Learning and transfer

(Chapter 3 from How People Learn)

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Introduction

- What is transfer of learning
  - “the ability to extend what has been learned in one context to new contexts ”(Byrnes 1996:74)
- What determines successful transfer ?
  - Initial learning
  - Context
  - Dynamic process
  - Utility of prior knowledge

Initial Learning

- Without adequate initial learning proper transfer can not happen
- What determines quality of initial learning ?
  - Understanding vs memorizing
  - Time allocation
  - Enhancements
  - Motivation

Initial Learning: Understanding vs Memorizing

- Learning with understanding helps transfer:
  - Understanding leads to broader knowledge
  - Understanding helps organizing knowledge around more general principles.
  - Understanding contributes to developing an expertise
  - Understanding helps avoid negative transfer

Initial Learning: Time Allocation

- It is important to allocate reasonable time for the learning process
- Bulk of the time is devoted to development of pattern recognition skills that help in recognition of meaningful patterns of information
- Time is key for developing expertise
- Talent does not save much time
- Common problem
  - Trying to cover too many topics with not enough time leads to:
    - Memorization of isolated facts that are disorganized and disconnected
    - "Hitting a wall" which prevents from grasping key organizing principles
- Provided time should be enough for processing information

Discussion questions

- How to handle time allocation issue in the context of teaching CT ?
  - Amount of time needed for grasping the key principles of CT will dramatically vary from student to student
- How to promote understanding in CT ?

Context

- Context of original learning influences transfer
  - Orange County and Brazilian examples
- The way knowledge is acquired determines to what extent learning and context are tied
  - Context-bound knowledge(sticking to one context)
- How to promote context-agnostic learning ?
  - Gradually shifting contexts
  - Explicitly focus on breaking out of context(“what-if” problem solving)
  - Generalizing so that the knowledge applies to broader spectrum of problems
- Representing problems
  - Help representing problems at higher levels of abstraction
  - Help represent solutions strategies in a more generalized way

Discussion questions

- Is teaching CT in the domain of expertise alone going to yield strictly context-specific skill/knowledge ?
- Can we teach CT in a way that it results in context-agnostic skill/knowledge ?
- If yes how would we promote that type of learning process ?

Relationships between learning and transfer conditions

- Rate of transfer ~ Overlap(“original domain of learning”, “new domain of learning”)
- Rate of transfer ~Overlap(“ cognitive elements in task A”, “cognitive elements in task B”)
  - Text editor example
    - Measuring transfer as savings in time
    - Number of shared procedural elements predicted savings

- Abstract instruction
  - Abstracted representations become component of a larger schemata(network of events)
  - Promotes analogical reasoning
    - “Successful analogical transfer leads to the induction of a general schema for the solved problems that can be applied to subsequent problems”(National Research Council 1994:43)
  - Abstract representations are derived from broad scope of related instances (from multiple learning experiences)

Discussion questions

- What prior knowledge has the "maximum overlap" with CT ?
  - From what domain of learning does the transfer occur when faced with comprehending CT ?
- How would one employ abstract representations for teaching CT ?
  - What is the acceptable upper "boundary of abstraction" in the context of CT ?

Active vs passive

- Transfer is a dynamic process
  - Repeat(evaluation strategies, consider resources and receive feedback)
  - Transfer takes time
  - Transfer as catalyst for learning new knowledge
  - No instant gratification
- Metacognition
  - Transfer is improved when “students actively monitor their learning strategies and resources and asses their readiness for particular tests and performances “
  - Metacognitive approaches have been shown to improve transfer
    - Reciprocal teaching method
      - » Enable students to monitor their understanding
      - » Provision (with initial scaffolding from teachers)
      - » Social setting for joint negotiation for understanding
    - Procedural facilitation
      - » Modeling
      - » Scaffolding
      - » Collaborative interaction

Discussion questions

- How to facilitate metacognitive approach to learning CT ?
- Can you think of reciprocal teaching method for CT ?
- Can you think of an assessment method that would effectively measure the rate of transfer in the context of learning CT ?

Learning as transfer from previous experiences

- "All learning involves transfer from previous experiences"
- Implications of previous experience:
  - Relevant knowledge that is not activated
  - Misinterpretation of new information because of prior knowledge
    - Fish is Fish
    - Plants example
    - Fractions
  - Conflicts with cultural practices
- Newly acquired knowledge should be made visible

Discussion questions

- Do you think previous experience(non-academic) has much effect on abilities to learn CT ?
- Can you think of cultural practices(mental) that could negatively/positively affect CT ?
- What prior knowledge could lead to a negative transfer ?

Transfer between everyday life and academic environment

- The goal of learning is to have knowledge that is useful for wide range of circumstances
  - Help students use knowledge from school in other everyday environments
  - Promote adaptive expertise
  - Real world is less individualistic and more collaborative
    - Ships can not be controlled by one person
    - Emergency room decision are made in collaboration
  - Abstract logical arguments in concrete contexts
    - ¼th of 2/3s of the cottage cheese
  - "School should be less about preparation for life and more like life itself"

Discussion questions

- How to leverage real life experiences in the context of teaching CT ?
- How to teach CT so that it can be leveraged in non-academic settings (real world environment) ?

Takeaway

- Objective of proper schooling is to prepare students for flexible adaptation to new problems and settings
- The ability to transfer serves as an important index of learning
- Initial learning determines expertise development