


3 Lerntheorien

- 3.1 Lernen
- 3.2 Behaviorismus
- 3.3 Kognitivismus
- 3.4 Konstruktivismus 
- 3.5 Lernen als sozialer Prozess

Literatur:

A. Holzinger: Basiswissen Multimedia Band 2, p. 146-163

<http://arbeitsblaetter.stangl-taller.at/LERNEN/LerntheorienKonstruktive.shtml>

<http://www.univie.ac.at/constructivism/>

Wie wirklich ist die Wirklichkeit?

- Paul Watzlawick, 1978
 - „... , dass es genauso unmöglich ist, einen Ereignisablauf nicht zu interpunktieren wie eine vollkommen regellose Zahlenreihe herzustellen. In beiden Fällen tauchen Regeln und Gesetzmäßigkeiten auf, und besonders in zwischenmenschlichen Beziehungen verringert jeder Austausch von Verhalten die Zahl der bis dahin offenen Möglichkeiten.“
- „Interpunktion“ = die Bildung von Untereinheiten in einem endlosen Fluß
 - Soziale Kommunikation erzeugt rekursive Aussagengeflechte. ‚Es ist unmöglich, nicht zu kommunizieren.‘ Auch Ausbleiben von Kommunikation ist ebenfalls eine Form der Kommunikation!
 - Die Aussage ‚Diese Aussage ist falsch.‘ kann man auf zwei verschiedene Arten interpunktieren: 1. ‚Die Aussage ist richtig, denn wäre sie falsch, müsste sie ebenfalls richtig sein.‘ 2. ‚Die Aussage ist falsch, denn selbst wenn sie richtig wäre, wäre sie falsch.‘
 - Beispiel des (zweistufig rekursiven) Dialogs eines Ehepaars:
`Ich meide Dich, weil Du nörgelst!' - 'Ich nörgle, weil Du mich meidest!'

Subjectively Different Interpretations



Constructivism

- In **education**, *constructivism* is a learning theory which holds that knowledge is not transmitted unchanged from teacher to student, but instead that learning is an active process of recreating knowledge. Constructivists teach techniques that place emphasis on the role of learning activities in a good curriculum.
- In **philosophy**, *constructivism* is a view that reality, or at least our knowledge of it, is a value-laden subjective construction rather than a passive acquisition of objective features.
- In **mathematics**, *constructivism* rejects any mathematical existence proof that fails to "construct" the object whose existence is asserted.

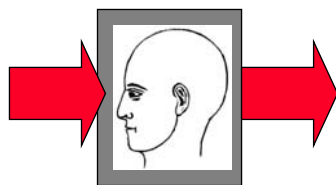
Radical Constructivism

Radical Constructivism - 'What is radical constructivism? It is an unconventional approach to the problem of knowledge and knowing. It starts from the assumption that knowledge, no matter how it is defined, is in the heads of persons, and that the thinking subject has no alternative but to construct what he or she knows on the basis of his or her own experience. What we make of experience constitutes the only world we consciously live in. It can be sorted into many kinds, such as things, self, others, and so on. But all kinds of experience are essentially subjective, and though I may find reasons to believe that my experience may not be unlike yours, I have no way of knowing that it is the same. The experience and interpretation of language are no exception.'

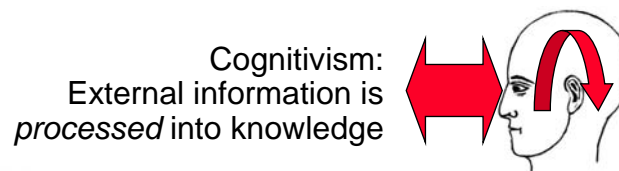
Ernst von Glasersfeld

Philosophical background (epistemology):
empiricism vs. rationalism
(extremes: representationism vs. solipsism)

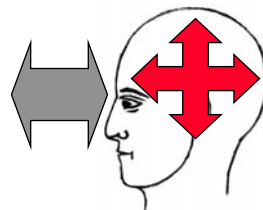
Behaviorism – Cognitivism – Constructivism



Behaviorism:
Input/output observation only,
Internal processing is irrelevant



Cognitivism:
External information is
processed into knowledge



Constructivism:
All knowledge is *constructed* internally,
The assimilation of external information is
dominated by internal constructions.

History of Constructivism

- Roots:
 - Giambattista Vico (1686 – 1744)
 - Immanuel Kant (1724 – 1804)
- Influence: Reformpädagogik
 - Maria Montessori (1870 – 1952)
(teacher as the „keeper of the environment“)
 - John Dewey (1859 – 1952)
(democratical, motivated learning)
- Cognitive constructivism
 - Jean Piaget (1896 – 1980)
- Radical constructivism
 - Humberto Maturana (1928 –) & Francisco Varela (1946 – 2001)
(human being as *autopoietic organisation, self-organized, structurally closed*)
 - Paul Watzlawick (1921 –) communication
 - Heinz von Förster (1911 –) cybernetics
 - Ernst von Glasersfeld (1917 –)

Man, having within himself an imagined World of lines and numbers, operates in it with abstractions, just as God, in the universe, did with reality.
G. Vico

Humberto Maturana

- „Jedes Tun ist Erkennen, und jedes Erkennen ist Tun.“
- „Alles Gesagte ist von Jemandem gesagt.“

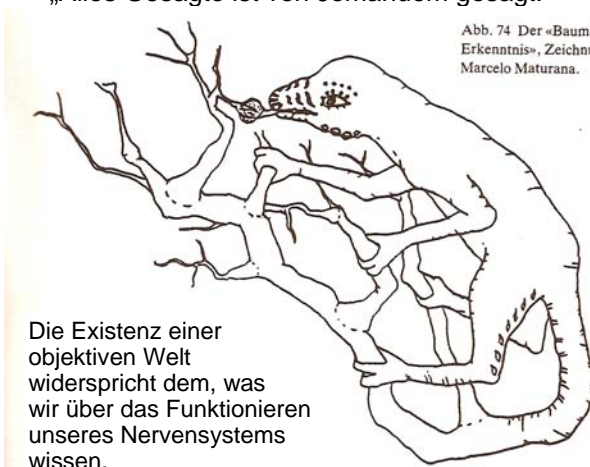


Abb. 74 Der «Baum der Erkenntnis», Zeichnung von Marcelo Maturana.

Die Existenz einer objektiven Welt widerspricht dem, was wir über das Funktionieren unseres Nervensystems wissen.

Die Nicht-Existenz einer objektiven Welt widerspricht der Existenz von Gesetzmäßigkeiten.

Wir bringen unsere Welt in Koexistenz mit anderen hervor.

„Der Baum der Erkenntnis“
Goldmann 1987

Paradigm of Constructivist Learning

- There is **no way to transfer knowledge** into a learning person.
- Learning is **active construction of knowledge** which can be performed only by the learner, and in a different way by each individual learner.
- Teachers can only assist the learner (coaching).

Support for Constructive Learning Processes

- Embedding into authentic situations (learning context)
 - Linked to the life context of the learner
- Learner must be able to change situations and compare alternatives
- Learner must be enabled to abstract general rules out of the concrete situation
- Transfer of strategies to new situations is important
- Intrinsic and extrinsic motivation:
 - (Remember the role of the Limbic system in the brain...)
 - Intrinsic: Positive attitude through pleasure
 - Extrinsic: External value, e.g. working for other people

Anchored Instruction

- Cognition and Technology Group at Vanderbilt (CTGV)
- *Anchor*
 - Specific task or problem (case study)
 - Motivating
 - Contains a general goal reachable via subgoals
- Multimedia presentation of anchor
 - Rich information source
 - Interactivity (stepwise presentation with intervening discussion/problem solving phases)
- Famous example
 - „The Adventures of Jasper Woodbury“
 - Video Disc series



John Bransford

Rescue at Boone's Meadow



Emily learns to fly an ultralight plane



Much information about various weights, speeds, money, prices and technical data

An eagle is shot and wounded



What is the quickest way to bring the eagle to Dr. Ramirez, the veterinarian?



<http://peabody.vanderbilt.edu/projects/funded/jasper/preview/rabm.html>

Cognitive Apprenticeship

- Apprenticeship = Lehre (im Sinne von Berufsausbildung)
 - Real-life situations
- Teacher explains expert-like strategies involved in a task
- Teacher designs *scaffolds* that encourage students to apply the strategies
- Students articulate their reasoning or methods to solve a problem
- Students are encouraged to reflect on and learn from others' approaches
- Teacher *fades* support as students apply their learning to personally relevant problems

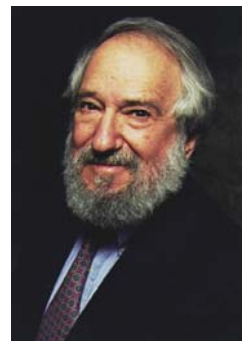


Only in the last century, and only in industrialized nations, has formal schooling emerged as a widespread method of educating the young. Before schools appeared, apprenticeship was the most common means of learning and was used to transmit the knowledge required for expert practice in fields from painting and sculpting to medicine and law.”

Collins/Brown/Newman 1990

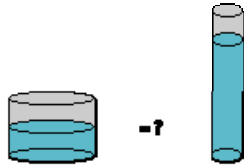
Seymour Papert & Logo

- Mathematician, scholar of Piaget
- Influenced Alan Kay
- Co-Founder of MIT AI Lab, member of Media Lab
- Most famous book: „Mindstorms“
- „Given my background as a mathematician and Piagetian psychologist, I naturally become most interested in the kinds of computational models that might lead me to better thinking about powerful development processes. [...] The kind of developmental questions I was interested in needed a dynamic model for how intellectual structures themselves could become into being and change.“
- Programming language „Logo“ targeted at children



Seymour Papert
(1928 –)

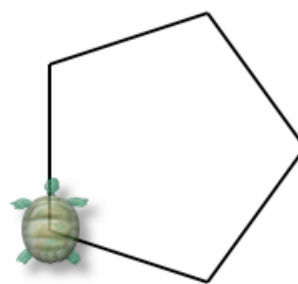
Liquid Conservation



Piaget:
Children up to the age of six/seven believe that the amount of liquid increases when poured into a taller container

- Papert's explanation:
 - „Height-agent“ judges everything by its vertical extent.
Practically successful: Comparing children, quantities of Coca-Cola
 - „Width-agent“ judges by horizontal extent. Little practical experience.
 - „History-agent“. Still unrelated with amounts.
 - Observation: Contradiction between height- and width-agents
 - Emergence of a „geometry-agent“ acting as a supervisor for the width- and height-agents. Compares the results of the other agents.
Germ for a mathematical concept but still rooted in experience.

Logo: Physical and Virtual Turtles



```
to polygon
repeat :sides
  [ forward :size
    right 360/:sides ]
polygon 5 100
```


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Literatur:

http://en.wikipedia.org/wiki/Asch_conformity_experiments

<http://www.mhhe.com/socscience/comm/bandur-s.mhtml>

Lev Vygotsky

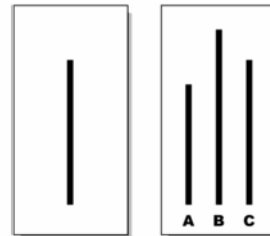
- "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals."
- Potential for cognitive development depends upon the "zone of proximal development. Full development of the ZPD depends upon full social interaction.



Lev Semyonovich
Vygotsky
(1896 – 1934)

Asch's Social Conformity Experiment

- Solomon Asch (1947 – 1996)
- Experiments in the 1950s
- Asch conformity experiment
 - Real subjects believe to be in a (boring) „vision test“
 - Task: which bar has the same size than a given bar?
 - Confederate participants have been instructed to give *incorrect* answers
- Results:
 - Subjects are discomforted
 - 33% conformed to the obviously wrong majority opinion!
- Related: Milgram experiment (1961)
 - Subjects believing to study „punishment effects“ apply 450 V electric shocks to other subjects



Albert Bandura

- Learning from models
 - By observing others
- Necessary conditions:
 - Attention
 - Remember
 - Ability to replicate
 - Motivation
- Modeling
 - Teaches new behaviors
 - Modifies the frequency of behaviors
 - May encourage previously forbidden behaviors
- Important issue:
 - Can violence be learned from the models on TV?



Albert Bandura
(1925 –)