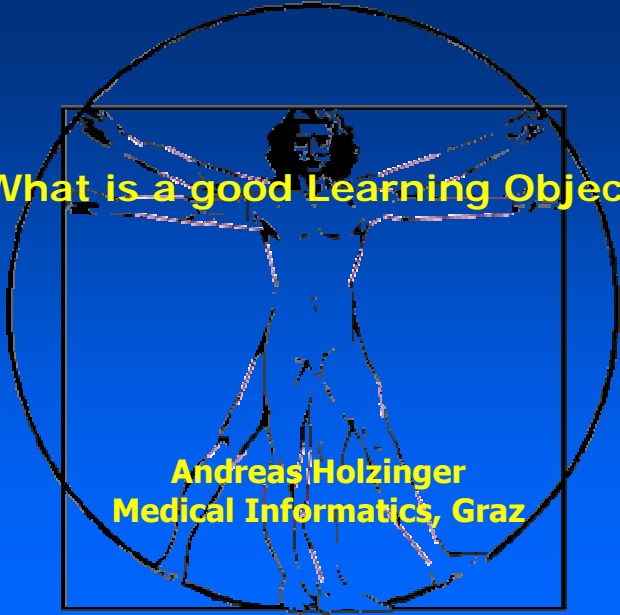
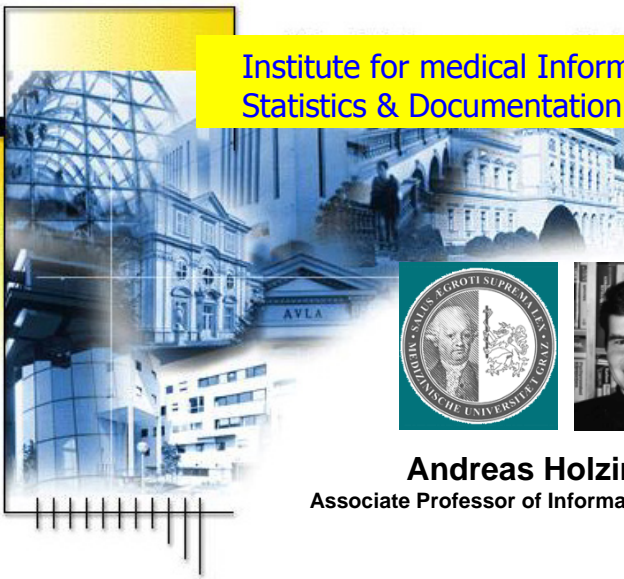


# What is a good Learning Object?

**Andreas Holzinger**  
Medical Informatics, Graz



Institute for medical Informatics,  
Statistics & Documentation



**Andreas Holzinger**  
Associate Professor of Information Processing



*"The old computing is about what computers can do;  
The new computing is about what people can do"*

*Shneiderman (2002)*

[www.basiswissen-it.at](http://www.basiswissen-it.at)

Hardware

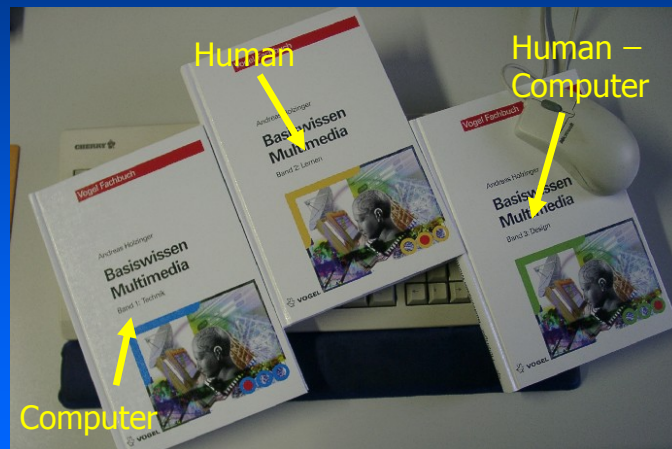


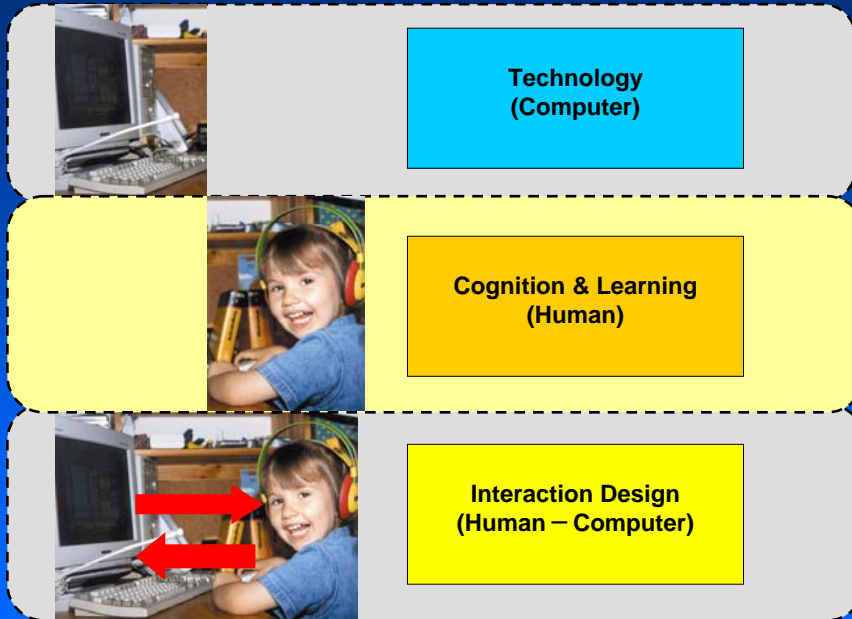
Software

Application

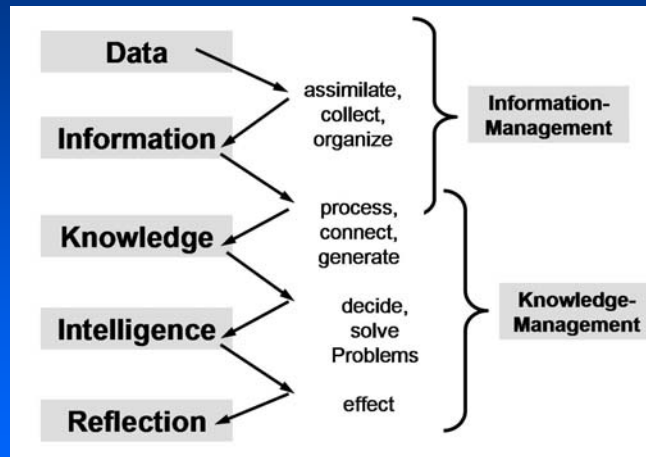


[www.basiswissen-multimedia.at](http://www.basiswissen-multimedia.at)





Learning is a basic cognitive process ... not an object...

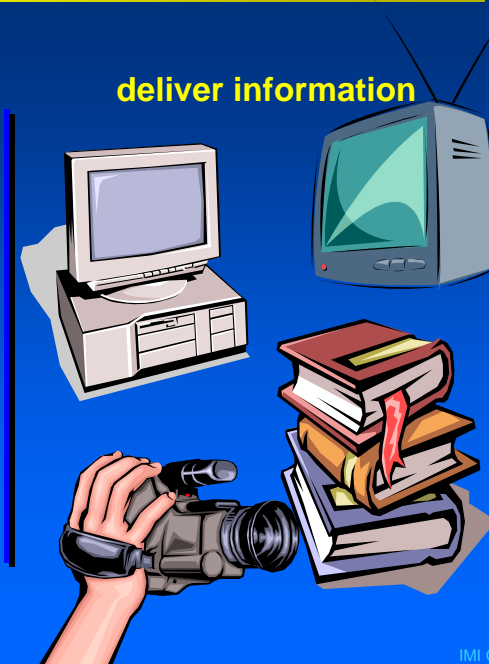


Skinner (1954), Gagné (1965), Holzinger (2000), 54, 105

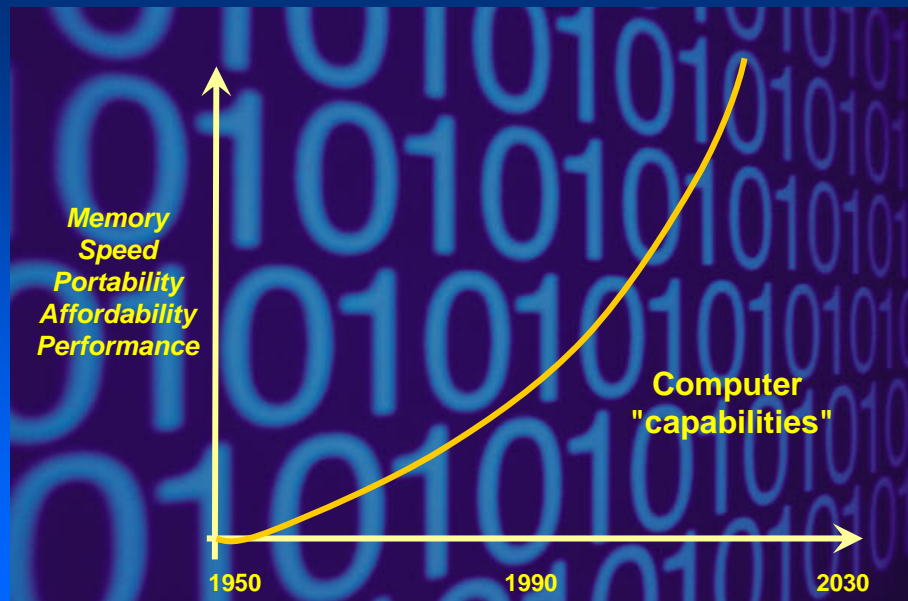
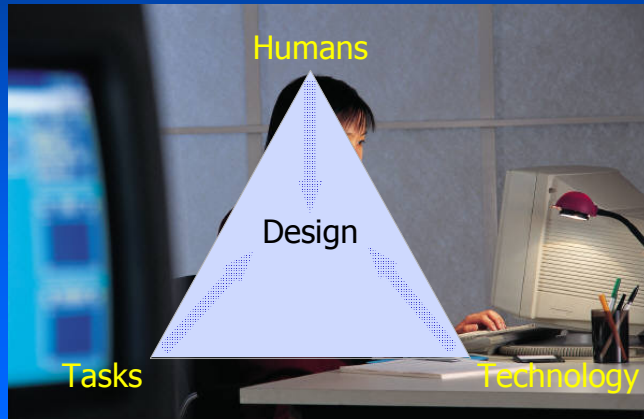
cause learning

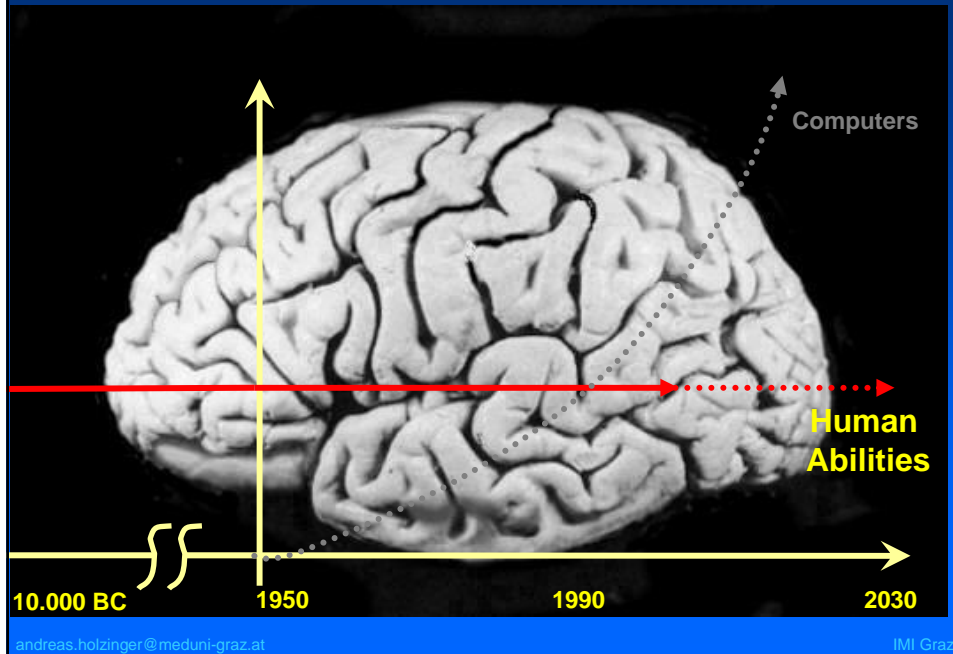
deliver information

- Practice**
- Simulation**
- Discussion**
- Presentation**
- Demonstration**



Human-Computer Interaction (HCI) includes both, methods and media





- Richard Clark (1994) Media will never influence learning, *Educational Technology R&D* (42) 21-29



- Rich media may be more entertaining but it doesn't necessarily lead to better learning!

*Salomon (1984)*

- Exceptions:
- Simulations
- Visualizations &
- Motivational Effects

*Schank (1994), Holzinger (1997), Holzinger (2000)*

- IEEE (Institute of Electrical and Electronics Engineers)
  - "Any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning"
    - Learning Object Metadata Working Group of the IEEE Learning Technology Standards Committee (LTSC)
- Wiley (2000)
  - "any digital resource that can be reused to support learning"
    - David A. Wiley (2000), "Connecting Learning Objects to Instructional Design Theory"
- Cisco
  - "A digital learning resource that is reusable, sharable, interoperable, and discoverable."



- Learning Objects are generally:
  - Granular
  - Reusable
  - Interoperable
  - Address an educational concept.
  - May have prerequisites.
  - *Must* have metadata.



*Holzinger (2001)*

- Raw assets – e.g., image, video, text, reference
  - Raw ingredients from which content is made
- Learning assets – e.g., image with text
  - Ingredients contextualized and organized into focused learning content
- Activities – e.g., task relating to image
  - Any activity having implicit or explicit learning objectives and outcomes
- Courses – containing a number of assets and activities
  - Integrated into a Lesson or Course schedule
- Templates – e.g., quiz generator

But always  
consider the Human in Multimedia Design ...



**The end-user must be considered**

**... research has to be centered on  
better understanding the end-  
user and the context in which the  
user works and learn ...**

**✦ USABILITY ENGINEERING**

- Ease of learning
  - Grasp, understand fast, efficient, effective ...
- Recall
  - Remember materials for a long time ...
- Productivity
  - Perform tasks quickly and efficiently ...
- Minimal error rates
  - Adapt in new situations ...
- High end-user satisfaction
  - Confident of success ...

*Nielsen (1994), Holzinger (2004)*



- Inadequate access to technology (digital divide)
- Driven by economics rather than education
- Driven by technology
- Excessive commercialization
- Disembodiment of instructor
- Lack of good content
- Lack of pedagogic and didactical knowledge
- Lack of understanding of technology



- "Know thy end-users"
- Common dimensions include
  - Role – Dominant persona of users (job, affiliation)
  - Goals – Reason for the interaction
  - Circumstances of Use – Setting, resources, strategy, timing
  - Culture – Group level beliefs, language, preferences
  - Ergonomics – Relevant perceptual & motor abilities, skills

## ■ Know thy end-users!

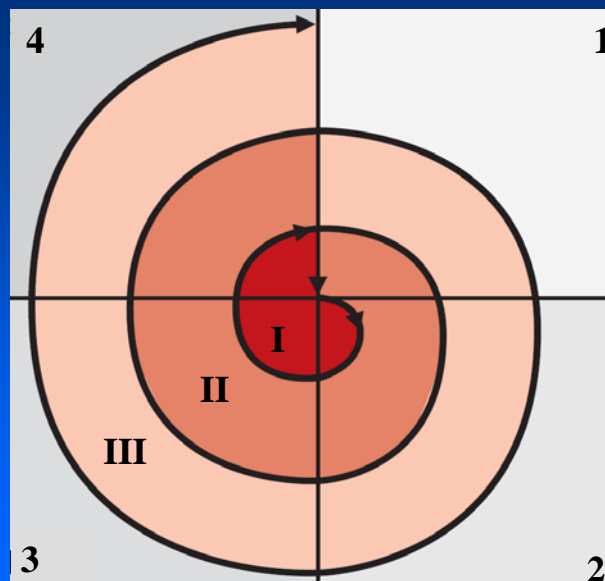
- Cognitive abilities
- Physical abilities
- Motivational background
- Previous knowledge and skills!



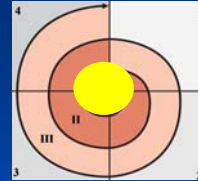
## ■ Keep users involved throughout the system development process

*Karat (1997)*

- Phase 1: Analysis  
 Phase 2: Design  
 Phase 3: Development  
 Phase 4: Testing
- Level I: Requirements Analysis  
 Level II: Low-Fi Prototyping  
 Level III: Hi-Fi Prototyping  
 (Level IV): Usability Reengineering



- Phase 1: Analysis
- Phase 2: Design
- Phase 3: Development
- Phase 4: Testing



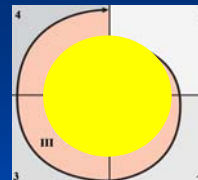
### Level I: Requirements Analysis & Specification

Focus on: Who? What? Why? Where? When?

- A) Identify users and analyze learning requirements
- B) Define learning outcomes
- C) Define context
- D) Define content

*Participants: Learners, Teacher (usually Domain Expert), Multimedia Expert (usually software Freak), Design Expert (usually Usability Engineer), Didactical Expert*

- Phase 1: Analysis
- Phase 2: Design
- Phase 3: Development
- Phase 4: Testing



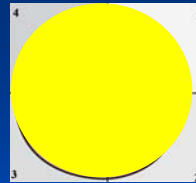
### Level II: Multimedia Application Design

Focus on: Presentation, Access, Engagement

- A) Select appropriate Didactical Model
- B) Follow pedagogical Design Guidelines (Pedagogy)
- C) Follow principal Design Guidelines (Information Design)
- D) Select proper Interactions (Interaction Design)

*Participants: Learners, Teacher (usually Domain Expert), Multimedia Expert (usually software Freak), Design Expert (usually Usability Engineer), Didactical Expert*

- Phase 1: Analysis
- Phase 2: Design
- Phase 3: Development
- Phase 4: Testing



### Level III: Multimedia Application Development

Focus on: Usability Engineering

- A) Prototype and implement Design from Level II
- B) Follow pedagogical Design Guidelines (Pedagogy)
- C) Apply current technology (Media, XML, Metadata etc.)
- D) Provide always good accessibility (bandwidth etc.)

*Participants: Learners, Teacher (usually Domain Expert),  
Multimedia Expert (usually software Freak), Design Expert  
(usually Usability Engineer), Didactical Expert*



Gagné (1965)  
Holzinger (2000)

- Learning Goals according to Bloom (1956):
  - 1) Cognitive Goals (Information, Knowledge, ...)
  - 2) Affective Goals (Curiosity, Awareness, ...)
  - 3) Psychomotoric Goals (Hands-On, Know-How)

What does the nature of your content require?

## ■ Orientation

*"Students need to know where they are, how they got there, and how to get back"*

- Electronic Medium Conceals Information
- Placement Cues
- Hierarchies and Indices
- Semantic Nets (make the associations between related information specific)

## ■ Navigation

*“Minimize the mental load required to understand the interface”*

- Simple and Consistent
- Layer Content
- Use Inverted Pyramids

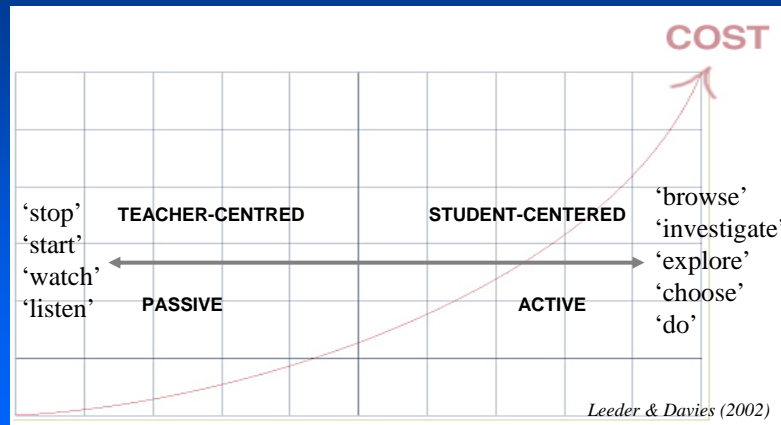
*“When a screen changes, change only the information to which the learner is directed”*

## ■ Text

- Amount of Text
- Text Display
- Text Structure
- Readability
- Fragmentation

*Nielsen (1994), Holzinger (2002)*





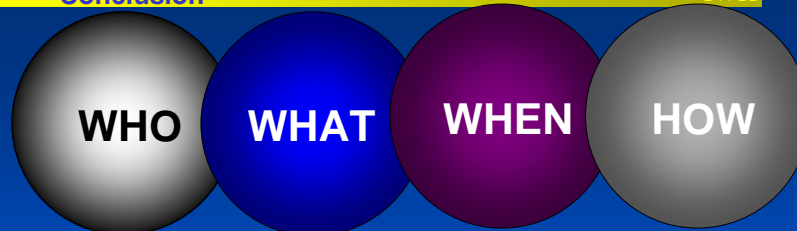
### What students hate ...

- Download Delays
- Downloading millions of Plug-ins
- Having to Change Fonts or Other Settings
- Having to Reboot after every session
- Long Scrolling Text – endless reading on screens
- Links Within a Page and not finding back
- Dead Ends/Can't Get Back
- Getting Lost
- No Online Moderator, no instructor available
- Overly Detailed Graphical User Interface
- Unnecessary Distractions (flashing, popping, ...)





e-Learning at the university:  
*It is one small step for mankind,  
But one giant leap for a teacher.*



- A good learning object fits to its end-users; It addresses the questions:
- Who are the learners?
- What do they need to be able to achieve the learning goals?
- How will I know when they've achieved the learning goal?
- How will they get to the learning goal?

We must provide benefits and gain acceptance in the sense of UBIQUITOUS USABILITY

# Further Reading

[www.basiswissen-multimedia.at](http://www.basiswissen-multimedia.at)



[www.basiswissen-it.at](http://www.basiswissen-it.at)