Fundamentals of Teaching

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Sources:

- Knight, "*Five Easy Lessons – Strategies for Successful Physics Teaching*", (2004) Addison Wesley
- Ambrose et al., "*How Learning Works*" (2010) John Wiley & Sons
- Mintz, "*The Fundamentals of College and University Teaching*", Columbia University Website
- Mazur, "*Peer Instruction*", (1997) Prentice Hall

Teaching vs. Learning

- TEACHING is the process done by the TEACHER
- LEARNING is the process done by the STUDENT
  - Learning is a process, not a product
    - Learning is not something done to students, but something students do themselves. The teacher is the facilitator of this process.
  - Learning involves change in knowledge, beliefs, and attitudes.
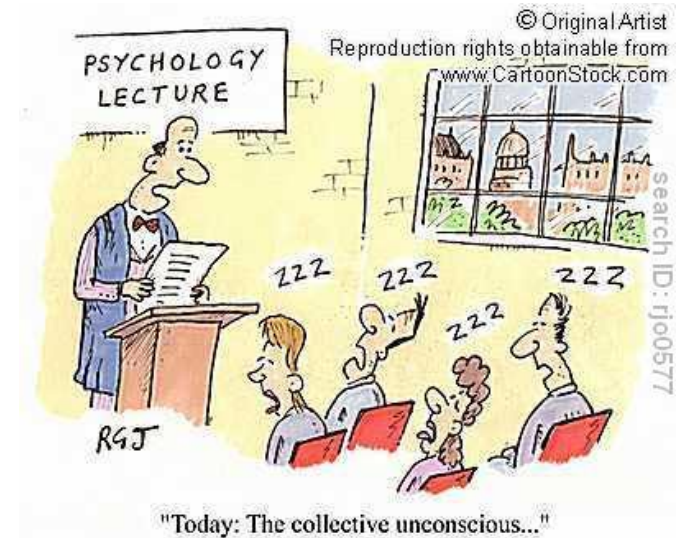 - Learning takes time and (if successful) has a lasting impact

ERROR NO 1 IN TEACHING
The teacher thinks he/she has taught the material, but the students have NOT learned

Paradigm Shift

- Old paradigm (transactional teaching)
  - the teacher conveys information
  - the students are expected to assimilate the knowledge on their own

- New paradigm (transformational teaching)
  - the teacher is the facilitator of the learning process for the students
  - the students are actively engaged in the learning process through a variety of activities

- New paradigm better for students, but harder on the teacher (until he/she has got used to it)

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PSYCHOLOGY LECTURE

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ZZZ

RGJ

"Today: The collective unconscious..."

GEORGE WARREN
BROWN
SCHOOL

Bloom's Cognitive Taxonomy of Learning

- **Remember**
  - Exhibit memory of previously-learned materials by **recalling** facts, terms, basic concepts and answers. Knowledge of specifics – terminology, specific facts.

- **Understand**
  - Demonstrative understanding of facts and ideas by **organizing, comparing, translating, interpreting**, giving descriptions, and stating main ideas. It includes Translation and Interpretation.

- **Apply**
  - By using new knowledge. **Solve problems to new situations** by applying acquired knowledge, facts, techniques and rules in a different way.

- **Analyze**
  - **Examine and break information into parts by identifying motives or causes**. It involves Analysis of elements, analysis of relationships, and analysis of organizational principles.

- **Evaluate**
  - Present and defend opinions by **making judgments about information, validity of ideas or quality of work** based on a set of criteria. It involves the Judgments in terms of internal evidence and Judgments in terms of external criteria.

- **Create**
  - Compile information together in **a different way by combining elements in a new pattern** or proposing alternative solutions. It includes the Production of a unique communication, Production of a plan or proposed set of operations.

Goal of today's lecture

- To move you from below Bloom's pyramid up to the first step:

  - *From knowing next to nothing about the fundamentals of teaching*

  - *To being able to REMEMBER some of the essential principles of teaching*

    - *And hopefully having nurtured your interest in moving up on the cognitive taxonomy pyramid*

1. Prior Knowledge

- Students' prior knowledge can *help* or *hinder* learning
  - It is mandatory that you ascertain and consider the prior knowledge of the students
    - Ask the students and other teachers
    - Diagnostic tests
  - You need to teach at the right level for the students to learn
  - New knowledge "sticks" better when connected to prior knowledge
  - You can never underestimate the students' prior knowledge
  - Insufficient or inappropriate prior knowledge can hinder learning

2. Knowledge Organization

- How students organize knowledge influences how they learn and apply what they learn
  - The teacher has a highly organized view of the knowledge
  - The students do not
    - "they can not see the forest for the trees!"
    - Example: pulley and ramp problems
  - Knowledge that is not connected to other knowledge is more easily forgotten
  - Always connect new knowledge to prior knowledge

Figure 2.2. Examples of Knowledge Organizations
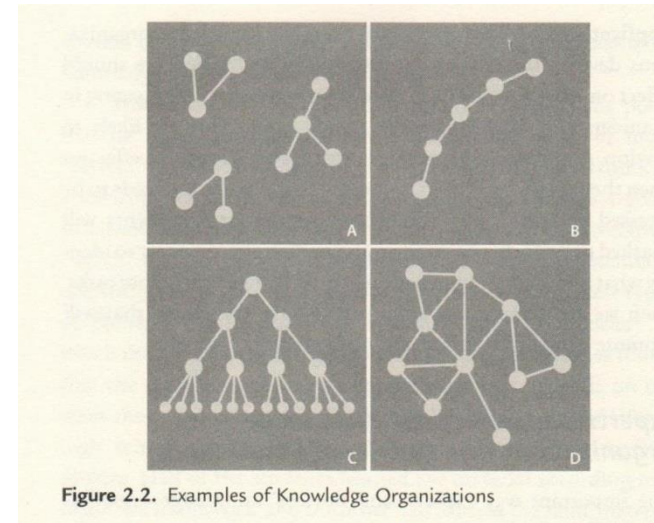
3. Motivation

- Students' motivation determines what they do to learn
  - Students have to have a goal in order to be motivated and the goal has to have value
    - Attainment value (mastery)
    - Intrinsic value
    - Reward value
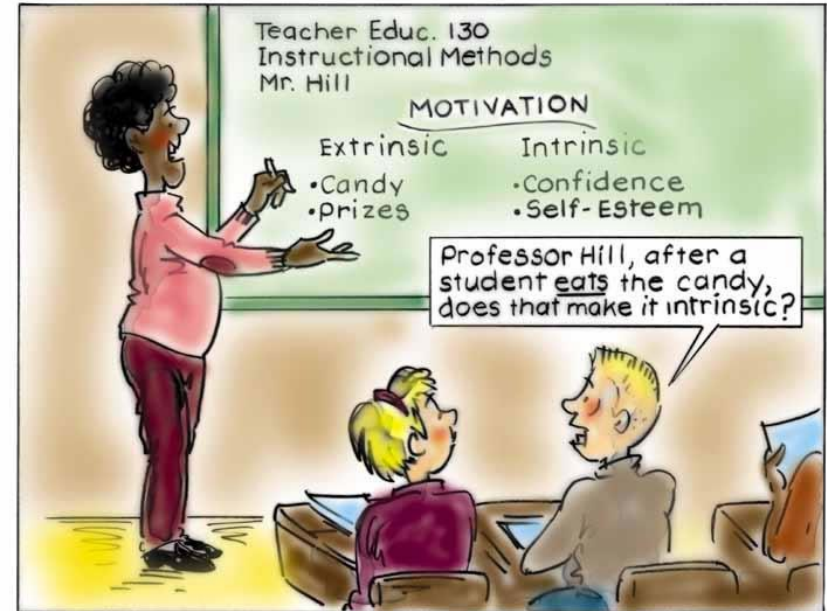
- Learning vs. performance goals or Extrinsic vs. Intrinsic
- Motivation is high if student realistically believes he/she is able to attain the goal and the goal has high value
- Therefore
  - ✓ Highlight importance of material for obtaining other goals
  - ✓ Provide early success opportunities
  - ✓ Make tests reasonable

4. Integrating Knowledge

- To develop sustained learning, students must
  1. acquire specific component skills
  2. practice integrating (= expanding) them into new situations
  3. know when to apply the skills

- Reach cognitive taxonomi level 3 (apply)

- Goal of learning (higher education) should be to reach at least this level (apply)

- Too often teaching only focusses on component skills and ignores integration

- Often teachers takes the integration (creating connections) for given or obvious
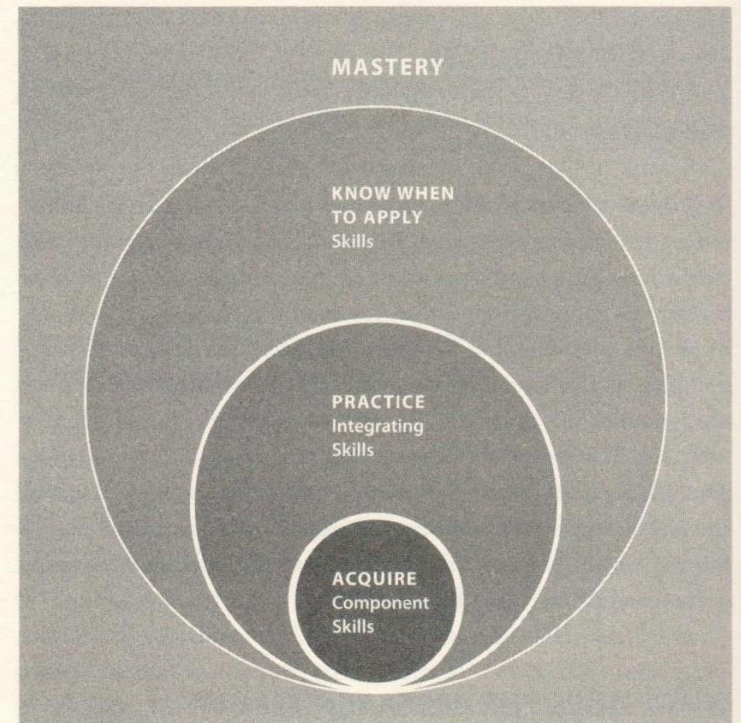

Figure 4.1. Elements of Mastery

5. Feedback

- Goal-directed practice coupled with targeted feedback enhances the students' learning
  - Effective feedback:
    - teach limited objective
    - Get feedback if students have learned the objective
      - Talk with them
      - Questions
      - Pop quiz
      - Clickers
      - Listen to group discussions
      - Home work
      - Don't ask: "did you understand it?"

Fig.15: Feedback control system

  - Be willing to adjust your teaching "in flight"
  - Tests are not necessarily great feedback mechanisms
    - Does provide overall feedback
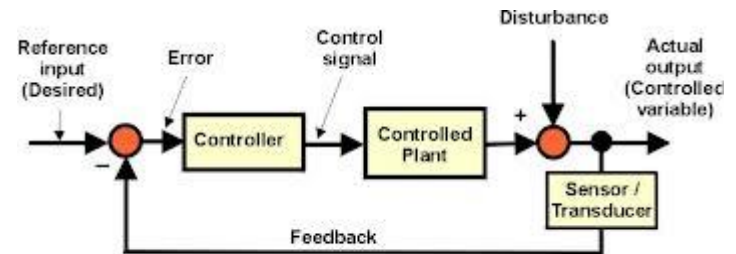   - But often too late to change teaching for current students

6. Learning Climate

- Student's current development level interacts with the social, emotional, and intellectual climate of the learning ("Classroom") environment to impact the learning.
  - Be in control of the situation, but don't be too authoritative and unapproachable
  - Connect with the students (but not too much!)
  - Be interested in them
  - Have your "antennas up"
  - Understand the different backgrounds of the students
  - Encourage positive interactions and discourage negative interactions
  - Don't just teach for the best students
 - Be encouraging even if students answer incorrectly

7. Self-evaluation and self-direction

- To become self-directed learners, students must learn to monitor and adjust their approaches to learning
  - Encourage students' *metacognition*: "The process of reflecting on and directing one's own thinking"
  - Help students to recognize internal issues (and not just blame external issues)
  - Make them "lifelong" learners
  - Increasingly important on the higher levels of the cognitive taxonomy
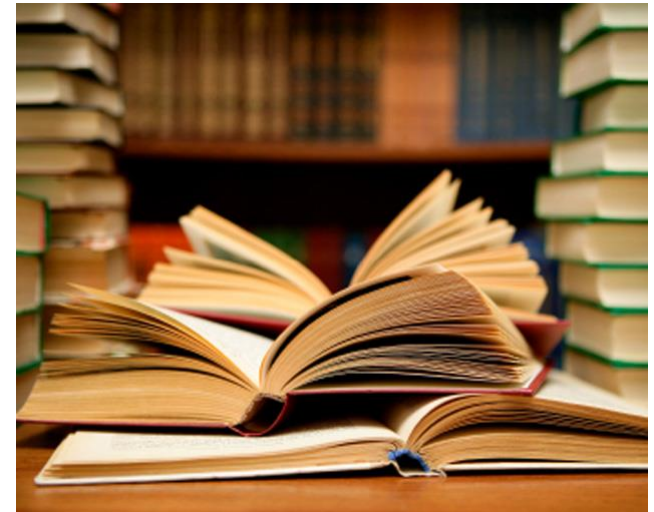
Learning recall
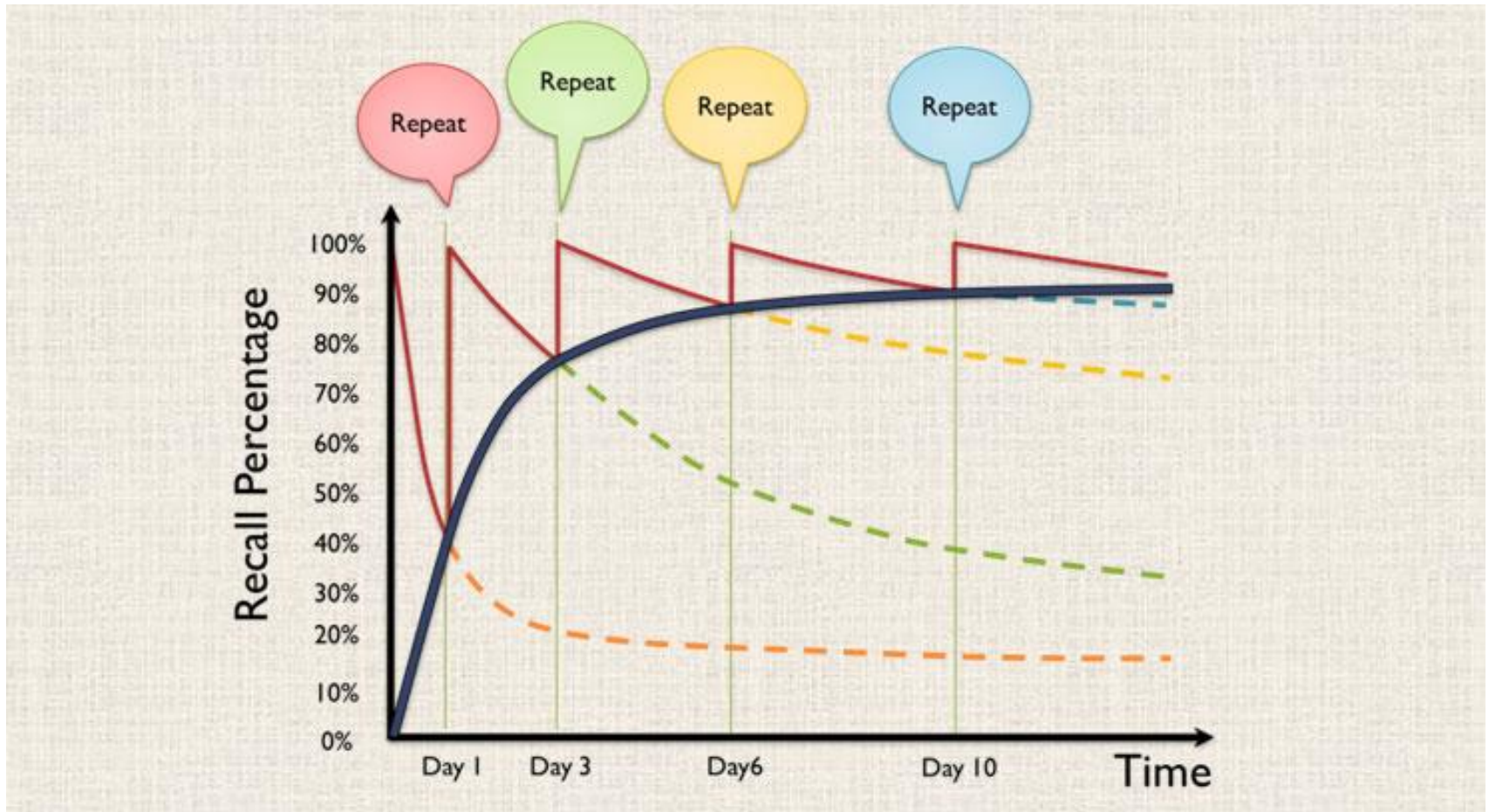
Partial summary of knowledge accumulation

- Information that is relevant and meaningful is easier to remember than information that isn't.

- Practice or rehearsal makes it easier to retain an idea.

- Prior knowledge or preconceptions can advance or hinder future learning.

- Memory is improved when a learner categorizes ideas or concepts

- Memory is context dependent; that is, it's easiest to remember an idea in a particular context than outside of that context.

Some important principles of teaching (review)

Teaching vs. Learning

1. Importance of students' prior knowledge.
2. Knowledge organization
3. Student motivation
4. Knowledge integration
5. Feedback
6. Teaching climate
7. Self-direction