

# What Science of Learning?

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with  
Professor Guy Claxton  
University of Bristol UK

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**Some definitions and  
misconceptions**

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## Sciences of learning - plural

- Neuroscience
- Affective neuroscience
- Social neuroscience
- Sociocultural psychology
- Cognitive anthropology
- Developmental psychology
- Embodied cognition
- Evolutionary psychology
- Information processing psychology
- Instructional psychology

**There's no such thing as THE science of learning**

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## Sciences of learnings

- Skill development
- Perceptual learning
- Learning to learn
- Developing attitudes, values and interests
- Identity development
- Information retention and retrieval
- Deep understanding
- Apprenticeship
- Drama, Design Technology, PE
- School maths and science

**The sciences of learning range much more broadly than teaching maths and science for exams**

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## Science

- ▀ Scientia = Knowledge
- ▀ Knowledge and understanding about learning
- ▀ Comes in many forms
- ▀ Much wider than binary experimental contests
  - ▀ “Does A work better than B”?
  - ▀ Measured by school results

## Learning

- ▀ That which transforms experience into lasting changes to competence, character and comprehension
- ▀ “Memory” is the embodiment of learning
  - ▀ The way that experience leaves its mark
  - ▀ The brain is not a warehouse

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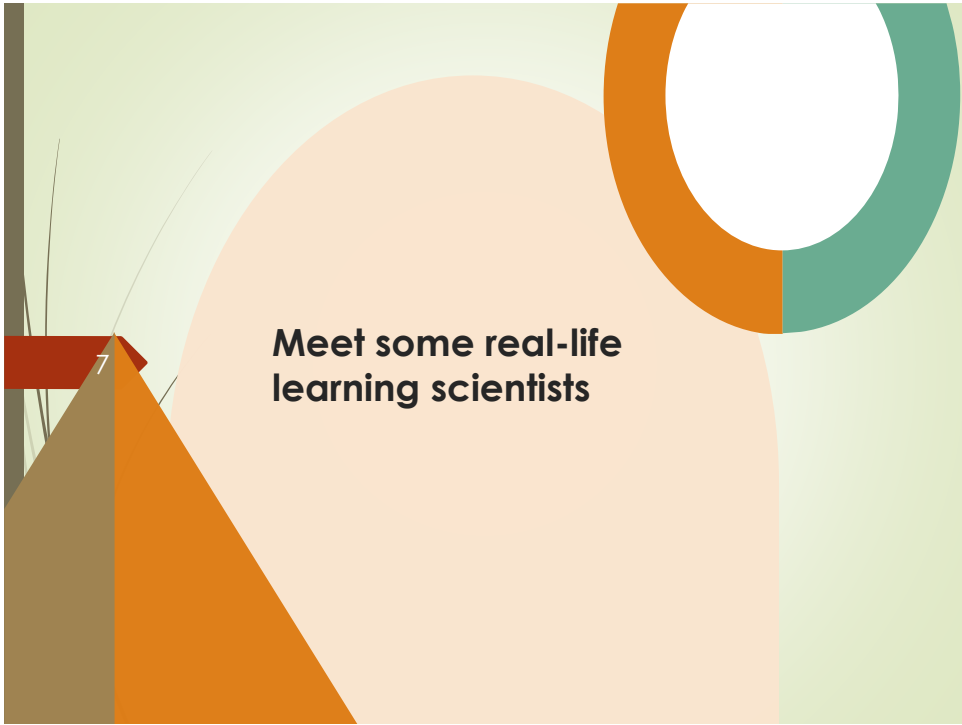
## Jean Piaget misunderstood



- ▀ “Genetic epistemology”
  - ▀ How rationality and scientific knowledge come into being
- ▀ New ‘knowledge’ emerges out of existing knowledge
- ▀ New ways of *knowing* emerge out of earlier ones
  - ▀ Sensorimotor, pre-ops, concrete ops, formal ops
- ▀ The earlier ones continue to function and develop
- ▀ The later ones continue to rely on the earlier ones
- ▀ **The later are not superior to the earlier**
- ▀ **The later do not supersede the earlier**

Presentation title

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## Meet some real-life learning scientists

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## Roger Schank

- Inventor of 'learning sciences'
- Professor at Yale
- Founder of first Institute for the Learning Sciences
- Co-founder, Journal of Cognitive Science



Roger Schank

Learning is about failure and recovery from failure.

Roger Schank

Learning happens when someone wants to learn, not when someone wants to teach.

Roger Schank

**ON LEARNABLE COGNITION AND AGENCY**

"A properly designed school system needs to focus on cognitive abilities, not scholarly subjects...If we allow students to choose what areas of knowledge they would like to focus on *while learning those skills*, they would be attentive and interested."

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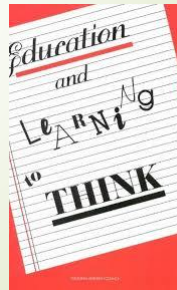
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# Lauren Resnick

- Director, U of Pittsburgh Learning and Development Research Center
- Past-president of AERA



**ON TRANSFER**  
 "As long as school focuses mainly on individual forms of competence, on tool-free performance, and on decontextualized skills, educating people to be good learners in school settings alone may not be sufficient to help them become strong out-of-school learners."



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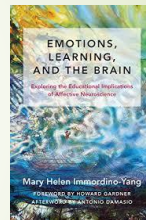
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# Mary Helen Immordino-Yang

Professor of Psychology, Education and Neuroscience, University of Southern California



**ON RELEVANCE**  
 "It's fairly obvious that there is a fundamental mismatch between secondary education and the way kids learn. In school we want kids to start with the small building blocks, to learn the little pieces and start to put those together. But that is not how the human mind grows. It grows by engaging with deep powerful ideas and then working backward to inform the meaning you are making...Supporting young people to engage with the complexities of their moral and social lives...is what is deeply, deeply motivating – and it is what grows their brains"



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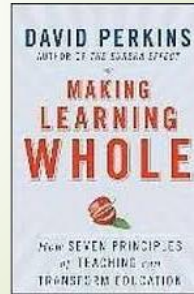
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# David Perkins

Professor Emeritus, Harvard Graduate School of Education  
Co-founder, Project Zero



**ON COLLABORATION**  
“Hardly anything we do is done solo. No matter whether you are an athlete, a business person, a scientist, a trash collector, or a clerk, you are almost always coordinating with other people in a complex way. Human endeavour is deeply and intrinsically collective – except in schools.”



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# Rethinking education – the right way

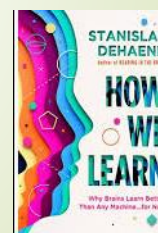
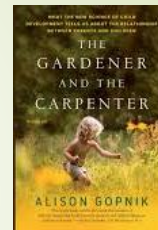
Presentator: MEd

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## Science of Learning 101

- 'Constructivism' is not an ideology founded on belief (like 'creationism')
- It is an empirically-based understanding of how and why human beings are built to learn (as secure as evolution)
  - We learn in order to **expand competence** and control
  - By attending to that which is **salient** and **surprising**
  - By generating manageable surprises by **exploring** and **inquiring**
  - By refining competence through **experimentation** and **play**
  - By **adjusting** and **adapting** that which is already known or mastered
- Knowledge and competence grow **organically**
- If they cannot be mastered organically learning is hard
- This should be avoided wherever possible through connection to **meaningful experiences** and **analogies**



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## How you teach depends on the desired outcomes of education

- To pass exams?
  - To select for university?
  - To mind children safely?
  - To perpetuate privilege?
  - To become economically active?
  - To prepare for a productive and fulfilling life?
- **There is no such thing as 'best practice': it depends on values**
  - **Science cannot tell you what to do**

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## The desirable outcomes of education

- ▀ What is it that all our young people are likely to need to...
  - ▀ Know: what knowledge is lifeworthy?
    - ▀ e.g. Chemical bonding vs. Anxiety and Depression
  - ▀ Be able to do: what literacies and expertise?
    - ▀ e.g. Essay writing vs. crap detection
  - ▀ Be like: what attitudes and habits?
    - ▀ e.g. Punctual vs. imaginative; Selfish vs. convivial

**Any system that is not actively and honestly asking itself these questions does not deserve our respect or assent**

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## Attitudes, skills and knowledge

$K_{SA}$  or  $A_{SK}$  ?

The difference between 20<sup>th</sup> and 21<sup>st</sup> century schools

In the latter, concern with cultivating the As is infused into everything the school is and does

- not tacked on as games, trips and PSHE
- it needs a complex pedagogy

**Attitudes are better predictors of real life outcomes than grades.**

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## Explanation / exploration

- ▀ Didactic teaching is good for relatively short-term retention of relatively superficial knowledge to be demonstrated on traditional examinations –especially for science and maths
  - ▀ Exploration can be safely sacrificed for efficiency
- ▀ If you value the cultivation of resilience, curiosity, independence, self-reliance, high-quality collaboration, and critical thinking, then **DT is not the pedagogy of choice**
  - ▀ Exploration has to play a major role in a more complex and fluid mix of teaching methods
- ▀ It's up to you!

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## What would it look, sound and feel like if you were teaching...

- ▀ Science with Self-Evaluation in mind?
- ▀ History with Empathy in mind?
- ▀ Writing with Imagination in mind?

**That's the question!**

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