Lernsoftware = Didaktik + Informatik

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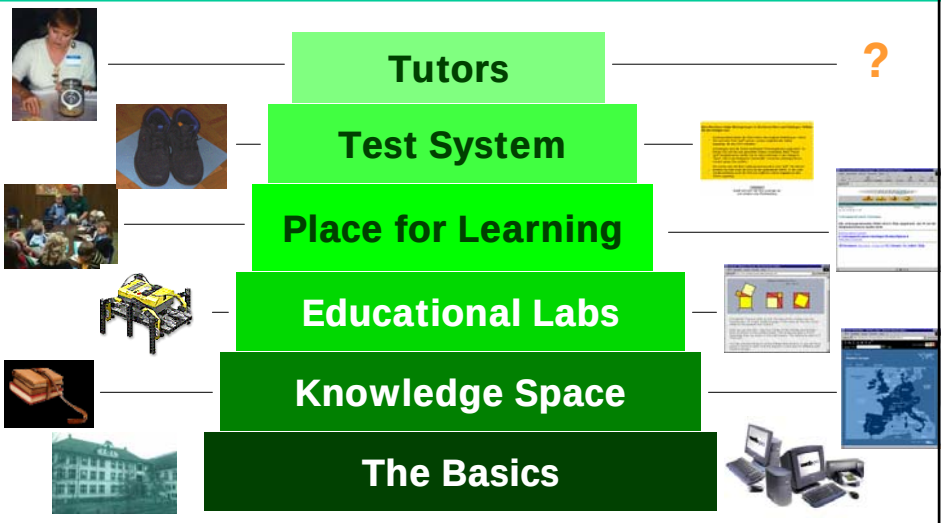
The „Learning“ in e-„Learning“ ?

5 High-Level Guidelines for Creating Interactive Learning Environments

Future Directions of Interactive Learning Environments

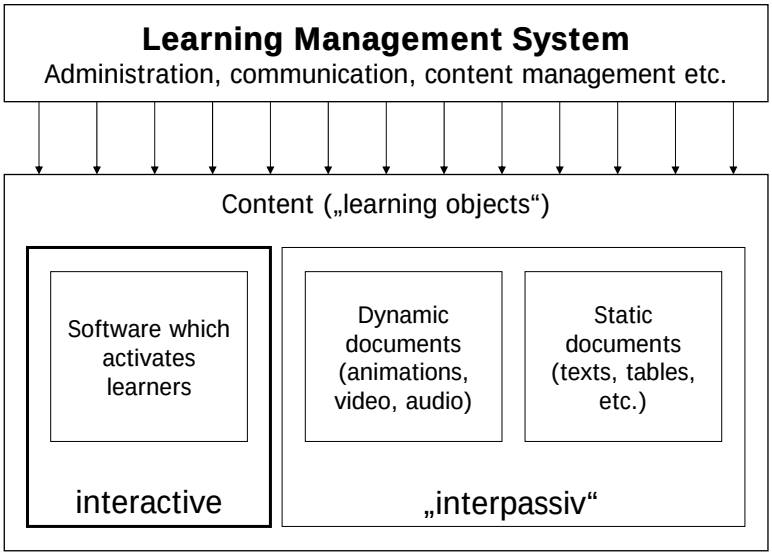
Components of a Learning Environment

Real World — Virtual

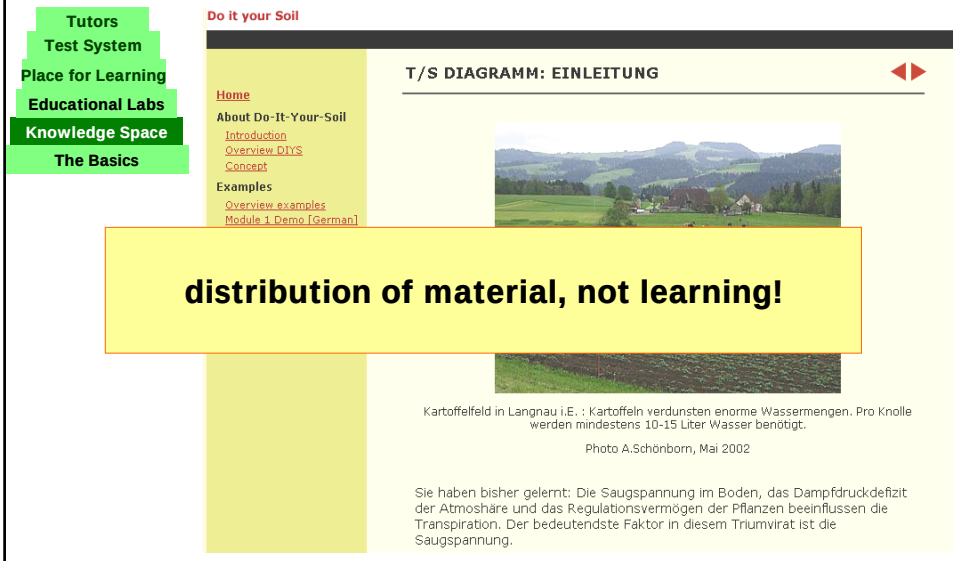


M. Pilloud, W. Hartmann. Talk at „Web Based Training“, Olten, 2000.

Typical Technology-based Implementation of Learning Environment

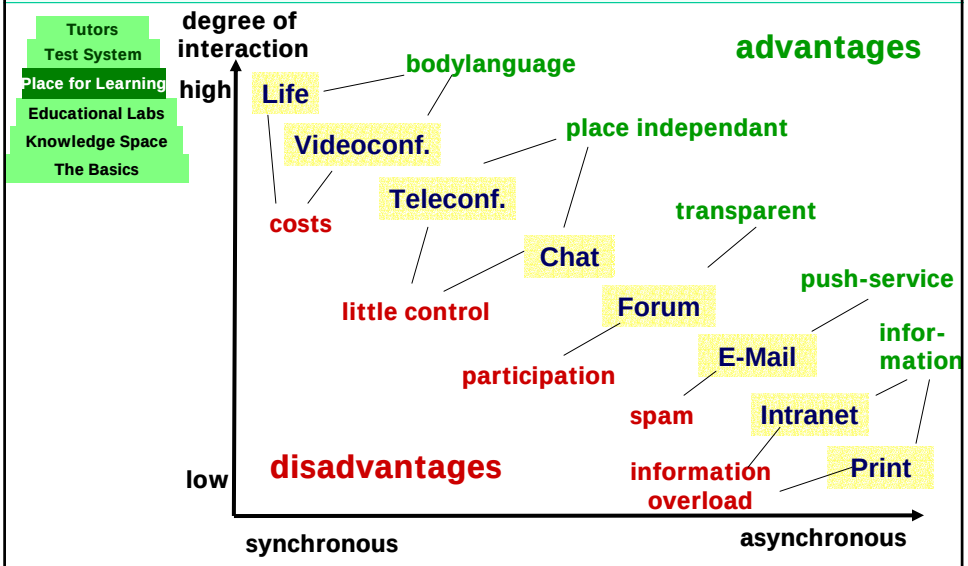


e-„publishing“ in e-„learning“: Web publishing of learning materials



distribution of material, not learning!

e-„communication“ in e-„learning“: Tools for technology based social interaction



e-„communication“ in e-„learning“: Much communication, little CSCL

Administration:
registering with a course etc.

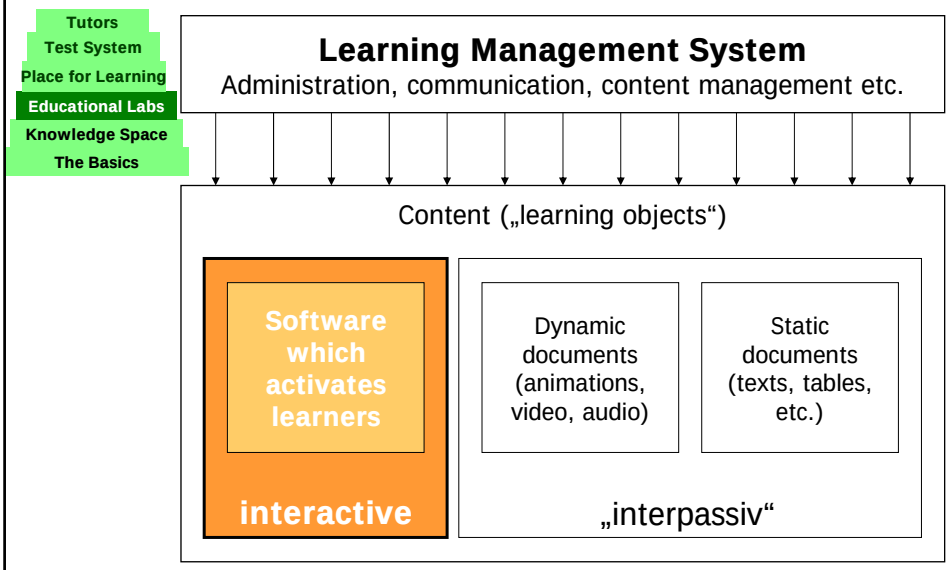
Organization:
Scheduling, exchanging documents etc.

Communication:
Mailing, chatting etc.

Computer Supported Collaborative Learning?

True CSCL is quite hard to do,
for the teacher as well as for the learners!

So, where is the „learning“ in e-„learning“? Learning through the interaction with computer?



Human-Computer Interaction: Learning through the interaction with computer

Social Notion of Interaction:

Interaction between users through the use of ICT as a medium (computer mediated human-human communication). This is a relatively new phenomenon.

Technological Notion of Interaction:

Interaction between users and the computer (human-computer interaction), i.e. the interaction of users with teaching materials. This is an old dream – remember CAL, CAI, CBT, WBT, ...

Learning Through Human-Computer Interaction: Interactive Learning Environments

The primary questions must be:

What can be done with technology that could not be done just as well without it?

Does technology yield an added value from a pedagogical perspective?

Even then, ILEs pose tough challenges:

You need subject matter experts with (at least) a sound grasp of pedagogy.

You need skilled software engineers with (at least) a sound grasp of design and usability.

That is, ILEs are expensive!

ILE Guideline #1: Content based on fundamental ideas

A **fundamental idea** with respect to some domain is a schema for thinking, acting, describing, or explaining which

is applicable in different areas,

may be demonstrated and taught on **every intellectual level**,

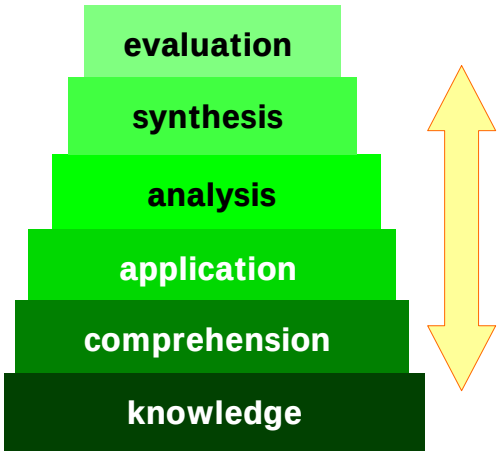
can be clearly observed in the historical development and will be **relevant in the longer term,**

and **is related to everyday language and thinking.**

Fundamental ideas guarantee the selection of content which is cognitively demanding, relevant, and long-lived – **justifying the expense of building ILEs.**

[Bruner 1960; Schwill 1994]

ILE Guideline #2: Different Cognitive Levels



ILEs should cover multiple levels, also addressing higher cognitive skills.

If they don't,
they will become boring quickly, not engaging the learners.

If they don't,
why go to the expense of implementing them?

[Bloom, 1956]

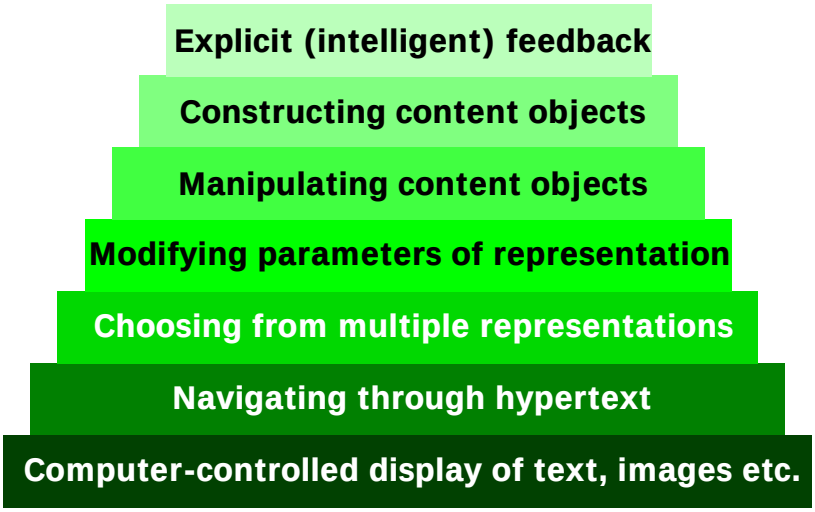
ILE Guideline #3: High level of (human–computer) interactivity

„You either feel involved in the computer representation or you do not.

The crucial point is the ability to interact with the representation, and not how often the software feigns communication with you."

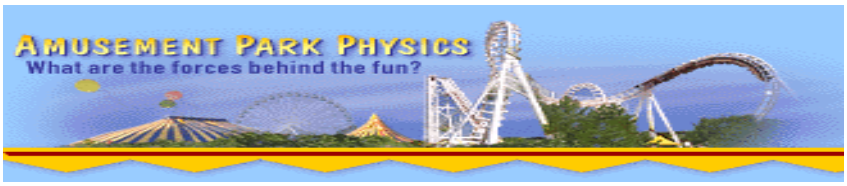
Brenda Laurel (1993): Computer as Theatre, Addison-Wesley Publishing.

ILE Guideline #3: Levels of interactivity



[Based on Schulmeister 2003]

ILE Guideline #3: Levels of interactivity
Interactivity level 4: Modifying representation



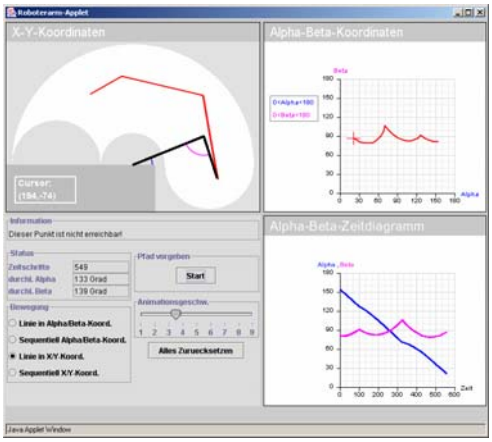
Users can play with parameters like height, length etc.

but can not create their own roller coasters

[www.learner.org/exhibits/parkphysics/]

ILE Guideline #3: Levels of interactivity

Interactivity level 5: Manipulating content



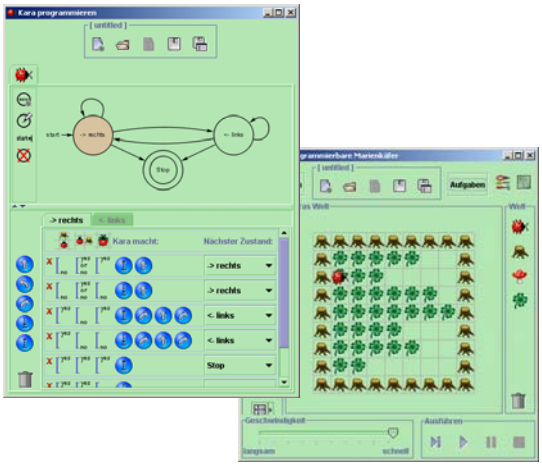
Users can control the actions of the robot's arm,

in either of the two representations.

[www.educeth.ch/informatik/interaktiv/roboarm/]

ILE Guideline #3: Levels of interactivity

Interactivity level 6: Creating content objects

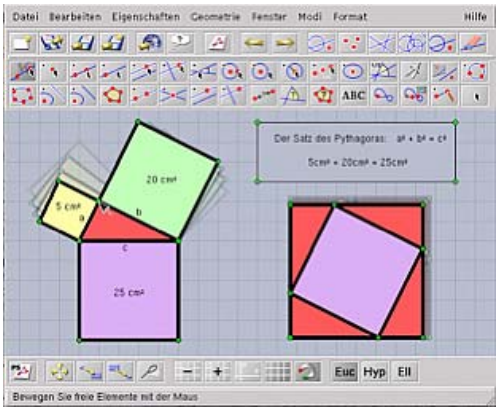


Users create their own worlds,

write their own programs for the ladybug.

[www.educeth.ch/karatojava/]

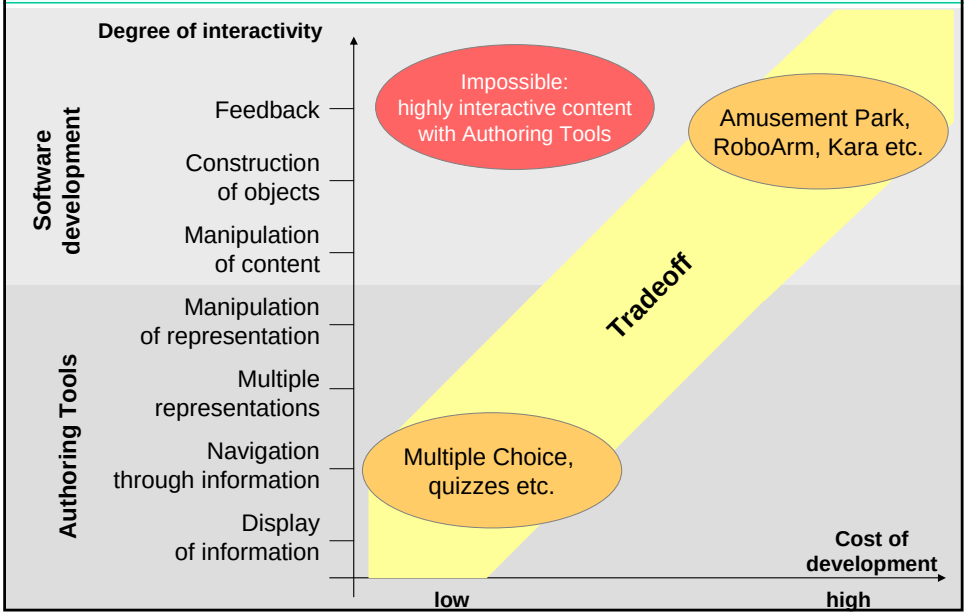
ILE Guideline #3: Levels of interactivity
Interactivity level 6: Creating content objects



Users create their own geometrical objects and proofs on their properties.

[www.cinderella.de]

ILE Guideline #3: Levels of interactivity
The Interacitivity Tradeoff



ILE Guideline #4: Visualization & Usability

ILE are used for learning.

Learners should be able to start learning immediately.

ILEs must therefore be as easy to use as possible.

Visualization allows more efficient understanding than formal displays.

ILE Guideline #5: Designing for the Nintendo Generation

Today's kids grow up in multimedia-rich environments, using devices their parents don't even know exist.

ILEs should strive to be (reasonably) attractive.

Also, don't use yesterday's technology to implement tomorrow's ILEs!

[Guzdial, Soloway: Teaching the Nintendo generation to program. Communications of the ACM, 45 (7), 2002.]

Future directions for ILEs?
Combining ILEs and CMC / CSCL

West Point Bridge Design Contest:

Combines ILE with web-based contest.

[bridgecontest.usma.edu]

Future directions for ILEs?
Combining ILEs and CMC / CSCL

We would love to ...

... see more good ILEs across the disciplines

... see innovative integration of ILE and some forms of CMC / CSCL

... see more collaboration with software engineering departments to build ILEs