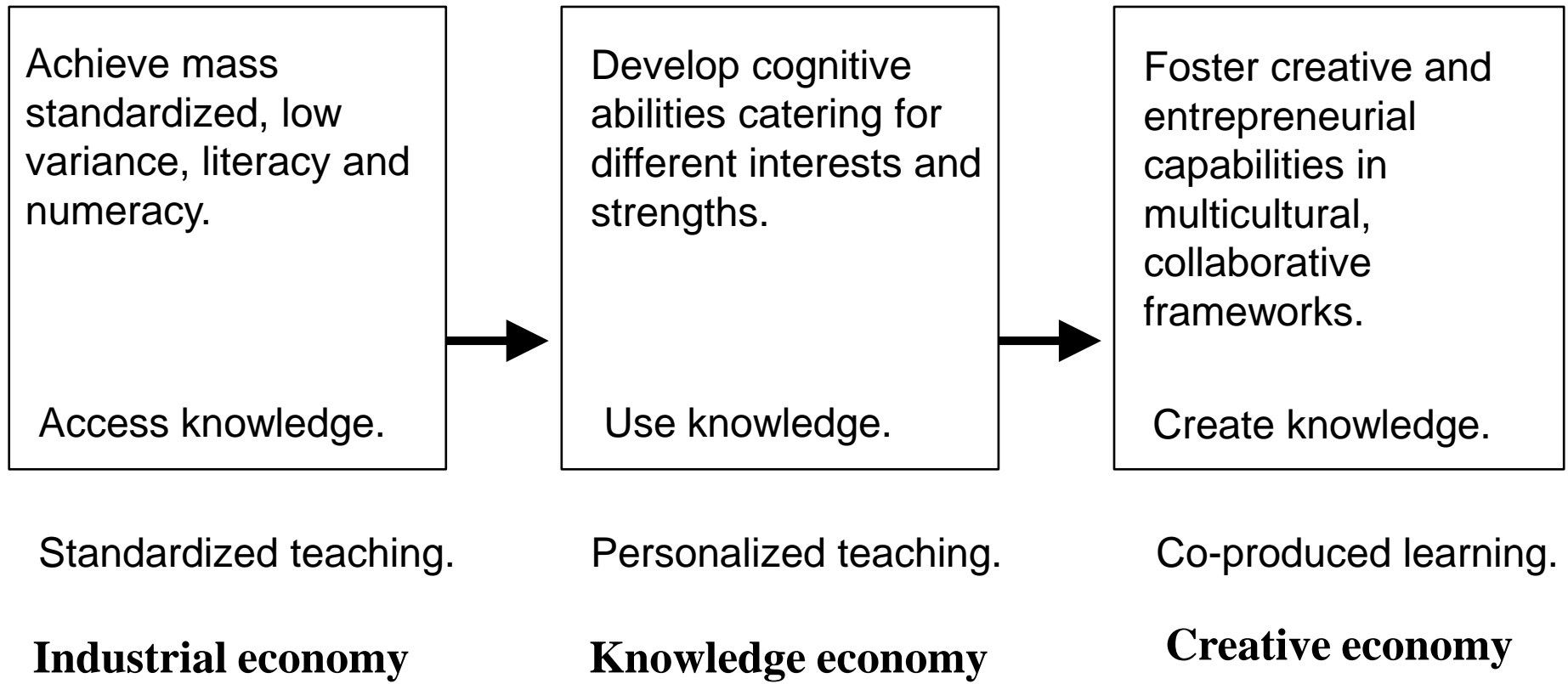
- **Higher value and necessity of knowledge; high stakes for countries and individuals excluded from knowledge.**
- **Spread of democracy: advanced education as a right rather than a privilege.**

**Demand for knowledge will create an “education spring”.
From Tahrir square to La Moneda square students uprisings
had a common cause: unmet demands for access to advanced
quality educational opportunities.**

The evolution of educational systems.

Organizational paradigms	<ul style="list-style-type: none"> - One-to-few - Socratic tutorials 	<ul style="list-style-type: none"> - One-to-many - Hierarchical exchange - Uniform content and rhythm 	<ul style="list-style-type: none"> - Many-to-many - Peer exchange - Flexible paths and rhythms
Level of personalization	High (personalized)	Low (impersonal)	High (highly personalized)
Level of accesibility	Low (elitist)	High (massive, local)	High (massive, global)
	Farming economy	Industrial economy	Knowledge economy
	1800	1900	2000

Aims of educational systems.



Education must meet modernity.

**Why would educational systems change this time?
There is a long history of technologies introduced in schools
with great expectations, with subsequent disappointment.**



The Evolution of Classroom Technology

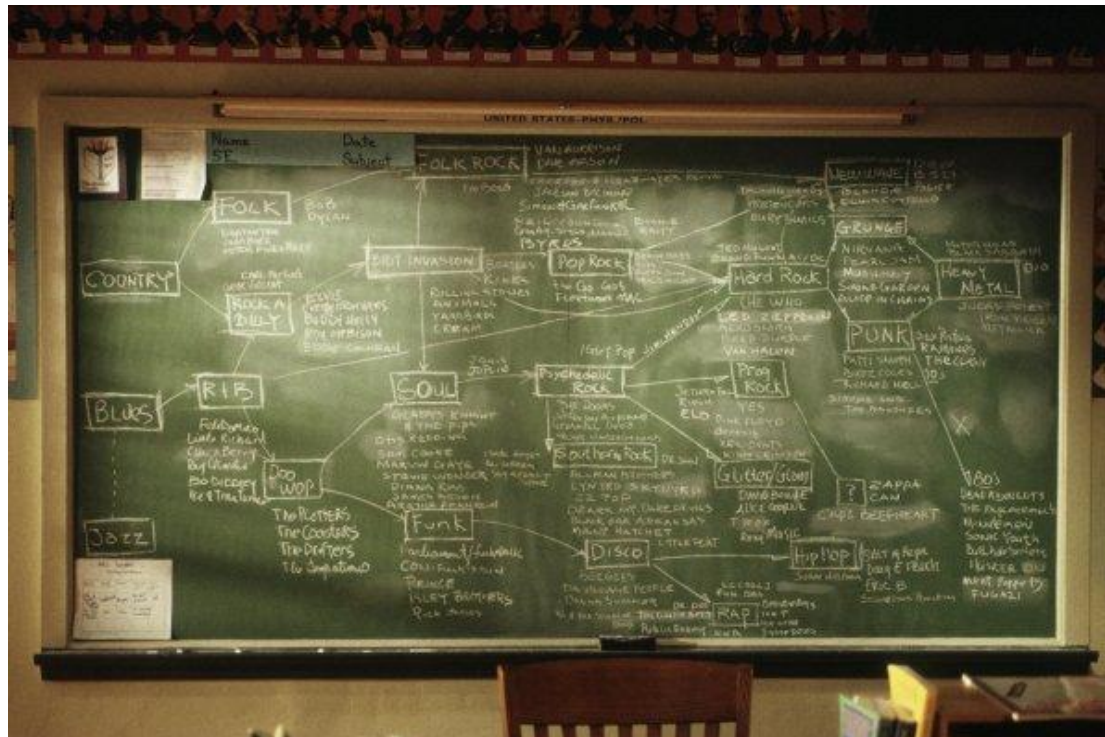
1850 - Ferule



A pointer and corporal punishment device.

The Evolution of Classroom Technology

1890 - Chalkboard



Still going strong to this day, the chalkboard is one of the biggest inventions in terms of educational technology.

The Evolution of Classroom Technology 1925 - Radio



Over the next couple of decades, “schools of the air” began broadcasting programs to millions of students.

The Evolution of Classroom Technology

1930 – Overhead Projector



Overhead projectors quickly spread to schools.

The Evolution of Classroom Technology 1957 – Skinner Teaching Machine



A series of devices that allowed a student to proceed at his or her own pace through a regimented program of instruction.

The Evolution of Classroom Technology

1958 – Educational Television



By the early sixties, there were more than 50 channels of TV which included educational programming including “flying studios” broadcasting from planes.

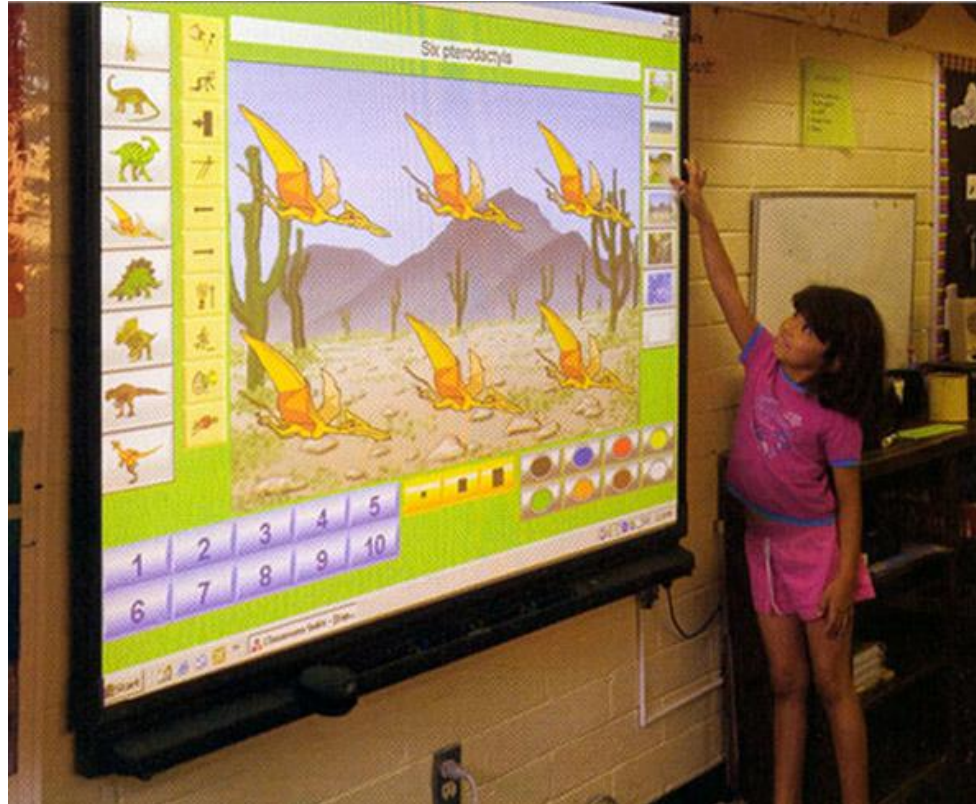
The Evolution of Classroom Technology

1970 – Plato Computer



Plato was one of the most-used early computers to gain a foothold in the education market.

The Evolution of Classroom Technology 2000 – Interactive Whiteboard



The chalkboard got a facelift with the whiteboard. Still getting slowly rolled out to classrooms right now.

Why have schools been remarkably impervious to fundamental change or disruptive innovations?

From an innovation theory perspective:

- They have hitherto been quite effective, until now that their aims must change.
- They have no competition.
- There are few "non-consumers".

Disruptive innovation starts with non-consumers for example phonographs, PCs or digital photography.

See: Christensen, C. , Johnson, C. and Horn, M. (2008) **Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns.** McGraw-Hill: USA.

Bring Your Own Device (BYOD) or,

Leave your devices out of my classroom

- **Turn off your smartphone (and camera and GPS and...).**
- **Turn off your IPOD, forget about music even in music class.**
- **Do not chat!**
- **Do not search. If you search, do not use the results.**
- **Do not access YouTube, it will clog the school's network.**



Technologies with the potential to effect fundamental change in education must be:

- **Interactive.**
- **Collaborative, social, allowing many-to-many exchanges.**
- **Personalized: customizable to needs and learning styles.**
- **Self directed, user-controlled.**
- **Unbounded by school geography, timing, scheduling.**
- **“Diggable” up to need, interest or ability.**
- **Logistically supple.**

Why did TV or CAI (computer-assisted instruction) not disrupt education?

- **TV was one-to-many, not interactive, not user-controllable, not customizable and not social.**
- **CAI was one-to-one, user-controllable and relatively personalized using learning-analytics but was not social.**

The challenge is to raise the productivity of teaching.

- **There are not enough good teachers to provide advanced education to all seekers. Teaching requires talent and training, it is a personalized service, more akin to a lawyer than a singer.**
- **Teaching productivity is constrained by the “Baumol effect” (a string quartet cannot become more productive by playing faster).**
- **To raise productivity, teaching must be unconstrained by co-location, co-temporality and linearity (more students requiring proportionally more teachers and buildings).**

How can we raise the productivity of teaching?

- **Shift paradigm to "flipped" classes, which releases teachers' from repetitive low-productivity lectures.**
- **Reorganize the "business model" towards a more "editorial" model with higher development costs but lower marginal costs per student.**
- **Use systematically self directed and peer-assisted (community) learning.**
- **Help students learn outside the classroom using the tools and technologies they already use and connect outside and inside content.**

Do we now have the technologies to achieve these paradigm shifts and productivity gains?

New technologies provide for real discontinuities in the dominant teaching paradigms and might support "disruptive innovations".

- **Cloud computing.**
- **Social networks: collective intelligence.**
- **Recommendation systems.**
- **Mobile computing: smartphones, tablets, embedded systems.**
- **Gesture and Kinect-type motion recognition.**
- **Geolocalisation.**
- **Video compression.**

Disruptive innovations that might improve teaching productivity.

Blended teaching technologies:

- **MOOC (massive open online courses).**
- **Flip teaching.**
- **Educational Games.**
- **Augmented reality.**

Massive open online courses or MOOC's.

- **Instruction is based on openly available content, typically, a series of video lectures, with short quizzes built-in.**
- **Interactions are largely peer-to-peer, structured to facilitate interactions between beginner learners and advanced learners records which are recorded and curated for future use by students.**
- **Assessments are automatic or peer-assessed.**

Online learning is highly scalable. The expense of adding an additional student is close to zero.

Flip teaching.

- **When teachers “flip” classrooms, they assign lectures to watch at home and save class time for working on homework together.**
- **TED launched a new online tool that turns any YouTube video into a lesson.**
- **Flipping uses the resources on the Internet to free up valuable teacher classroom time, changes the teacher-student relationship and opens the door to “discovered” learning.**

Educational games.

- **Games are goal-oriented, have strong social components and simulate real world experience.**
- **Ideal method of assessing student comprehension, provides immediate performance feedback to the players.**
- **Allows for experimentation, the exploration of identities, and a safe place to learn from failure.**
- **MMOs bring many players together to work on activities that require collaborative problem solving.**

Augmented reality

- **Layering of information over 3D space produces a new experience of the world, sometimes referred to as “blended reality,” bringing with it new opportunities for learning.**
- **Students can construct new understanding based on interactions with virtual objects that bring underlying data to life.**
- **Real-time geolocalisation with smartphones or other mobile devices enable rich applications, interrelating the real world with relevant information and even live action.**

Where do we go from here?

- **Will schools once again “reform the reform”?**
- **Or the unprecedented (social) nature and (near universal) extent of adoption of the new technologies by students will “change the tide” of teaching and learning?**

PS: ORT Uruguay University is designing its first large-scale experimental project to teach programming to all 12-13 years old in the country. We´ll keep you posted.

Thank you for your attention

