Lecture 1

Educational Software
IN4145

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Today

- General information about the module
  - Programme
  - Assessment
  - Assigning students to topics
- Introduction of Educational software / Multimedia learning

Learning outcomes of lecture 1

After today's lecture you should :

- have better understanding of what this module is about
- know how your performance in this module will be assessed
- know definitions for multimedia, multimedia teaching and multimedia learning
- distinguish between different types of facilitating learning methodologies
- able to list a number of multimedia principles
- know the difference between technology centred and learner centred approach
- know 3 metaphors of multimedia learning

Aim of the Module

To achieve an understanding and practical experience of key principles, methods and theories in the area of educational software and electronic instruction manuals.

Module learning outcomes

The module provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas:

1. Obtain understanding of major learning principles, theories, and approaches
2. Identify key factors of successful educational software design and deployment
3. Apply theories, principles, and approaches into an appropriate design of educational software system and electronic (multimedia) instruction manuals
4. Establish an appreciation of state-of-art developments in the area of educational software design and e-manuals.

Teaching Method

- **Lectures (3rd Q)**
  Focus on the theoretical background. Each week the lecture will start with a student presenting a short (5-10 minutes) summary of material discussed in previous lecture.

Special Guest lectures (4th Q)
people from academia and industry will be invited to discuss and demonstrate how educational software is being used in the field

Teaching Method – Timetable

Quarter 3

- week 3.1 – 3.7, 2 Feb 2010 / 23 March 2010
- Tuesdays 8:45 – 10:45
- TN-Classroom 10, A272

Quarter 4

- week 4.1 – 4.7, 19 April 2010/ 7 June 2010
- Mondays 10:45-12:45
- EWI Lecture room G

Seminar Program

Quarter 3

1. Introduction
2. Educational principles
3. Development of educational software
4. A) Computer assisted personalised system of instructions; B) student presentation outline project
5. Web lectures and knowledge management systems
6. Manuals
7. Affective Computing and Tutor Learning systems

Quarter 4

10. A) Serious gaming and simulations ; B) Bike brains
11. <Not yet scheduled>
12. <not yet scheduled>
13. <Not yet scheduled>
14. <Not yet scheduled>
15. <no lecture>
16. <no lecture>
17. Project Presentations

Assessment

Assessment I	
• Oral examination	**35%**
• Student's summary presentation and participation in lectures	**15%**
Assessment II	
• Coursework project	**50%**
Overall mark IN4145	**100%**

Assessment I

This assessment exists of 2 parts:

1. Oral examination on topics presented in the reading material and discussed in the lectures
2. Student's summary presentation and participation in lectures (sign attendant list, assignment this week on blackboard)

Assessment II

- **Work groups of 2 or 3 students**
- **Design and implement a small but executable and usable piece of educational software or manual**
- **Evaluation criteria:**
  - Presentation of design (5%)
  - Design (25%)
  - Presentation of the product (5%)
  - Product and report (65%)
- **Template report on Blackboard**
- **Presentation outline in week 4**
- **Presentation final product in week 17**

Assessment II

Examples of from last year

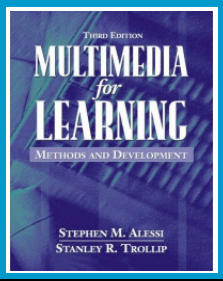
- Operator Training for the VRET system
- Flatten training tool

Reading Material

- Material on blackboard
- Book only 2 chapters.

Research in the area of multimedia learning

Mayer, R.E., (2005). *The Cambridge handbook for multimedia learning*. New York, NY: Cambridge University Press.



Study hours

Lectures : 36 hours (9 × (2 hours lectures + 2 hours reading time))
Preparation Student Presentation lecture summary: 2 hours
Preparation coursework presentation: 4 hours
Coursework: 60 hours
Exam preparation and revision: 10 hours

Total = 112 hours

Will computers always facilitate learning?

- There seems only a small overall effect, however other factors could also explain this
- Instead look at situations where a computer is likely to be beneficial, such as:
  - Cost of other methods are high
  - Safety is an issue
  - Material difficult to teach with other methods
  - Highly individual teaching is needed
  - Logistic is difficult
  - Learners with special needs

(Alessi and Trollip, 2001, p.6)

Phase of instruction

- Presenting information
- Guiding the learner
- Practicing
- Assessing learning

(Alessi and Trollip, 2001, p.7)

Methodologies for Facilitating learning

- Tutorials (presenting information, guiding the learner)
- Hypermedia (presenting information)
- Drills (practicing)
- Simulations (presenting information, guiding the learner, practicing, and assessing learning)
- Games (see simulations but also motivation)
- Tools en open-end learning environment
- Tests (assessing learning)
- Web-based learning

(Alessi and Trollip, 2001, p.10-12)

Definition

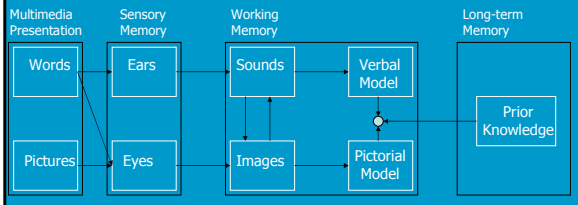
- **Multimedia**: Presenting words (e.g. printed text or spoken text) and pictures (e.g. illustrations, photos, animation, or video)
- **Multimedia learning**: Building mental representations from words and pictures
- **Multimedia instruction**: Presenting words and pictures that are intended to promote learning.

Multimedia:

1. Delivery media view
2. Presentation modes view
3. Sensory modalities view

(Mayer, 2005, p. 2, table 1.1)

Processing of pictures, spoken words, and printed words



Three assumptions of a Cognitive Theory of Multimedia Learning:
1. Dual channels
2. Limited capacity
3. Active processing

(Mayer, 2005)

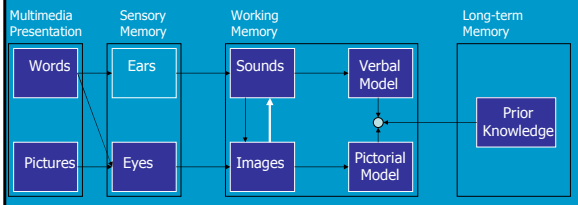
Some basic principles of multimedia learning (1)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better from words and pictures than from words alone.

Some basic principles of multimedia learning (1) - Multimedia principle



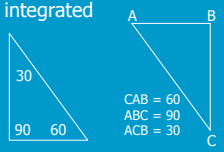
Additional coding: different channels that reinforce each other, and reduce load
Dual-coding theory: there are 2 independent, but complementary cogn. sub systems

Some basic principles of multimedia learning (2)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better when words and pictures are physically and temporally integrated



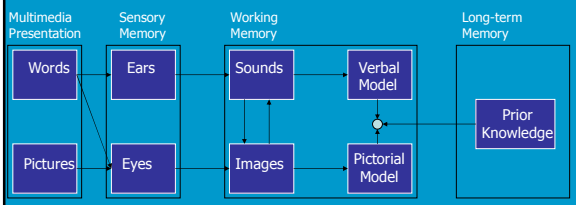
Some basic principles of multimedia learning (3)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better from graphics and narration than graphics and printed text

Some basic principles of multimedia learning (3) - Modality principle



Additional coding: different channels that reinforce each other, and reduce load
Dual-coding theory: there are 2 independent, but complementary cogn. sub systems

Some basic principles of multimedia learning (4)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better when the same information is not presented in more than one format

For example:

listening to spoken text, while reading, requires cognitive load for synchronisation

Full text vs. reduced or summarised text

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Some basic principles of multimedia learning (5)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better when a multimedia message is presented in learned-paced segments rather then as a continuous unit.

Too many novel items can exceed working memory capacity

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Some basic principles of multimedia learning (6)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better from multimedia message when they know the names and characteristics of the main concepts

Provide knowledge to process information

For example: first explain component, secondly the relation between components

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Some basic principles of multimedia learning (7)

1. Multimedia principle
2. Split-attention principle
3. Modality principle
4. Redundancy principle
5. Segmenting principle
6. Pre-training principle
7. Signalling principle

(Mayer, 2005, p. 6-7)

People learn better when cues are added that highlight the organisation of the essential material

Strategy to cope with too many novel items: include cue to draw attention to essential items

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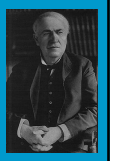
Approach to Multimedia learning: Technology Centred Approach (1)

- How can a technological capability be used in the designing multimedia presentation?
- This approach often fails to produce long lasting improvements in education

Motion picture

In 1922 Thomas Edison:

"*The motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks*"



(Mayer, 2005, as cited in Cuban, 1986, p.9)

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Approach to Multimedia learning: Technology Centred Approach (2)

- How can a technological capability be used in the designing multimedia presentation?
- This approach often fails to produce long lasting improvements in education

Radio

In 1932, Benjamin Darrow (founder of the Ohio School of the Air) about the radio:

"*bring the world to the class-room, to make universally available the services of the finest teachers, the inspiration of the greatest leaders*"

In 1945 William Levenson (director of the school):

"*radio receiver will be as common in the classroom as the blackboard*" and "*radio instruction will be integrated into school life*"

(Mayer, 2005, as cited in Cuban, 1986, p.19)

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Approach to Multimedia learning: Technology Centred Approach (3)

- How can a technological capability be used in the designing multimedia presentation?
- This approach often fails to produce long lasting improvements in education

Television
1950s "continental classroom" that would provide access to "richer education at less cost"
(Mayer, 2005, as cited in Cuban, 1986, p.33)

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Approach to Multimedia learning: Technology Centred Approach (4)

- How can a technological capability be used in the designing multimedia presentation?
- This approach often fails to produce long lasting improvements in education

Computer
1960s "computer tutoring machines were predicted to eventually replace teachers"
(Mayer, 2005, p.8)

General pattern:
1. Begin with grand promises how technology would revolutionize education
2. Initial rush to implement the cutting-edge technology in schools
3. After few decades it become clear that hopes and expectation were largely unmet.

(Mayer, 2005)

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Approach to Multimedia learning: Learner-Centred Approach

- How can we adapt multimedia to enhance human learning?
- Following ideas of Donald Norman *Human-centred technology*
- Technology should serve the learner (and the teacher)
- Begin with understanding of how the human mind works but also its motivations.

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Three Metaphors of Multimedia Learning – Response strengthening

- **Definition**: Strengthening and weakening connections
- **Content**: Connections
- **Learner**: Passive receiver of rewards and punishment
- **Teacher**: Dispenser of rewards and punishment
- **Goal of multimedia**: Exercise system

(Mayer, 2005, p. 11, table 1.3)

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Three Metaphors of Multimedia Learning – Information acquisition

- **Definition**: Adding information to memory
- **Content**: Information
- **Learner**: Passive receiver of information
- **Teacher**: Dispenser of information
- **Goal of multimedia**: Delivery system

- Also referred to as: Empty vessel view, transmission view, commodity view

(Mayer, 2005, p. 11, table 1.3)

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Three Metaphors of Multimedia Learning – Knowledge construction

- **Definition**: Building a coherent mental structure
- **Content**: Knowledge
- **Learner**: Active sense maker
- **Teacher**: Cognitive guide
- **Goal of multimedia**: Cognitive guidance system

(Mayer, 2005, p. 11, table 1.3)

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Summary

- **Focus** on educational software and electronic instruction manuals
- **Assessment**: Oral Exam, Class presentations, and coursework project
- All details about module can be found in **syllabus** on blackboard
- **Multimedia instruction**: Presenting words and pictures that are intended to promote learning
- **Facilitating learning methodologies**: Tutorial, Hypermedia, Drills, Simulations, Games, Test, Tools, web-based learning
- **Basic principles of multimedia learning**: Multimedia, Split-attention, Modality, Redundancy, Segmenting, Pre-training, and Signalling principle
- **Technology** centred vs. **Learner** centred approach
- **Metaphors of multimedia learning**: Response strengthening, Information acquisition, and Knowledge construction

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Next time

Educational Principles (Monday 9 Feb 2009)

Literature:

- Alessie, S.M., and Trollip, S.R. (2001). Chapter 2: Learning principles and approaches. In *Multimedia for learning; Methods and development* (3rd ed) (pp. 16-47). Boston, MA: Allyn and Bacon. (see blackboard)

Summary by *(will be announced)*

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References

- Alessi, M.S., and Trollip, S.R. (2001). *Multimedia for learning; Methods and development* (3rd ed). Boston, MA: Allyn and Bacon.
- Mayer, R.E., (2005). Chapter 1: Introduction to multimedia learning. In R.E. Mayer (ed) *The Cambridge handbook for multimedia learning*. New York, NY: Cambridge University Press.

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