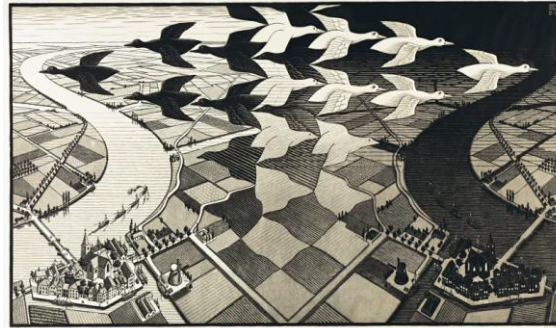
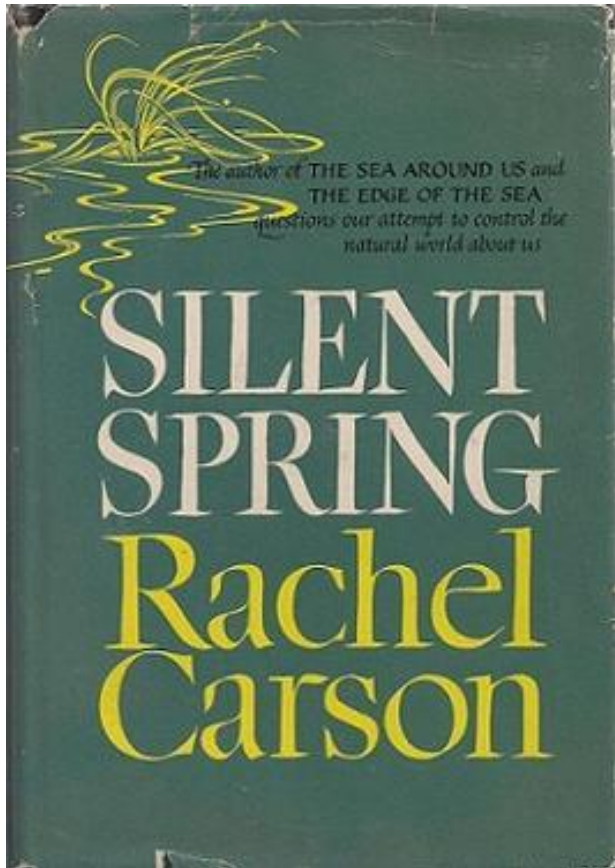


# ON THE DYNAMICS OF LEARNING. AN INTEGRATIVE APPROACH



Christian Kraler  
Department for Teacher Education and School Research  
University of Innsbruck

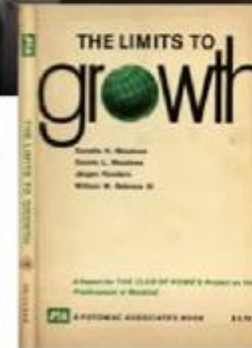
# Intro



1962



In March 1972, a report by a group of young scientists at the Massachusetts Institute of Technology (MIT) commissioned by Aurelio Peccei, founder of The Club of Rome, shook the world. Today, 50 years after its publication, "The Limits to Growth" is considered one of the most important and controversial environmental books of all time and it continues to influence conversations around sustainability and our continued existence on this finite planet. Below is the story behind this ground-breaking publication.



<https://www.library.dartmouth.edu/digital/digital-collections/limits-growth>

# Intro: do we learn ... ?



Klimawandel

United Nations • Der Begriff „Klimawandel“ bezeichnet langfristige Temperatur- und Wetterveränderungen, die hauptsächlich durch menschliche Aktivitäten verursacht sind, insbesondere durch die Verbrennung fossiler Brennstoffe.

Carl Sagan testifying before Congress in 1985 on climate change

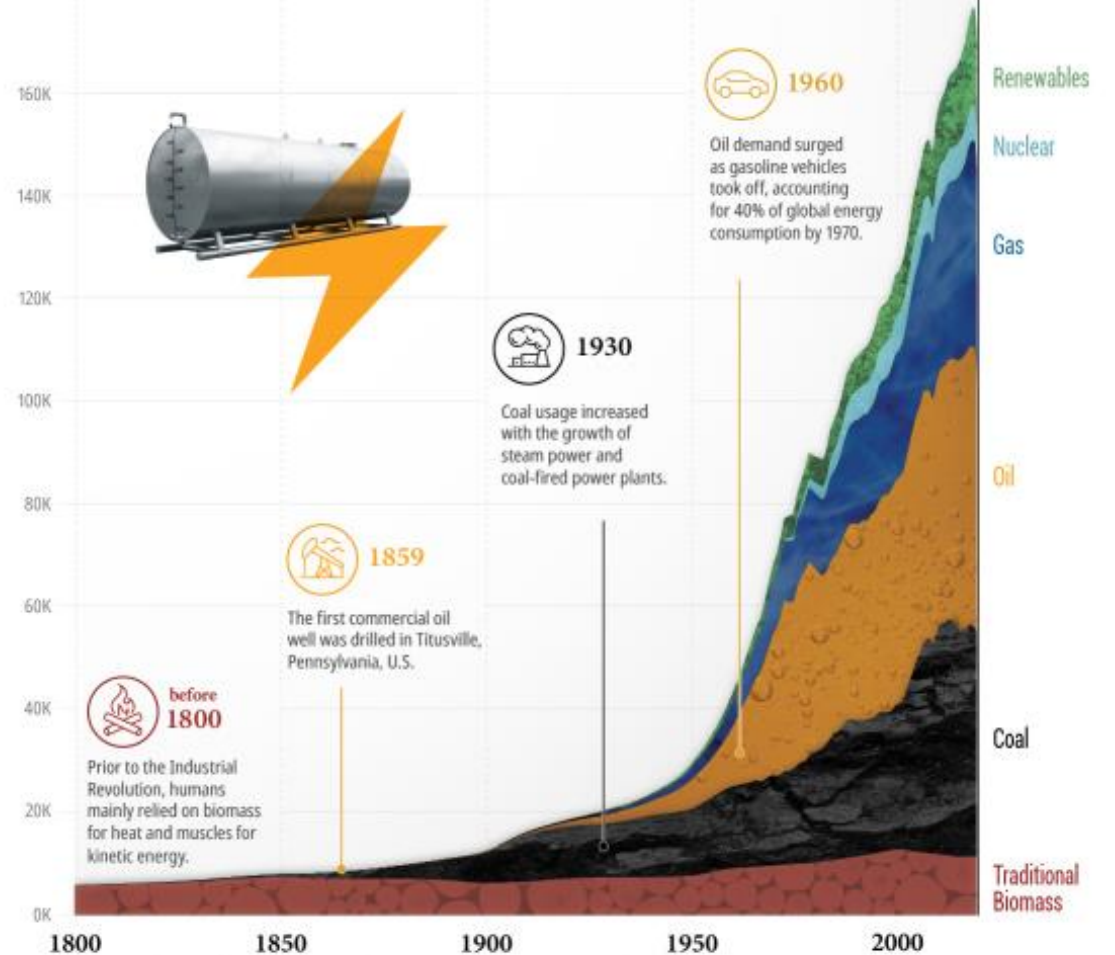
<https://www.youtube.com/watch?v=Wp-WiNXH6hI>

The economic and technological advances over the last 200 years have transformed how we produce and consume energy.

Here's how the global energy mix has evolved since 1800.

Global Primary Energy Consumption by Source 1800-2020

180K Terrawatt-hours (TWh)



Source: Vaclav Smil (2017), BP Statistical Review of World Energy via Our World in Data

<https://www.weforum.org/stories/2022/04/visualizing-the-history-of-energy-transitions/>

# Question?

What is learning?  
Why do we learn?  
When do we learn?

From an individual point of view ...  
From a societal (group) point of view ...



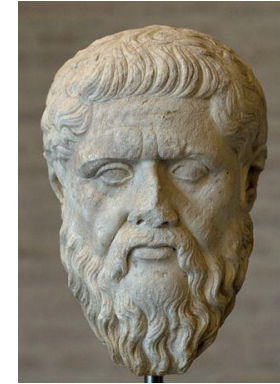
# Intro

What is learning?

Learning as recollection ...

Why:

- > immortality of the soul
- > soul gave and gives life
- > soul knows (=can see) “everything”  
    Process of birth -> loss of memory
- > Learning as recollection (Μένων)



Fundamental anthropological question ...

# Intro

Approaches from

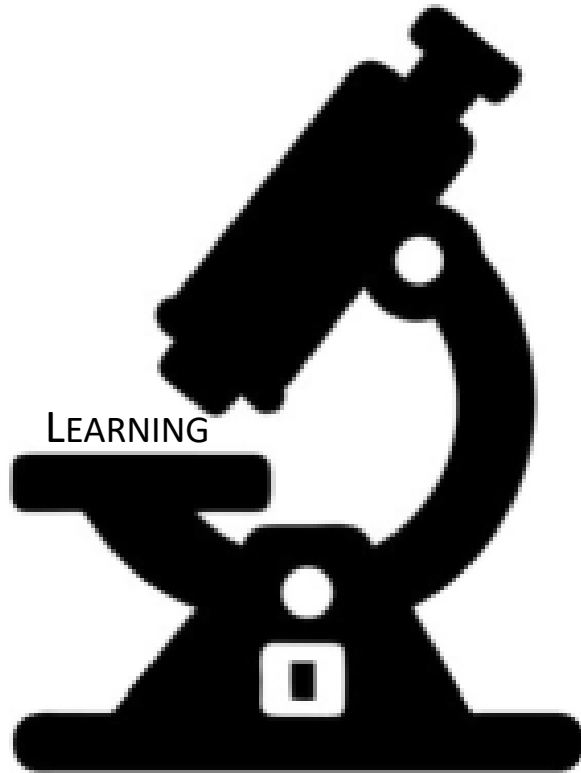
- Science (Philosophy, Psychology, Pedagogy, Sociology, Engineering...)
- Politics
- Economy
- Technology
- Religion/Faith groups
- ...



Learning:

CHANGE -> directed change -> permanent change -> (sustainable) development  
+ CONTEXT (INTER-ACTION)

# Context



Learning Theories in  
the 20<sup>th</sup> Century ...

# Context

## Research Perspectives on Learning in the 20<sup>th</sup> Century

### External Perspective

~1910 – 1950: *Behaviorismus*

Pawlow, Watson (Stimulus-Response Model)

Skinner (Reinforcement)

~1945 – 1980: *Cybernetics/Information-Theory*

Norbert Wiener (Information Processing)

G. Bateson, P. Watzlawick (Mental Research)

~1960-1985: *Cognitivism*

Noam Chomskys, Albert Bandura, Jean Piaget

~1975 – 2000: *(Radical) Constructivism*

Glaserfeld, Foerster, Paul Watzlawick

~1990 – today: *Social/Interacionism, Constructivism*

Gergen, Reich, Arnold, Siebert

~ 1995 – today: *Social, Critical & Subject-oriented approaches*

Meyer-Drawe, Holzkamp, Illeris, Jarvis,...

### Internal Perspective



# Context

Subject-Orientation

~ 1995

Individualization, Personalization  
Pluralization

Constructivism

~ 1980

Cognitivism

~ 1960

Computer as "problem solver",  
first networks

Cybernetics  
Information-Theory

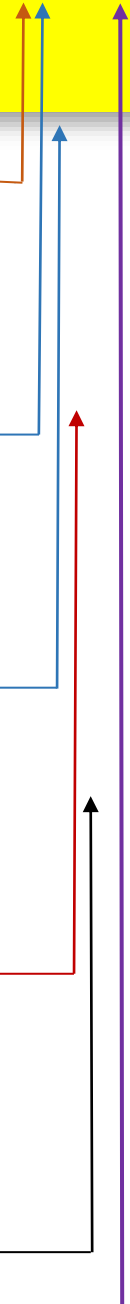
~ 1940

World War II: Cryptography  
(Information decisive for war)

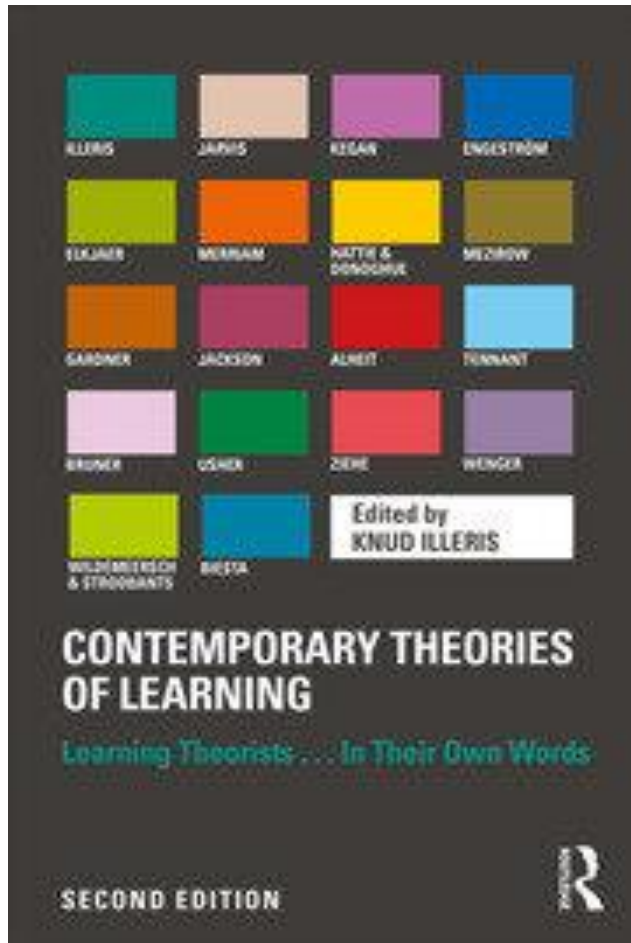
Behaviorism

1910

Belief in technology



# Context



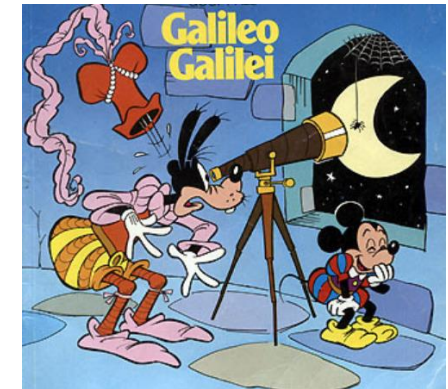
Today:

- Acceleration
- Virtualization
- Glocalization
- (Mis-)Information Age

-> theoretical pluralism

Learning Theories:

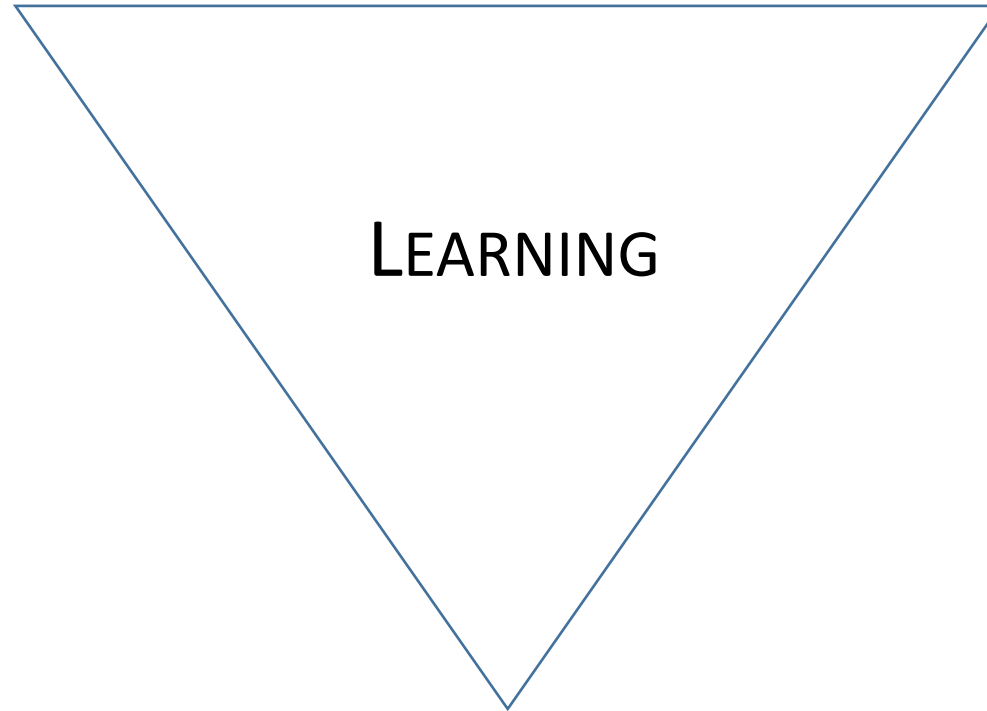
WE ARE AT THE EDGE OF SOMETHING “NEW”



# Context

Learning Models are embedded in and contextualized by societal (political, technological, economic) developments

The way how we look at/try to understand learning is shaped by its societal context

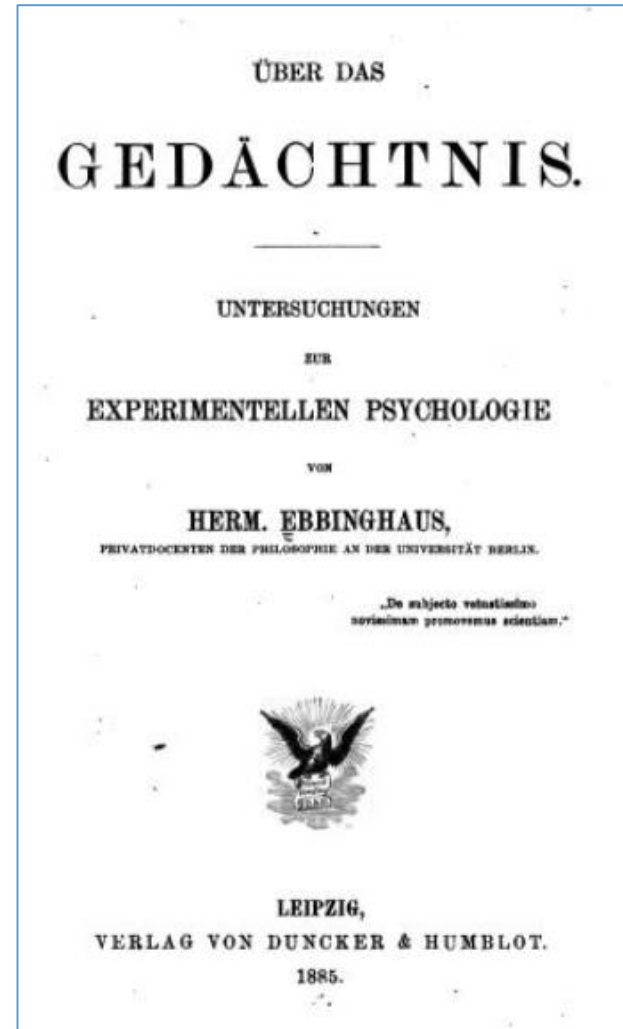


That has an effect on our anthropological image of humans

# Change & Development

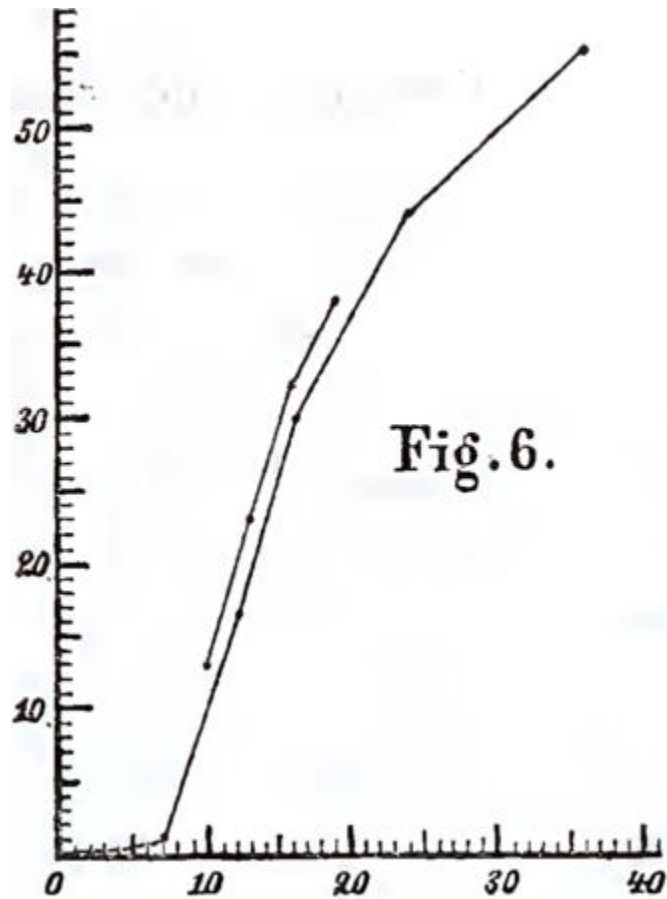


Hermann Ebbinghaus (1850-1909)

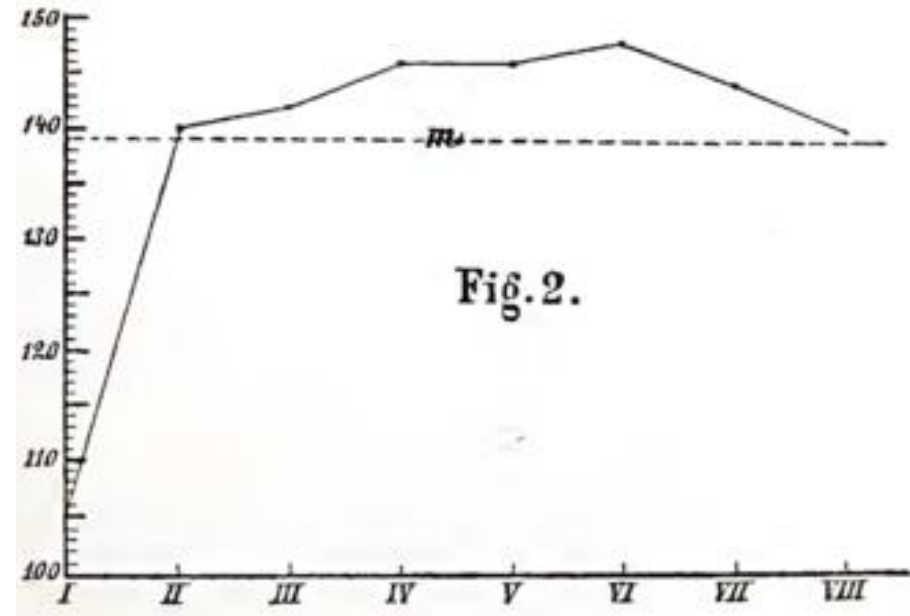


Ebbinghaus, H. (1885). Memory: A contribution to experimental psychology. New York: Dover.

# Change & Development



Learning curve



Learning plateau

# Change & Development

Milstein, M. (1990). *Plateauing: A growing problem for educators and educational organizations*. Teaching & Teacher Education. Vol. 6, No. 2. pp. 173-181. 1990

Farrell, Th. (2014). *'I feel like I've plateaued professionally ... gone a little stale': mid-career reflections in a teacher discussion group*. Reflective Practice, 15:4, 504-517

Zwart, F.S., Vissers, C., Kessels, R. & Maes, J. (2019). *Procedural learning across the lifespan: A systematic review with implications for atypical development*. Journal of Neuro-psychology (2019), 13, 149–182©2017 The British Psychological Society

Howard, R. W. (2020). *Mapping the outer reaches of the learning curve: Complex intellectual skill performance after decades of extensive practice*. Acta Psychologica. Volume 209, September 2020, 103135

Shin, S., Mercer, S., Babic, S., Sulis, G., Mairitsch, A., King, J. & Jin, J. (2021). *Riding the happiness curve: the wellbeing of mid-career phase language teachers*. The Language Learning Journal, DOI: 10.1080/09571736.2021.1979632

Gray, W.D., Banerjee, S. (2021). *Constructing Expertise: Surmounting Performance Plateaus by Tasks, by Tools, and by Techniques*. Topics in Cognitive Science 13 (2021) 610–665© 2021 Cognitive Science Society LLCISSN: 1756-8765 onlineDOI: 10.1111/tops.12575

Fields: Sports, Music, Language Acquisition, Mathematics, ..., Modelling, ...

# Change & Development

Rahman, R., Gray, W.D. (2020). *SpotLight on Dynamics of Individual Learning*. Topics in Cognitive Science 12 (2020) 975–991

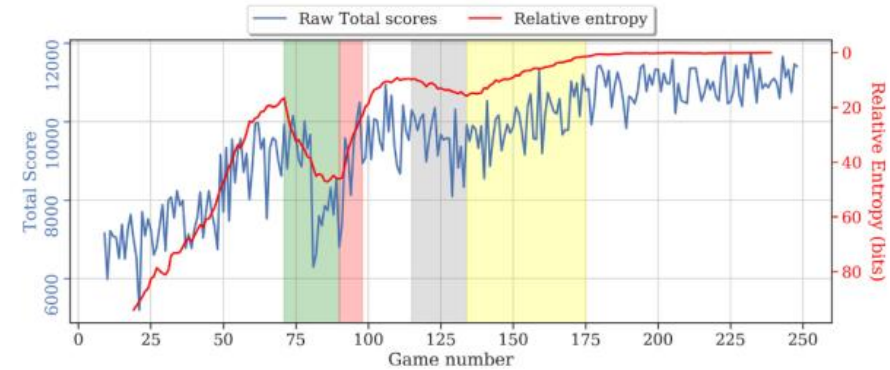


Fig. 2. Performance of our best player, Player 7, through Total score and its relative entropy curve. Green and gray regions denote two dip periods; red and yellow regions show the two leaps that follow the dips.

Gray, W.D., Lindstedt, J.K (2017). *Plateaus, Dips, and Leaps: Where to Look for Inventions and Discoveries During Skilled Performance*. Cognitive Science 41 (2017) 1838–1870

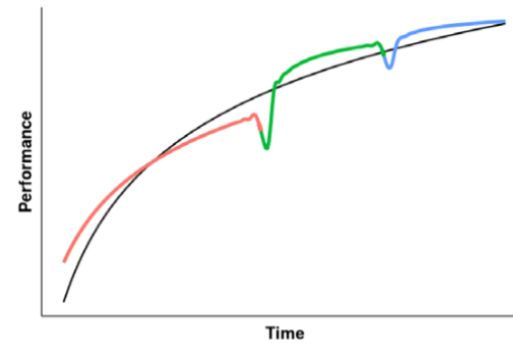
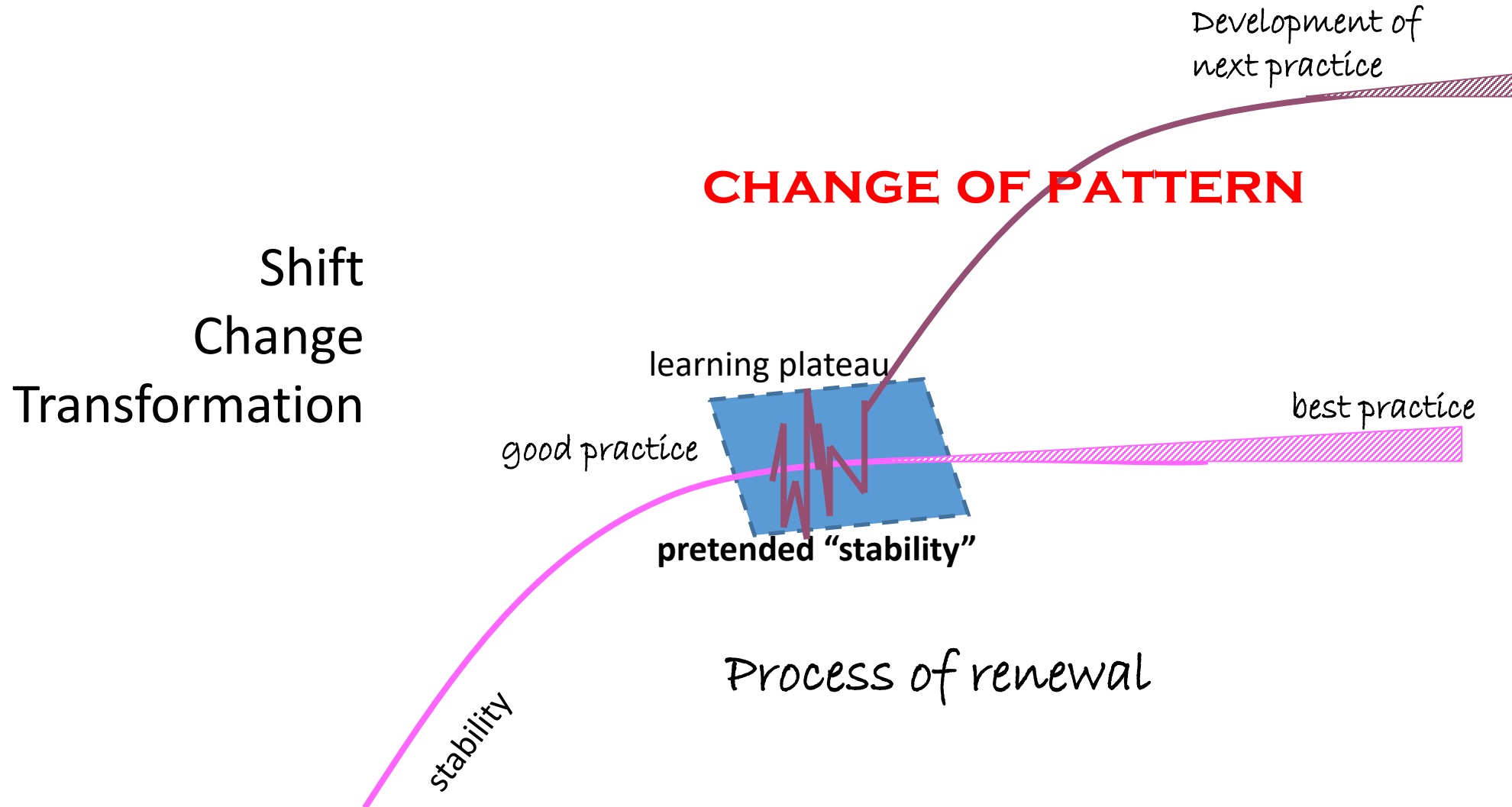


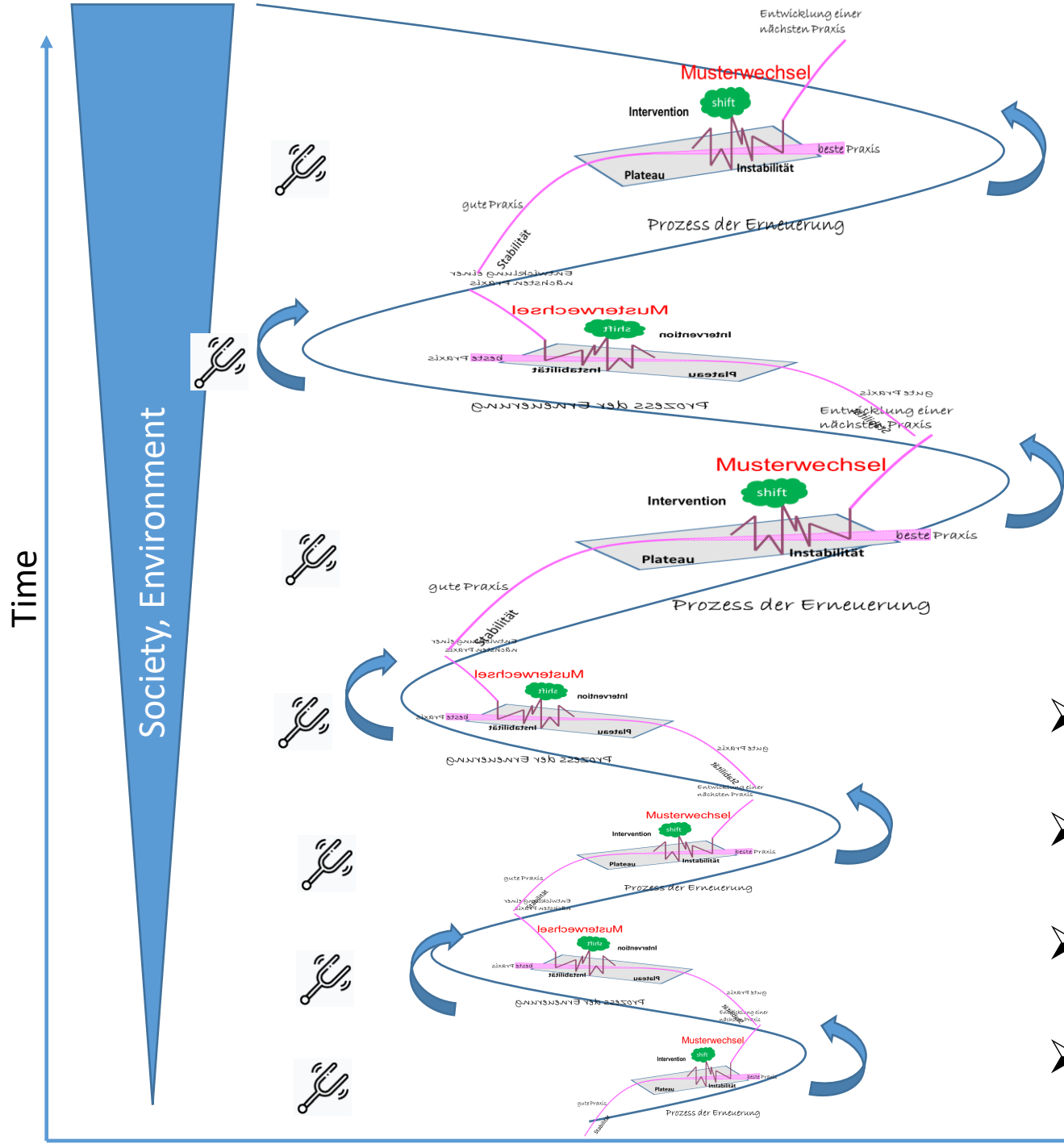
Fig. 4. Notional plot of a succession of three performance curves separated by dips and leaps.

# Change & Development





# Change & Development



- Resonating, conical Spiral-Modell (cf. Bruner, 1960)
- Stage Model (cf. Whitehead 1929, Havighurst, 1972)
- Individual, collective, organizational, societal
- interdisciplinary Content