Learning (part III)
Cognitive and Social Learning Theories

Stefan Bode, PhD

Melbourne School of Psychological Sciences,
Decision Neuroscience Laboratory
The University of Melbourne, Australia

sbode@unimelb.edu.au

Cognitive Learning

- Edward Tolman and some cool rats who learn how to navigate in a maze

Insight Learning

- Wolfgang Köhler and some intelligent monkeys who solve new puzzles

Social / Observational Learning

- Albert Bandura and some aggressive children who learn from aggressive adults

Basic Principles of Learning: Cognitive Learning

Some researchers thought in order to understand learning, we need to put the "mind" back into learning

- There are *internal cognitive processes*, even in non-human animals
- Organisms *interpret* the stimulus before they respond
- They are not a "black box", as the Behaviourists stated, but they actively perceive, anticipate, "think" about stimuli in the world
- These cognitive processes strongly contribute to learning

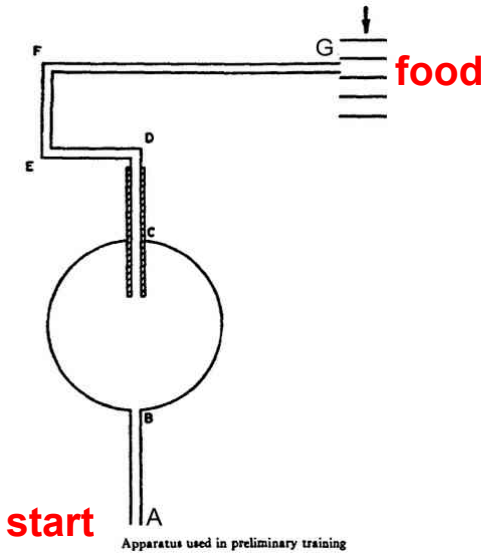
- An example for such a researcher is Edward Tolman (1989-1956): he believed cognitive processes play an important role in learning of complex behaviours
- It is harder to demonstrate cognitive processes, and one needs clever experimental techniques to show them

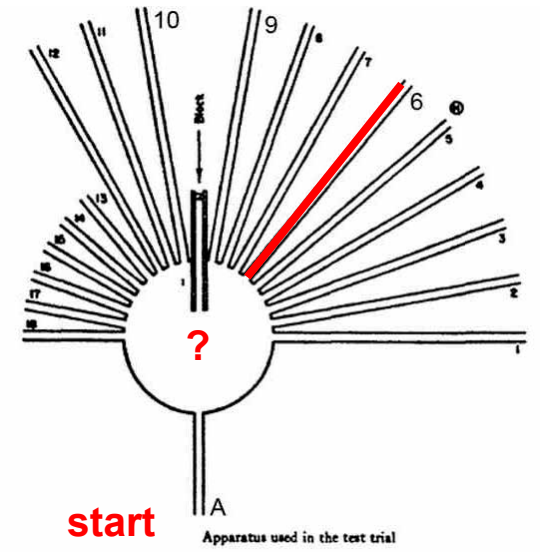
Basic Principles of Learning: Cognitive Learning

- Tolman studied the problem solving strategies of rats in mazes

- After several trials of running in the maze, the rat would learn to get the goal quickly and with few errors

- But what about when the original maze is suddenly replaced by a new one?



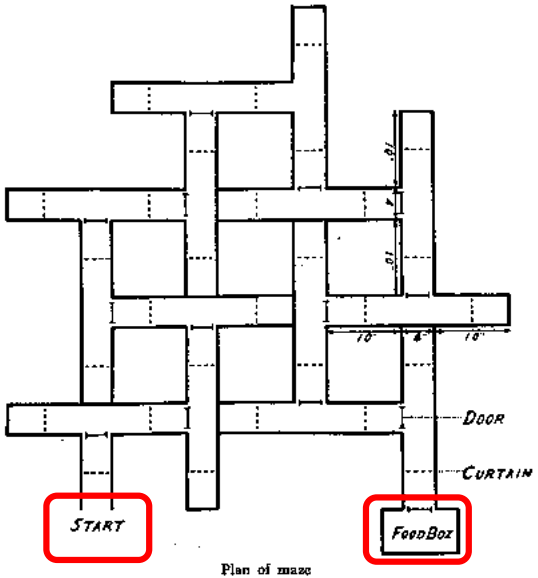


rats would try this one!
And it's a good idea, because that is the direction of where the food was before...

Basic Principles of Learning: Cognitive Learning

- In other mazes, rats can also learn *shortcuts* to the food

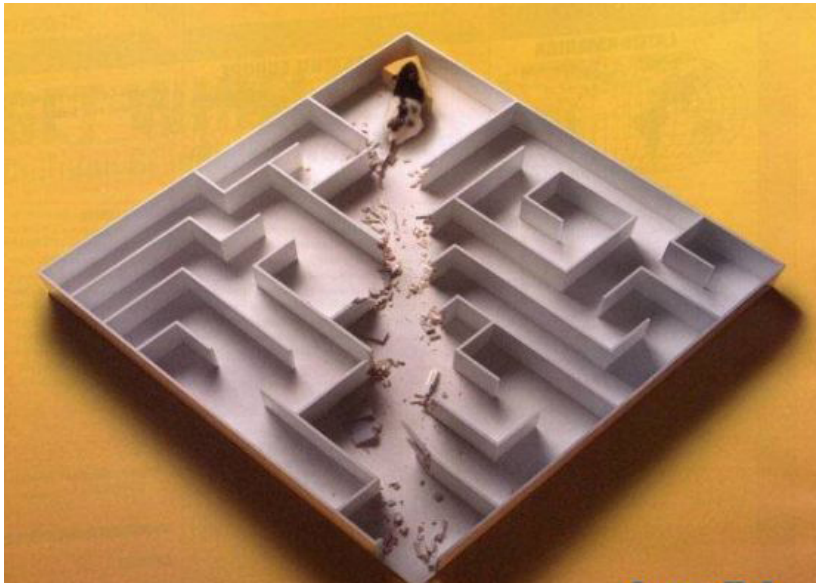
- Tolman suggested, that rats do not simply learn S-R associations, but they build *cognitive maps* of their environment



Plan of maze
14-Unit T-Alley Maze

FIG. 1

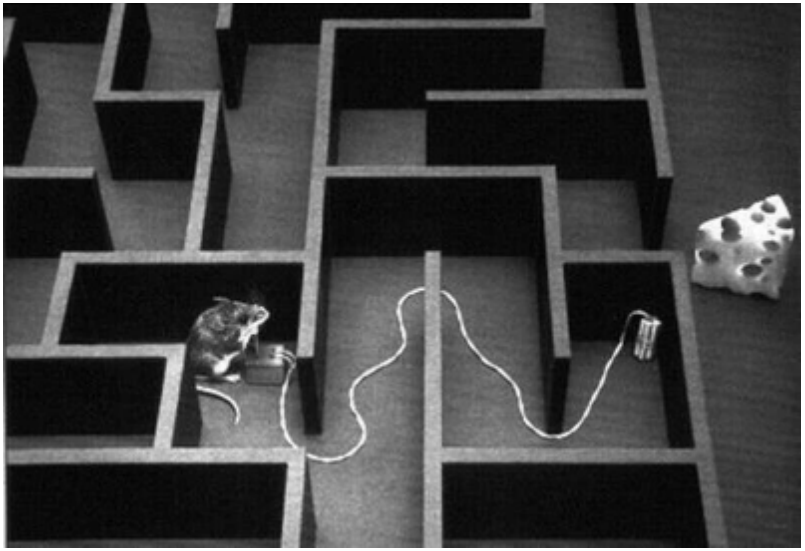
(From M. H. Elliott, The effect of change of reward on the maze performance of rats. *Univ. Calif. Publ. Psychol.*, 1928, 4, p. 20.)



Tolman et al., 1946, J Exp Psychol

Basic Principles of Learning: Cognitive Learning

- A cognitive map is a *mental representation* of a the spatial characteristics of a familiar environment, such as a maze
- This means, the rats could use their maps *to reason* about alternative routes to the goal



Tolman et al., 1946, J Exp Psychol; Image taken from CartoonStock.com

Basic Principles of Learning: Cognitive Learning

Learning also occurs in the *absence of rewards and punishments*

Experiment: three groups of rats in mazes.

Group A: always reinforced (food)

Group B: never reinforced (no food)

Group C: delayed reinforcement – first no food, then later suddenly food

According to Behaviourism, learning should only take place under conditions of reward

- *Group A* should learn fast

- *Group B* should not learn

- *Group C* should only start learning after reinforcement has started!

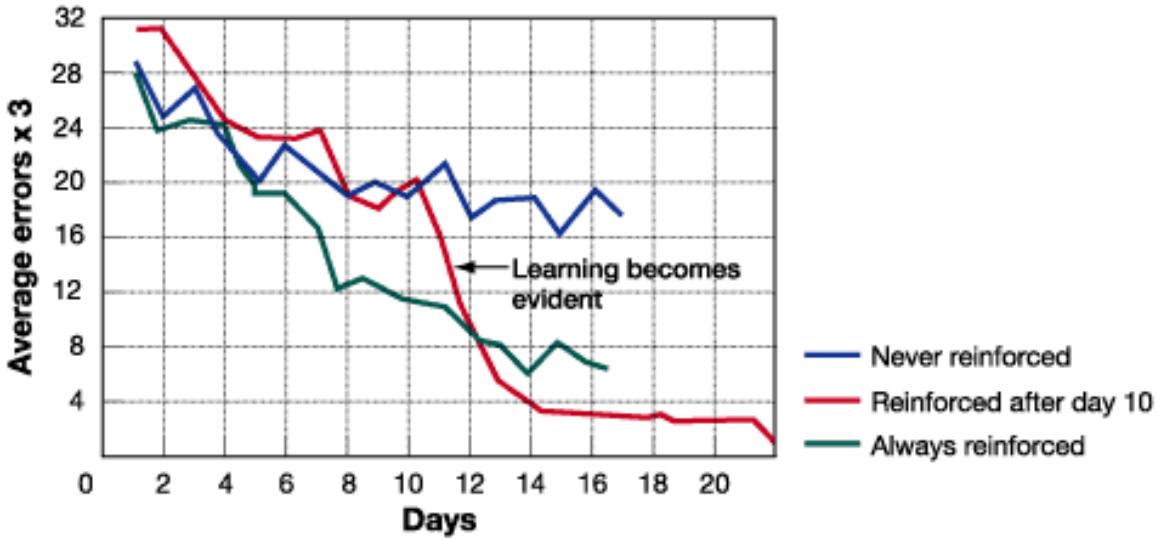
Tolman et al., 1946, J Exp Psychol

Basic Principles of Learning: Cognitive Learning

Results of the experiment:

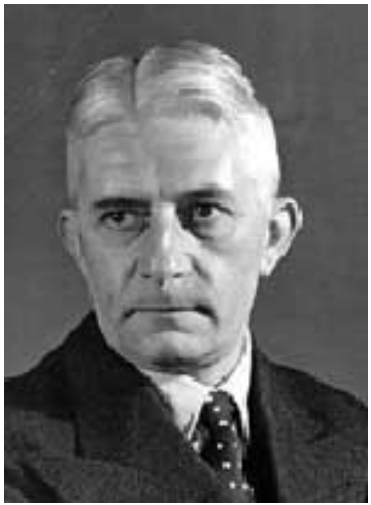
- *Group C* got better very quickly after onset of reinforcement

- The animals already learned the maze by exploring in the beginning – but they only *showed* their learning after they got the reward!



Tolman et al., 1946, J Exp Psychol

Basic Principles of Learning: Learning by “Insight”



Wolfgang Köhler (1887-1967)

- German Gestalt-psychologist, carried out a series of experiments with chimps during the first world war on Tenerife

- He was influenced by Darwin

- He was interested in problem solving in primates via “insight”

- The chimps got problems to solve, each of which involved obtaining food that was not directly accessible

Basic Principles of Learning: Learning by “Insight”

Sudden insight:

rapid learning as a result of understanding all the elements of the problem

- It often took an hour before the chimp obtained the solution
- The solution came with recognizing the “problem space”

Images from: wkprc.eva.mpg.de

Basic Principles of Learning: Learning by “Insight”

- This learning can also not be explained by Behaviourist models of learning
- Insight is – by definition – not based on previous reward / reinforcement

Images from: wkprc.eva.mpg.de

Basic Principles of Learning: Learning by "Insight"

https://www.youtube.com/watch?v=FwDhYUlbxiQ
(original experiments)

- Can only primates learn by insight and use tools?

https://www.youtube.com/watch?v=vU0RZFCrCfk&feature=related/
(Pigeons solving problems using insight learning)

- Do monkeys need to see the shape of tools, or is this an abstract cognitive process?

https://www.youtube.com/watch?v=fPz6uvIbWZE/
(Monkey is solving a puzzle)

Basic Principles of Learning: Social Learning

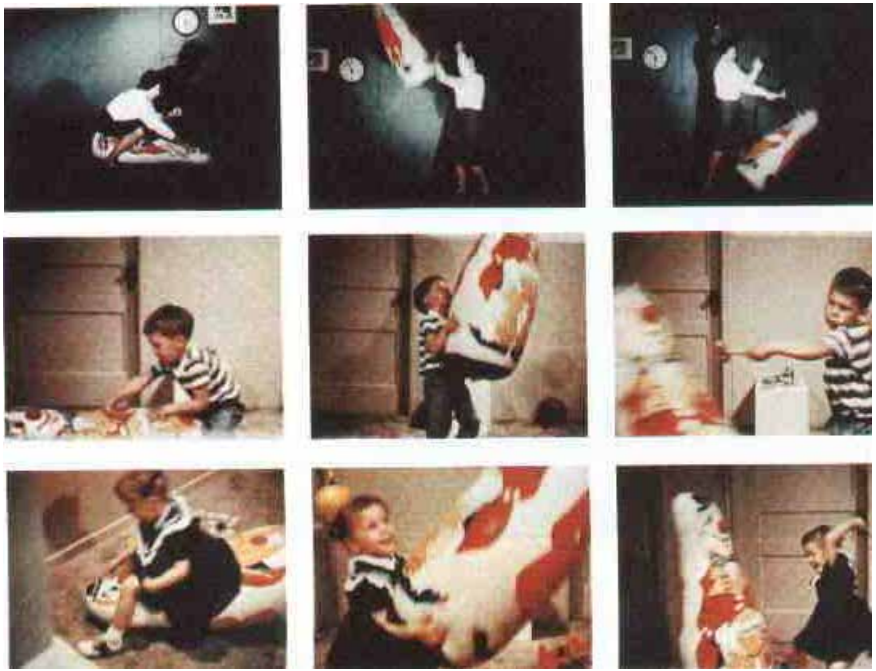
Albert Bandura

- He is known for his observational learning / social learning theory
- The theory states that learning takes place *"socially"* through *observing* others
- Observational learning is also called *vicarious learning* or *modeling*
- Observational learning takes place through active judgement and *constructive processes*, not just mechanical imitation
- *Role models* are important for social learning

Bandura, 1971, *The Nature of Reinforcement,* NY, Academic Press.

Basic Principles of Learning: Social Learning

Experiment: Imitation of aggressive behaviours in children (Bandura, 1965)



4-year-old children watched a short film showing an adult playing aggressively with a Bobo-doll

The adults in video were:

a) **reinforced**

b) **punished**

c) **nothing/no consequence**

Basic Principles of Learning: Social Learning

Experiment: Imitation of aggressive behaviours in children (Bandura, 1965)

- After the film each child played alone in a room with several toys, including a Bobo-doll

- The children imitated specific behaviour from the adults (verbal abuse, throw doll on floor, bash up with mallet) that they observed before

- Children who observed punishment were much less likely to display aggression towards the doll

- This demonstrates vicarious reinforcement and vicarious punishment (not experienced first hand)

http://www.youtube.com/watch?v=hHHdovKHDNU&feature=related/
(Albert Bandura explains his experiment)

Basic Principles of Learning: Social Learning

Experiment: Imitation of aggressive behaviours in children (Bandura, 1965)

- *All* children were capable of showing aggressive behaviour when asked

- The *expectation* for reinforcement affects the performance

- Direct reinforcement is not necessary for learning

- Social learning theory advances our understanding of how people learn by demonstrating that humans use their powers of observation and thought to interpret their experiences and those of others when deciding how to act

Summary

- Taken together, cognitive learning, insight learning and social/observational learning are all examples that learning is not restricted to the principles of Classical and Operant Conditioning

- Learning usually involves thinking, reasoning, and creating mental representations of our world. Not only humans, but different animal species, are capable of doing this

- However, this does not invalidate Classical / Operant Conditioning – these learning principles are well documented and very powerful explanations in many settings. They are just not the only contributors to successful learning...

If you want to know more:

Bandura, A. (1965). Influence of models' reinforcement contingencies on the acquisition of imitative responses. *Journal of Personality and Social Psychology, 1,* 589-595.

Bandura, A. (1971). Vicarious and self-reinforcement processes (Chapter 9), in: *The Nature of Reinforcement,* NY, Academic Press.