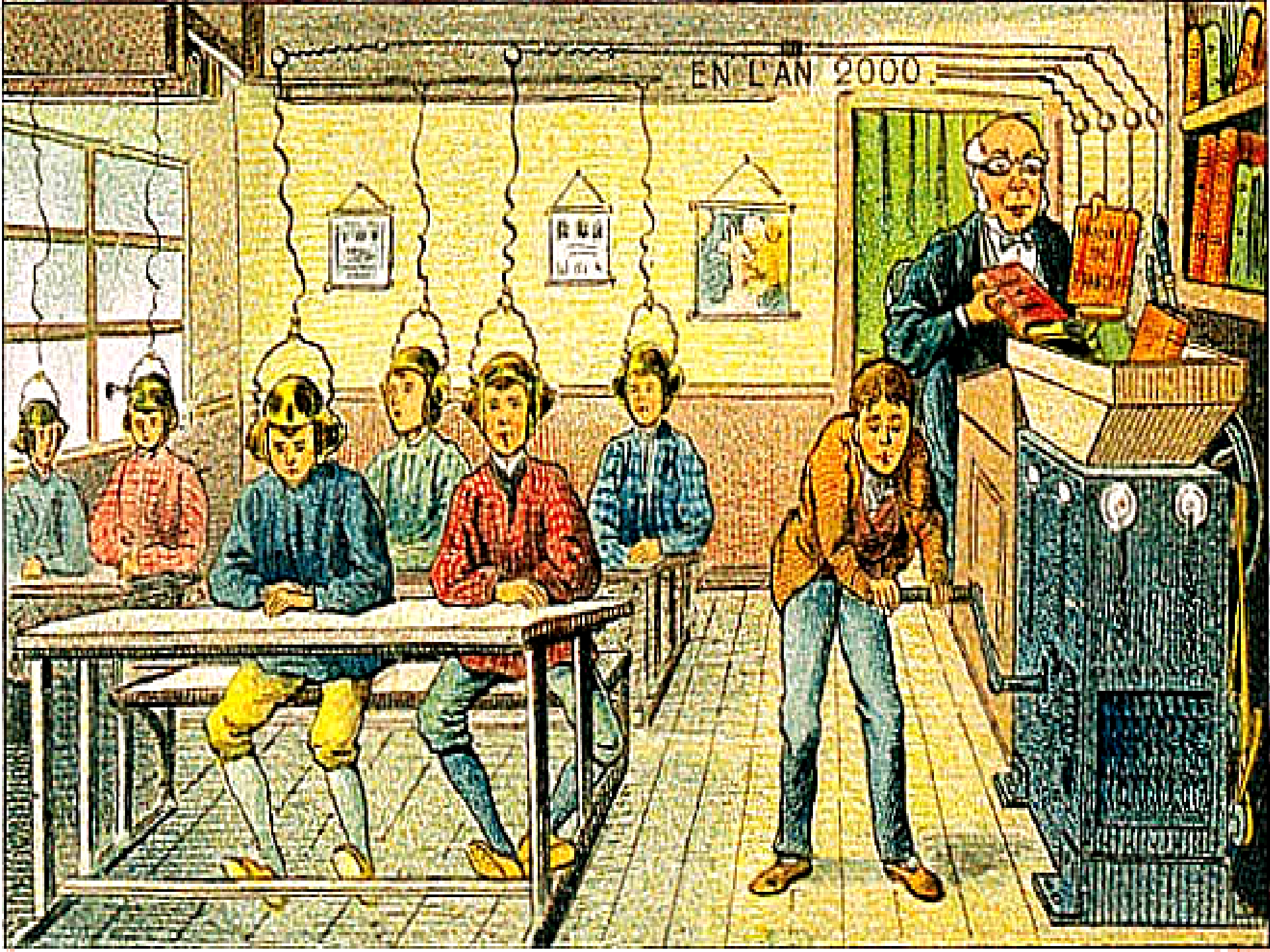
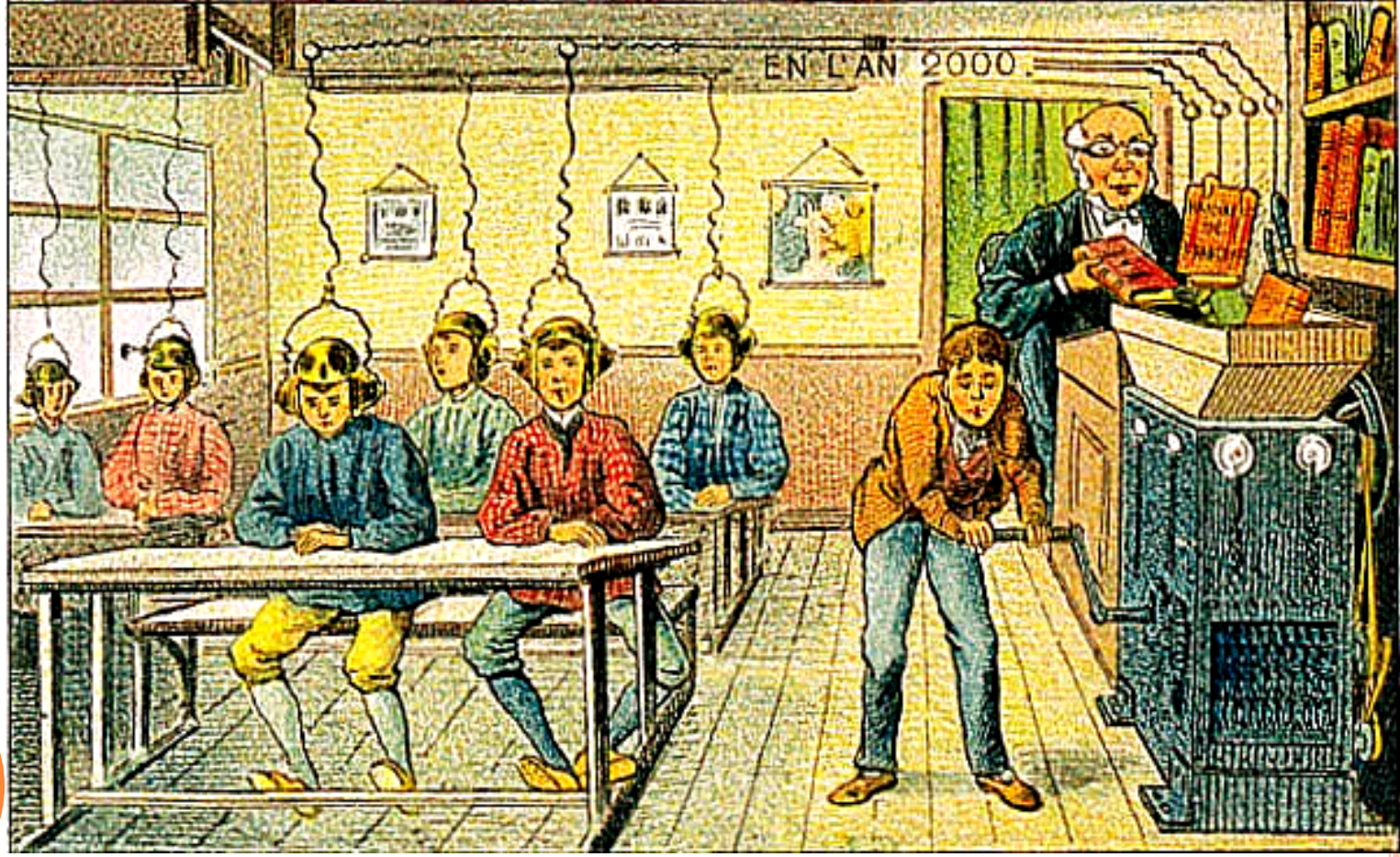

EN L'AN 2000



The Science Behind the Art of Teaching a Science

Rob Reilly Ed.D.

My Perspective Comes From….

- MIT Media Laboratory USA, 6 yrs
- IEEE Education Society
- Computer Education Teacher, 25 yrs

My research

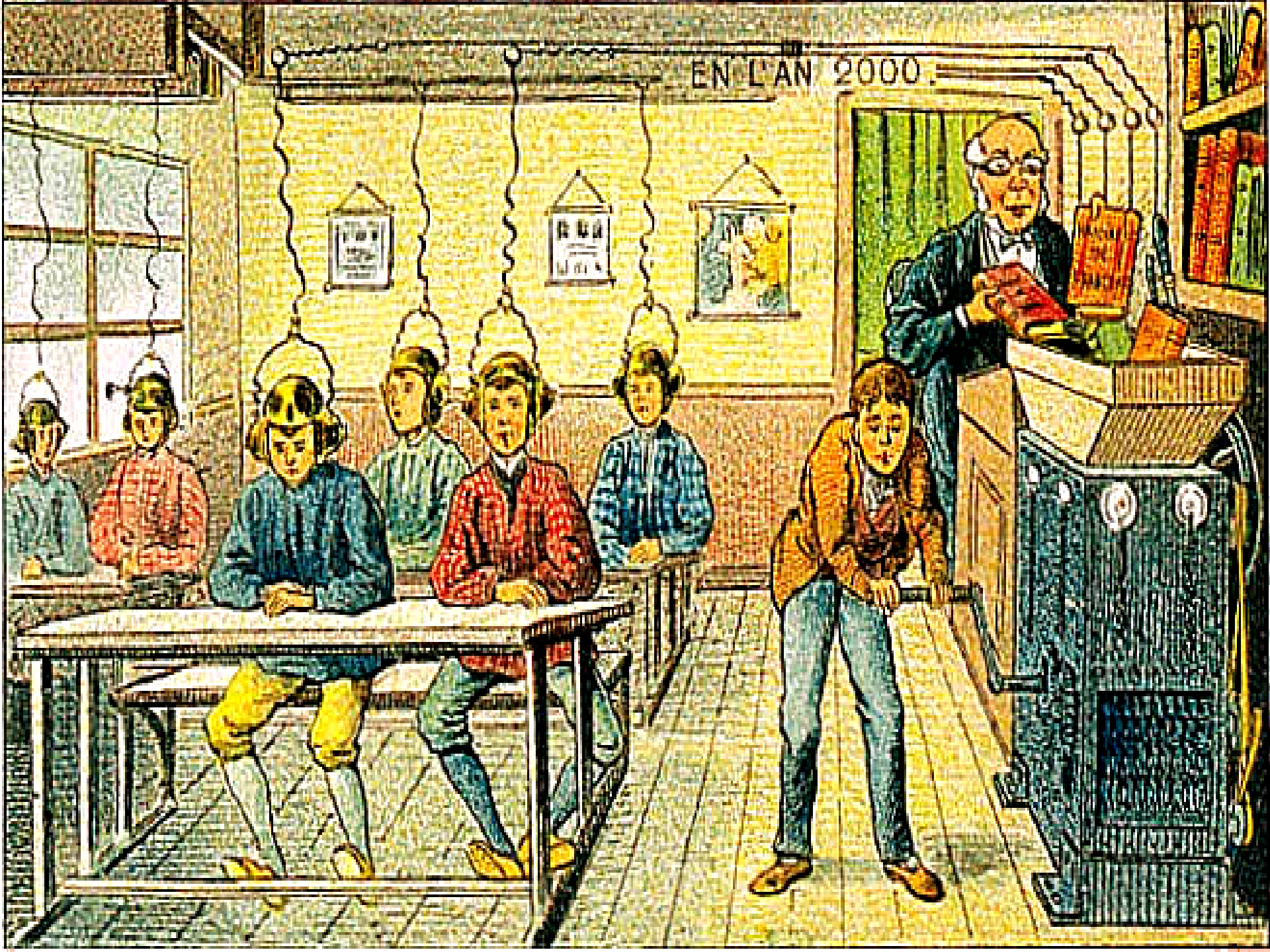
Develop affect sensitive intelligent cognitive machine

A computer that provides domain knowledge (*e.g.*, conceptual physics, hydraulics) and can identify the emotional state of a learner (*e.g.*, cognitive assessment, frustration, confusion, exhilaration, despair) and react appropriately to that state (*e.g.,* offer clues to correct mistaken knowledge, leave the learner alone).

Problems

1. Understanding of total cost of ownership of technology.
2. Substantative curriculum-long content (i.e., islands of excellence w/no ferry service).
3. Integration into broader curriculum (e.g., no teacher preparation time available, teacher ilteracy level, administrative support, release time).
4. Basic function of the brain is not different in 2008 than it was in 1908 or 1808? Educators do not seem to know how the brain functions!

As it impacts pedagogy, we talk about the ‘new stuff’, but we have never operationalize the ‘old stuff’…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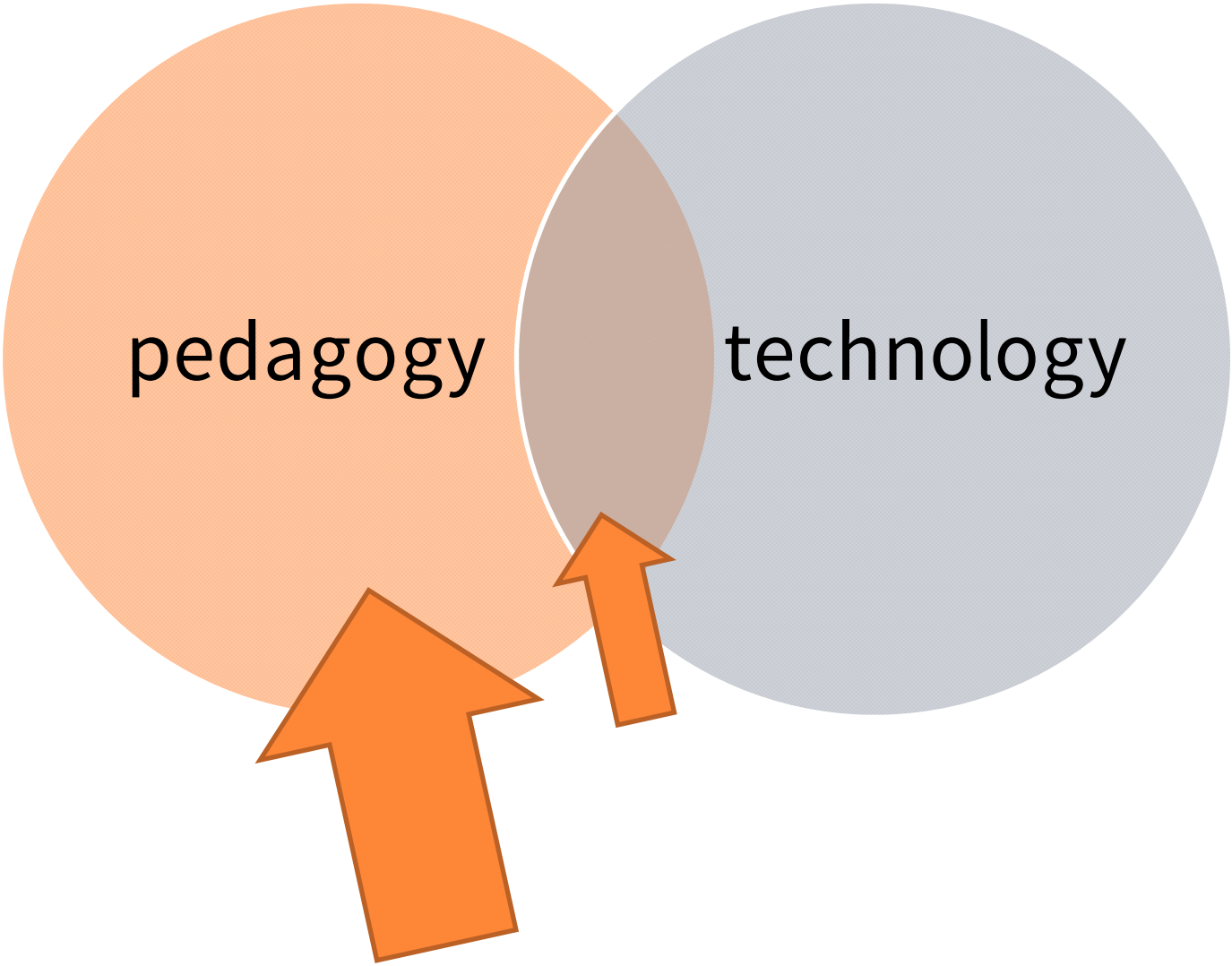
What I'm going to talk about today…

1. My personal beliefs,
2. Thinking points about a person's learning journey,
3. Separate the various components of Technology Salad (i.e., assessment, techno-gizmos, pedagogy),
4. Building blocks of learning (*i.e.*, knowledge, wisdom, data, information, etc.),
5. A model of learning that invokes the *teachable moment,*
6. Our focus must include an understanding of the learner's brain.


pedagogy
technology

Delivery of Effective Education

Some basic questions to serve as a starting point:

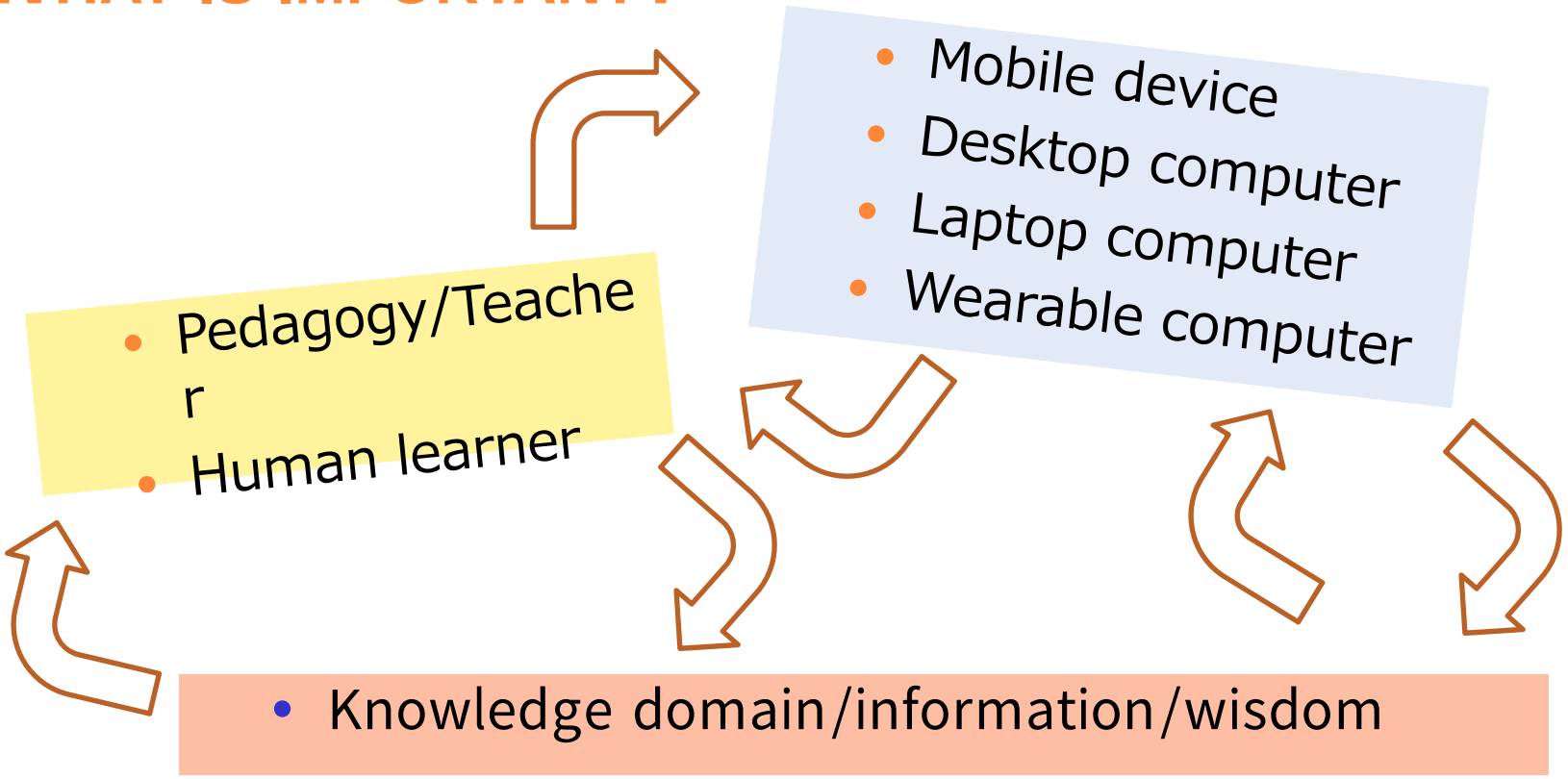
- What is a good teacher like?
- How do you learn from a person or from an object?
  - What's occurring when you are watching a teacher (or a teaching object)? What's your brain doing?
  - How do good teachers interact with your brain?
- Must we wait for a 'teachable moment' or can one be created by the teacher (teaching object)?
  - Sport coaches constantly create teachable moments every second during a contest! Teachers can also do this.

What is important?

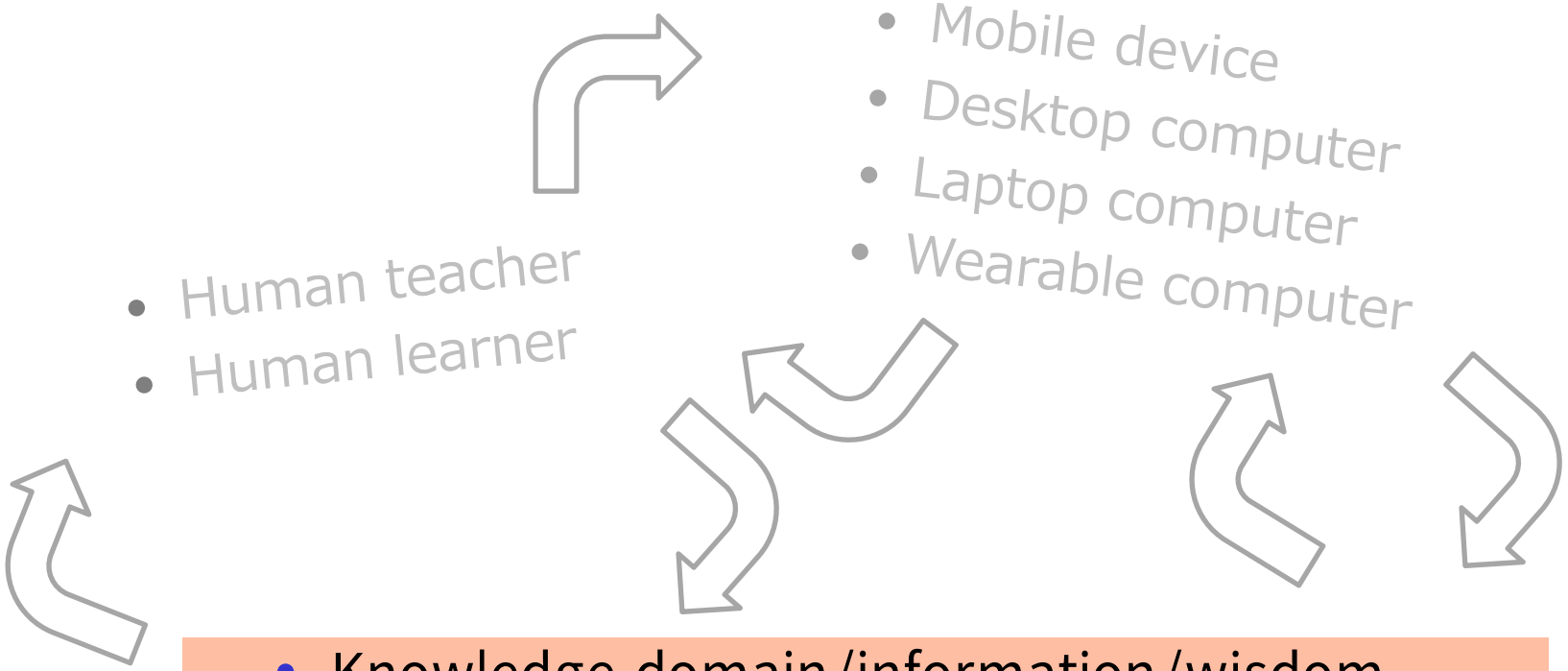
Rank order these items:

- Mobile device
- Desktop computer
- Laptop computer
- Wearable computer
- Human teacher
- Human learner
- Knowledge/information/wisdom/*education*

What is important?



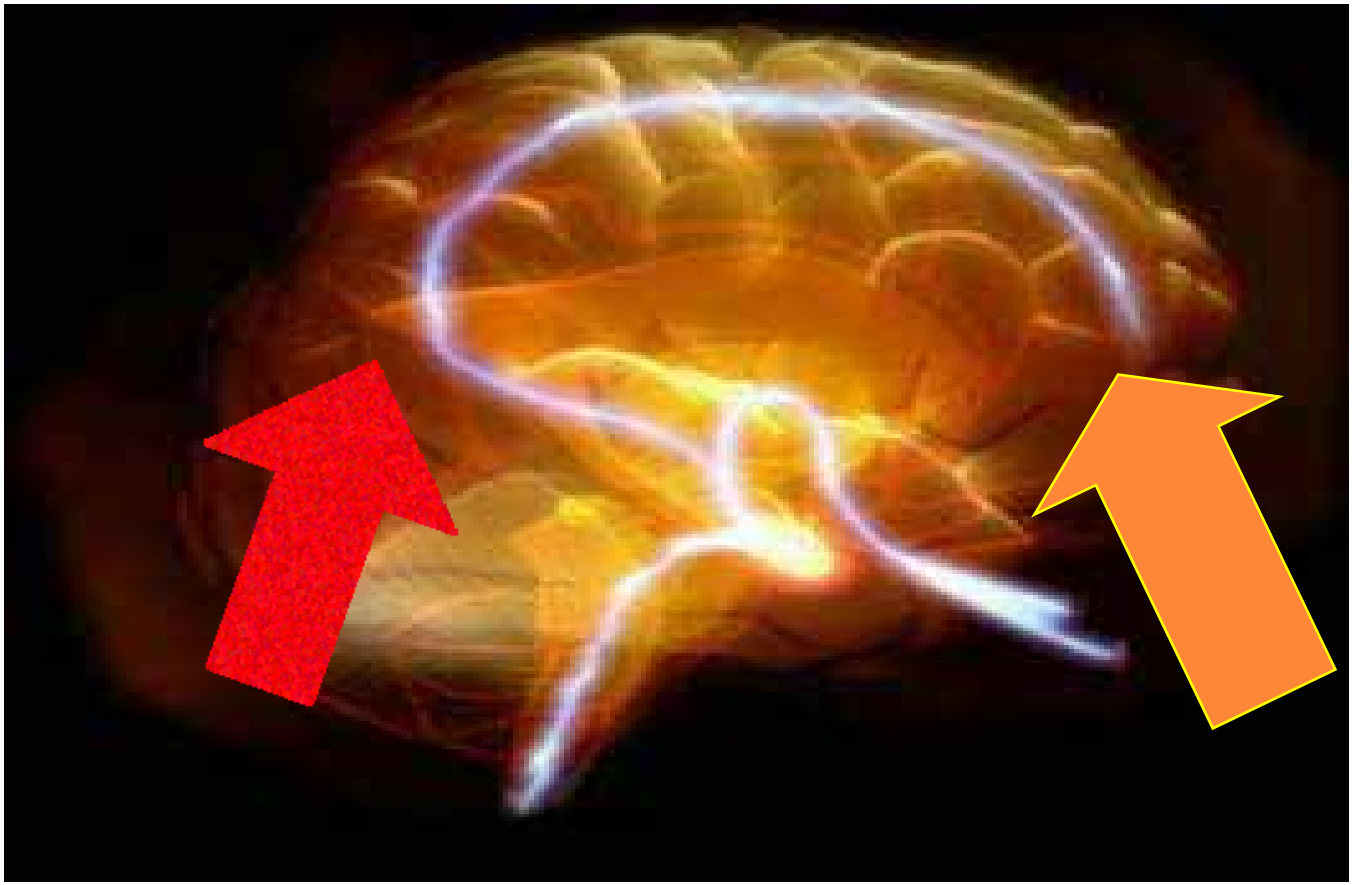
What is important?



- Knowledge domain/information/wisdom

content is king

Brain Shifting Moment



A Meta Thought

- Engage various parts of your brain
  - This is what teachers do (address the brain)

There were two people fishing…

A Meta Thought

There were two people fishing…

- Symptom was identified as problem
- Cure the problem in addition to dealing w/symptom(s)

My hypothesis

The impact of technology, which is ultimately about *education*, must be driven by how people process information, which involves understanding the underlying process, which is really the delivery of knowledge.

My beliefs

- Mobile computers will become what today's paper and pencil have become.
- Computing devices will be owned by the student not by the institution.
- Mobile computers will be smart devices…
  - They will 'see' you and interact with you
  - They will know if you understand what is being taught in the class

My Beliefs

Assessment is a two part question…

- Hardware people need to prove that their techno-gizmos are scalable by orders-of-magnitude, and that they are sustainable at cruising altitude on long flights.
- Software people need to develop their products the same way that educational textbook publishers develop their products.

Meta Abstract

Emerging technologies will be what they will be (e.g., nano technology, laser optics, small screen, mobile devices, low earth orbit satellites, etc.).

The new technology-based learning delivery methods will facilitate critical changes in educational structure and curriculum. And, the curriculum will **NEED TO** drive (be driven by) pedagogy (and not by the technology).

Meta Abstract (con't)

- THINKING is the next emerging technology
  - "…exist at baseboard level, with ceiling potential"
- STORY TELLING (Socratic Method) will also be an emerging skill for a professor

- **Education will focus/shift to act as though content areas are Model-based Knowledge Domains**

Elements of 'Learning'

- Knowledge
- Wisdom
- Intelligence
- Information
- Data
- Anecdote

Intelligence, Curiosity…

I’m not that much smarter than anyone else, I just stay with a problem longer.

– Albert Einstein

"Acquire knowledge,

it enables its professor to distinguish right from wrong…

it is our friend in the desert,

our company in solitude and companion when friendless…

it sustains us in misery, it is an ornament amongst friends…

armor against enemies."

– Prophet Mohammed (peace be upon him)

It's not so much about computers

The illiterate of the twenty-first century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

– *Alvin Toffler*

Content is king

"Acquire knowledge…"

Over the past 10 years and over the previous century, we have seen mega change in, for example, transportation, medicine, and, communications!

What change(s) has there been in Education, in teaching pedagogy in the past 10 years, in the previous century?

Knowledge

Learners must understand the process

Curiosity ⇨ Deep learning ⇨ Recursion

- Knowledge:
  - What is it?
  - How do we acquire it?
  - What is its function?
  - **How can it effectively function?**

Bricolage

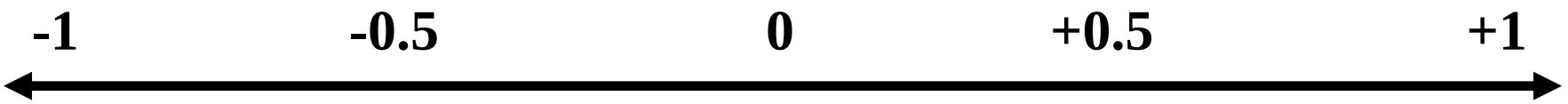
Learning Journey Analogy

Ordinary motion (Galileo)	Learning Journey
Time	Time
Distance	Knowledge (beliefs)
Velocity	Learning
Acceleration	Emotions

Emotions and Learning

- Learning is not a smooth journey
- Examples of relevant emotions (affective states of the learner)
  - Curiosity, Anxiety, Frustration, Bewilderment, Confusion, Dread, Disillusionment, Dispiritedness, Hopefulness, Satisfaction, Anguish, Confidence, Joy…

Emotion Axes



anxiety worry discomfort comfort hopeful confident

ennui boredom indifference interest curiosity fascination

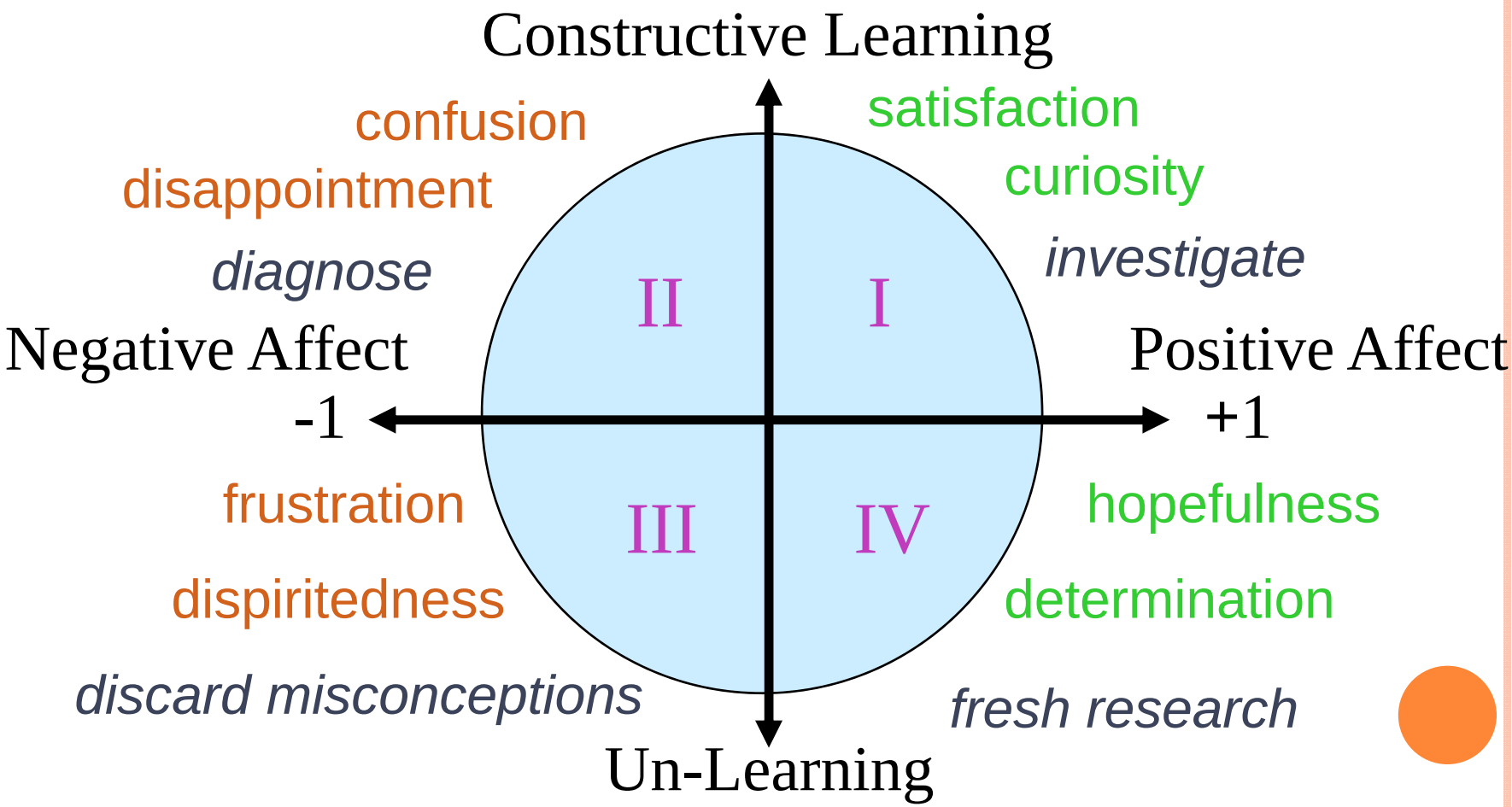
frustration confusion puzzlement insightful enlightened euphoric

dispirited disillusioned dissatisfied wistful hopeful encouraged

terror dread apprehension calm enchanted enthralled awe

humiliation embarrassed chagrin content pleased prideful

Emotions and Learning Cycle

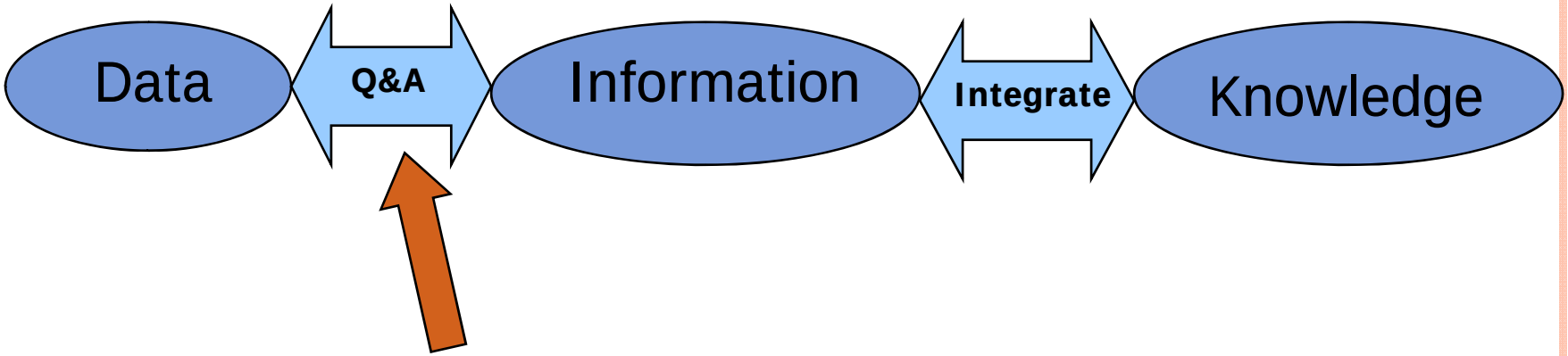


Knowledge Domains

- **Rule-based** (*e.g.*, language)
  - learn the rule, you have the knowledge
- **Model-based** (*e.g.*, sciences)
  - recursion, deep learning, understand the model and be able to apply it

Rule-based Learning

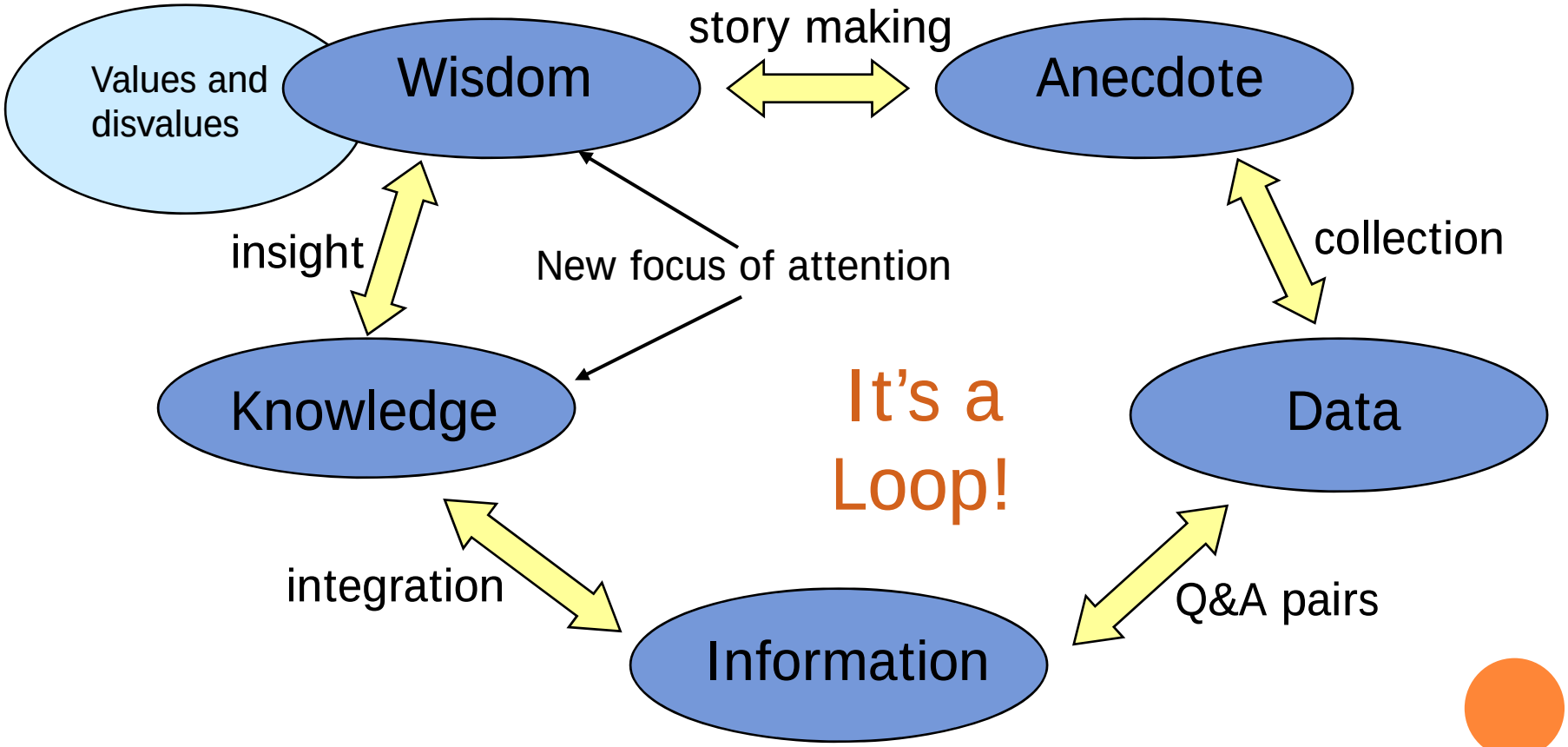
a set of facts



Focus of modern day educational pedagogy

Model-based Learning

a set of theories with underlying models



In conclusion…

The illiterate of the twenty-first century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

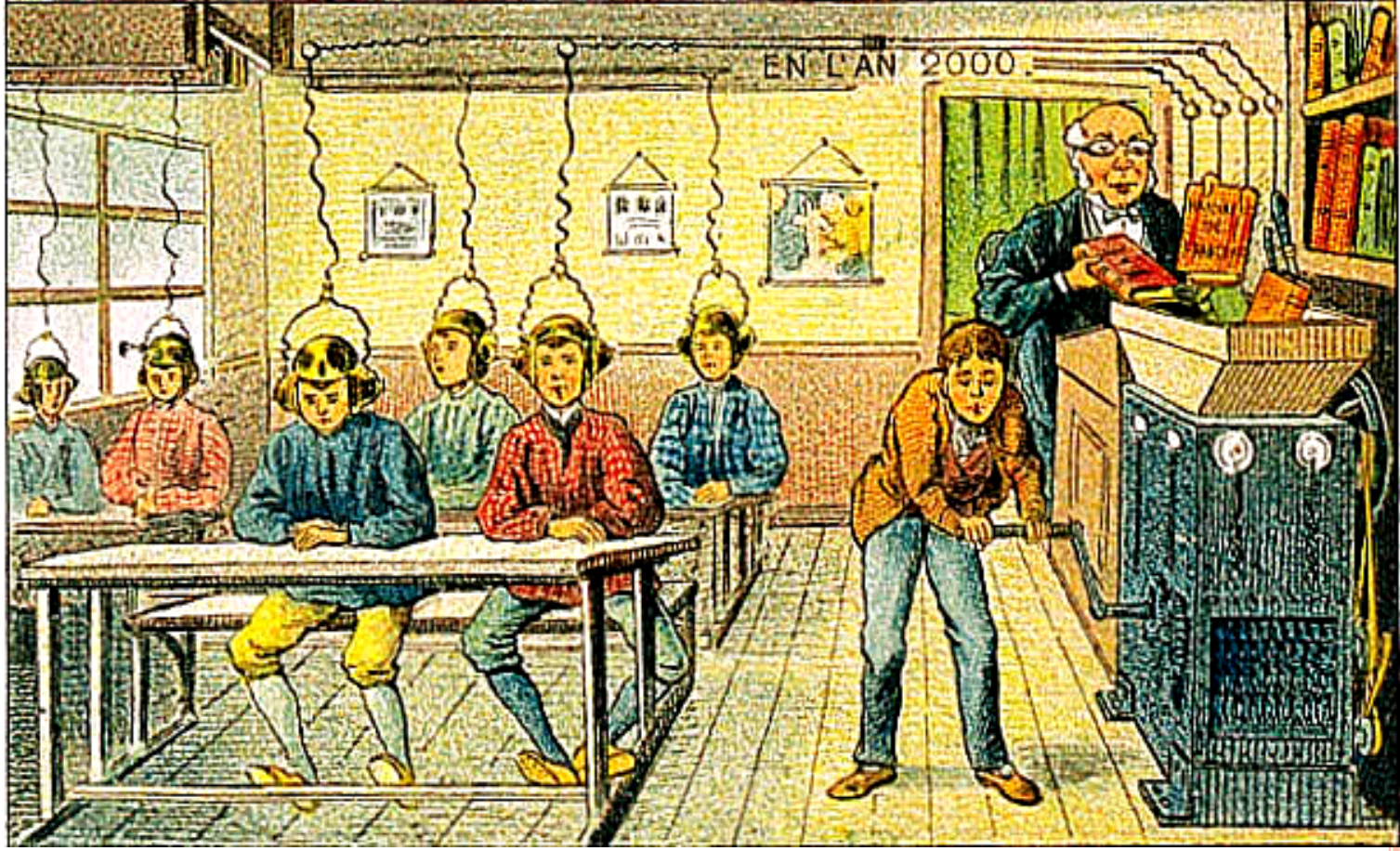
– *Alvin Toffler*

- Focus/shift to view content area as a Model-based Knowledge Domain
- The new delivery methods will facilitate critical changes in educational structure and curriculum.

In conclusion…

Regardless of what technological device a learner is using, that device, including the human device, will need to have a solid grounding in educational pedagogy.

As it impacts pedagogy, we talk about the ‘new stuff’, but we have never operationalize the ‘old stuff’…



Thank you…

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