Learning and Problem Solving

Maria Wolters
University of Edinburgh
January 2015

Relevant Learning Outcomes

- Understand:
  - What happens when a person learns something
  - What makes something memorable
- Remember:
  - Types of learning: paths to long-term memory
  - Learning lists: primacy versus recency
  - Mental Models
- Apply:
  - Determine what people need to learn in order to interact with / use a technology
  - Investigate steps people take to solve problems with user interfaces

Problem Solving

In HCI context:

How can I get the system to do what I want it to do?

The Path To Goal

- Can I start working towards the goal?
- What current state is the system in, and how far is this from my goal?
- What can I use (safely) to reach my goal?
  - How on earth does that work?
  - How many steps do I need?
  - Did that do anything?
- Have I reached my goal?

The Complexities of Problem Solving

- User interface problems often interfere with real world problem solving (e.g., how to write a thesis)
- People can become fixated on a particular use of an object or a particular strategy
- How do people learn to use an interface?
  - Successful problem solving = learning

What is Learning?

- Declarative learning: new items are stored in episodic and semantic (long-term) memory
- Procedural learning: new skills are acquired

When Learning, You Need To

- Test yourself: Practice makes perfect
  - Practice does not mean repeat exposure
- Feedback: Check whether you got it right, or you will learn the wrong thing

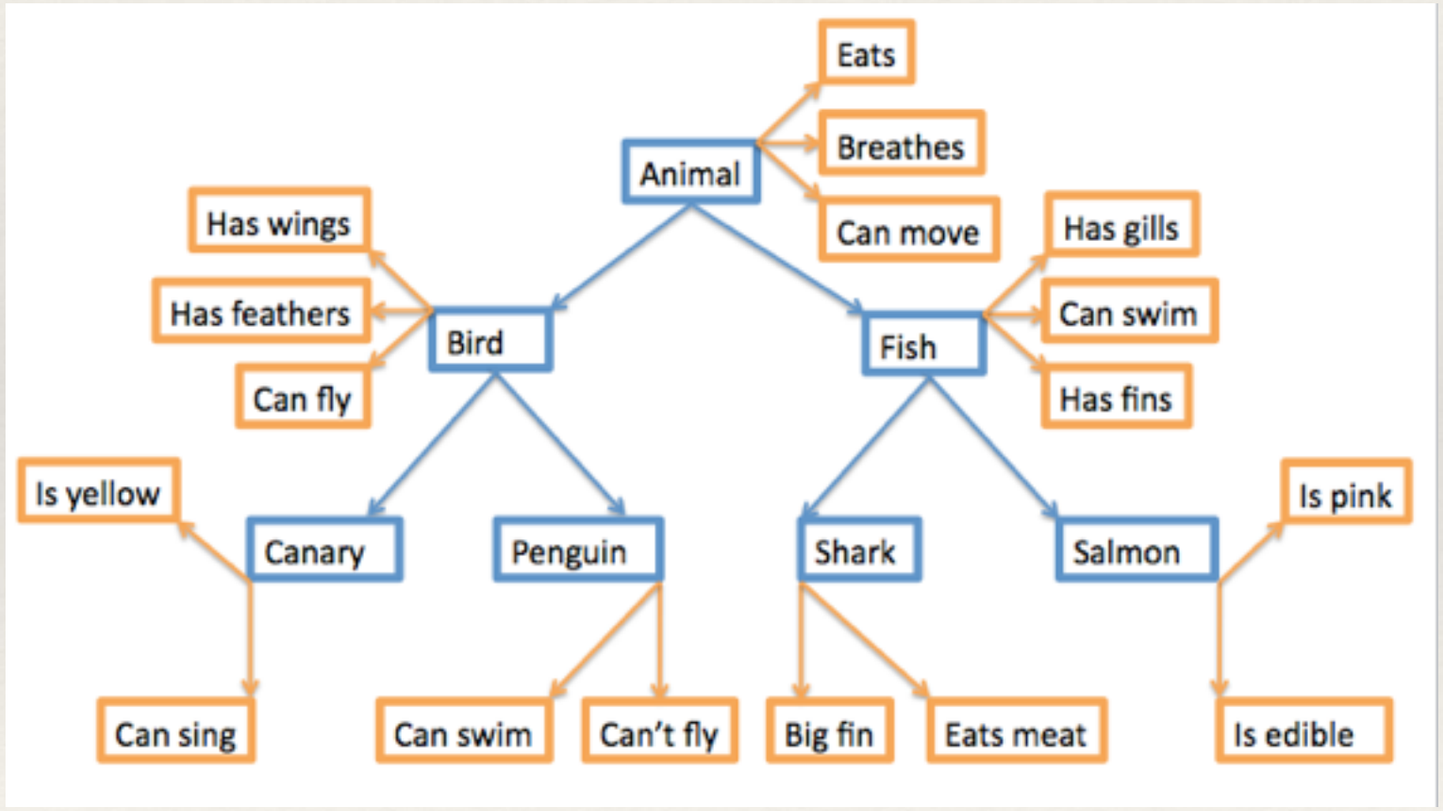
Learning Takes Time

- Learning curve: amount retained versus time invested
- distributed practice (little and often) leads to faster learning
- knowledge generated oneself is learned better ("learning by doing / problem-based learning")

Learning Means Rich Representations

Knowledge is linked across long-term memory

Experts have richer, more stable representations



Source: http://en.wikipedia.org/wiki/Mental_lexicon

Implicit Learning

- Classical conditioning:
  if a stimulus (opening Microsoft Word) is mostly associated with a second stimulus (frustration when it crashes), the two become associated
- Priming:
  one stimulus primes a person to expect another stimulus (e.g. after opening an app on Mac, expect to see menu on top)
- Procedural learning:
  acquiring a new skill, e.g. typing

Motivation For Learning?

Learning takes time and attention. People who are motivated are more likely to:

- spend enough time
- pay enough attention
- use the right learning strategies

Advantages of Learning

- people become faster
- performance varies less
- people become better at the task
- less frustration, more flow
- people are ready to for shortcuts / new functionality that builds on what they have learned

Mental Models

- Knowledge can be organised into mental models
  - Scripts: models for events, sequences of steps
  - Frames: models for objects and concepts with slots that can be instantiated
- In many cases, technology is part of the script

Example 1: Script for Writing a Letter

- open new window in text processing software
- load appropriate letter template
- fill in fields
- print off
- put in envelope and stamp
- put in outgoing mail

Example 2: Text Processor Frame

- Text processors (instance: Pages)
- run on a computer (Mac)
- and have templates for common text types (Pages Letter Template)
- that can be found in a menu (Pages: New Document Creation)
- and you can preview formatting (Pages: What You See Is What You Get)

Mental Models in HCI

- What is the mental model of
  - the things people want to accomplish with the system?
  - how to accomplish these things?
  - the structure of the system?
- Whose mental model is it?
  - designer / analyst vs developer
  - people who use the system vs people who commission the system

Change Blindness

Expectations are so strong that changes that do not conform to expectations are not detected.

(See the infamous Gorilla video)

use expectations to your advantage

Learning Never Ends

- Learned knowledge, patterns, skills can be transferred to similar situations.
- A change of strategy / approach requires relearning
- This is why **consistency** is so important