



NTNU

Innovation and Creativity

My phd-project

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Overview

- Research context: E-LEN and QUIS
- State of the art
- Problem description
- Research methods and questions
- Preliminary results
- Further work

State of the art

- Standardization and reuse
- Design patterns
- IMS Learning Design
- Conole's Toolkit

Standardization and reuse

- Much work done on standardization and reuse of content (reusable learning objects)
- Several standards (!) : SCORM, IMS, IEEE LOM, Dublin Core
 - Problems: A lot of metadata, learning object granularity
- Standardization of learning activities: IMS Learning Design

IMS Learning Design

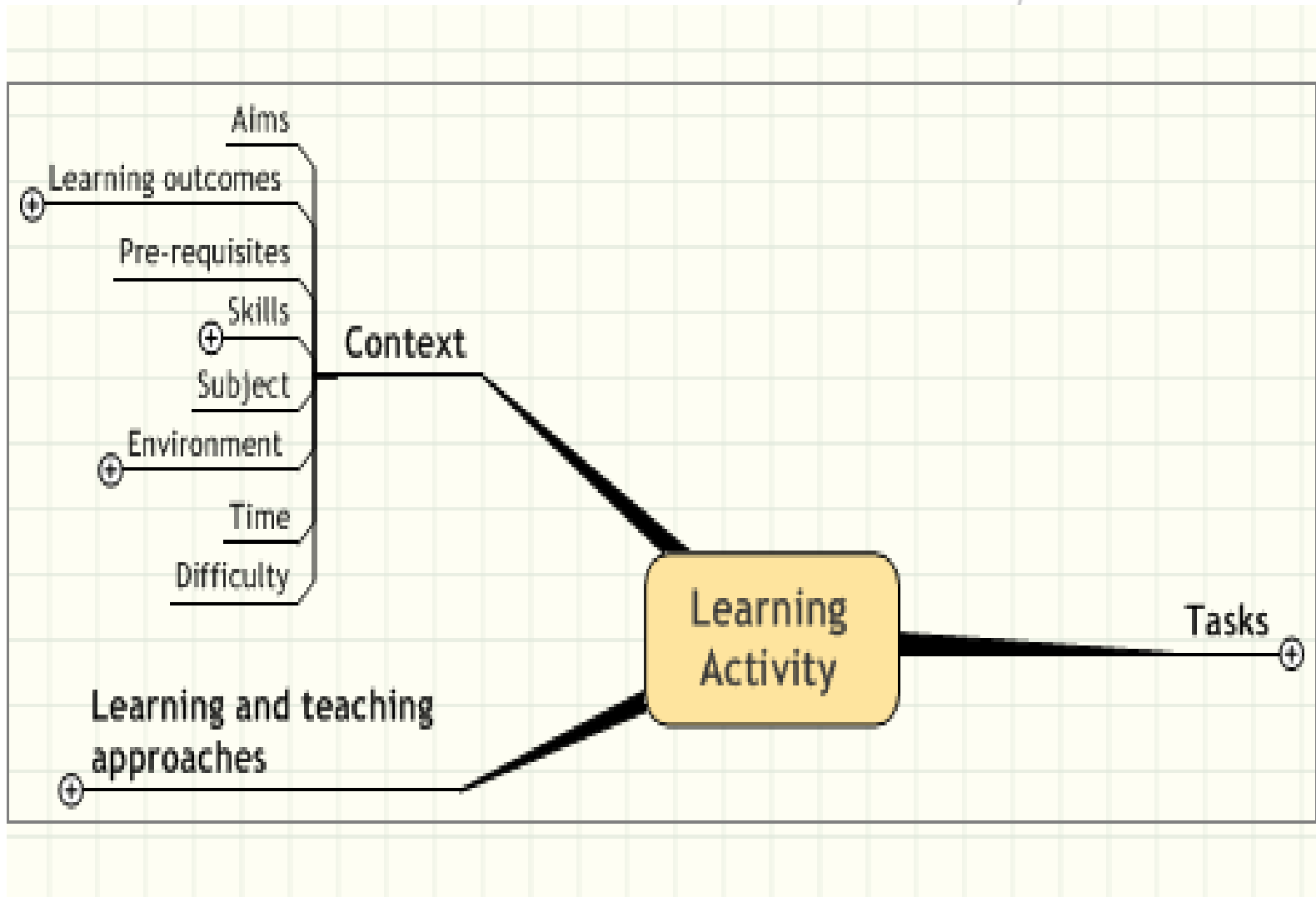
- IMS Global Learning Consortium: "The IMS-LD specification supports the use of a wide range of pedagogies in online learning, by providing a generic and flexible language."
- Problems:
 - Context vs reusability
 - Granularity of learning activities
 - Not very flexible for user
 - EML made for system developers, not end users
- Several systems under construction; LAMS, RELOAD, Bodington Buzz

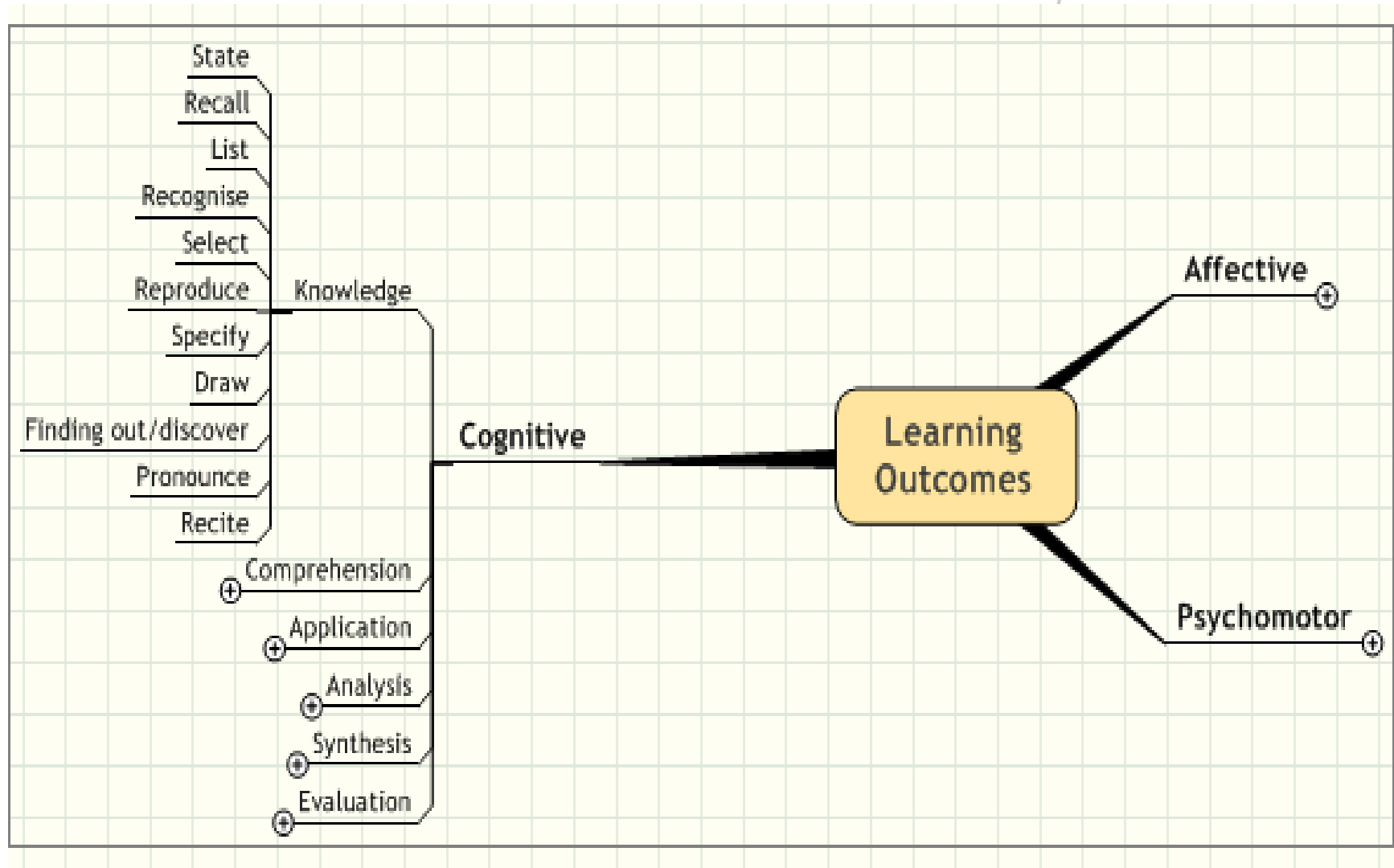
Design patterns

- Describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem in such a way that you can use this solution a million times over, without ever doing it the same way twice” (Alexander 1977)
- Archetypes on well-used solutions
- Design patterns can build expertise of experienced online teachers into the system (best practice), and teach novice online teacher how to work online.

Conole's Toolkit

- Toolkit to link the gaps between the ***potential*** of the technologies and ***application*** of good pedagogical principles.
- Provide guidance, but is not prescriptive
 - For teachers, not system developers
- Components;
 - Context: subject, level, learning outcomes, environments
 - Learning and teaching approaches: Theories and models
 - Tasks: types, techniques, tools, resources, interaction, roles





Problem description

Design of learning systems:

- More specifically on
 - **how the demand for...**
Individualization, Differentiation, Variation, Metacognition, Best practice
...can be integrated into the system design?
 - **What should be the characteristics of a next-generation e-learning system?**

→ Components in the design process:

Tools that will improve and assure the quality of the system design process of a learning system, when it comes to mentioned pedagogical principles.

Target group

- The target group of my study will be users of learning systems in higher education:
 - both system developers
 - end-users like teachers and students

Methods

- Literature review
 - Literature from the fields of pedagogies and information technology
 - Identify, systematize and present experiences, research results and problem areas
- Grounded theory
 - Depth interviews

Preliminary results

- Definition of variation and reusability in an "e-learning" setting.
 - Examples
 - References to the literature
- Combining the concepts:
 - Challenges
 - Opportunities
- Conclusions

Variation

- Varied learning styles ([Dunn & Dunn](#) / [H. Gardner](#))
- Varied levels of intellectual behavior ([Dreyfus](#) / [Blooms taxonomy](#))
- Varied pedagogical methods ([Koschmann](#))
- Varied teaching styles ([Grasha](#))
- Varied content (RLO)
- Varied media (multimedia)
- Varied goals ([Bloom et al](#))
- Varied evaluation ([Bloom et al](#) / [Conole](#))

The concept of variation

- Varied learning styles – Varied levels of intellectual behaviors
- Varied pedagogical methods – Varied teaching styles
- Varied content – Varied media
- Varied goals – Varied assessment

Reusability

Definition IEEE:

- "The ability of a component to function and integrate outside the environment for which it was primarily designed."

Barriers to reuse:

- Copyrights, technology, economy, missing standards, language and culture of sharing

Reuse and Varied Content / Media

- Reusable learning objects
 - Learning object granularity
- Several standards: SCORM, IMS, IEEE LOM, Dublin Core
 - A lot of metadata
 - Authorware needs to adapt to several (!) standards
- To satisfy different learning styles, it is necessary to provide learning content in a variety of media
- Categorizing according to both learning outcome / theme and media??

Reuse and Varied pedagogical methods / Teaching styles

- Traditionally reusable
- IMS Learning Design
 - "Context is the friend of learning and the enemy of reuse" (Robson)
 - Granularity of the "learning activities"
- Interactive pedagogical methods through wizards
- One teacher – one subject → several teachers – several subjects

Reuse and varied learning styles/ levels of intellectual behavior

- Learning styles:
 - Divide the student group into subgroups with similar needs
 - Easier to reuse "individualized" material.
- Dilemma: Capitalize or Compensate?
- Goals: Individualization / differentiation
 - Need to know the different types of users

Dreyfus' stages:

Gardner's intelligences:

	Novice	Advanced beginner	Competence	Proficiency	Expert
Visual					
Verbal					
Logical					
Bodily					
Musical					
Interpersonal					
Intrapersonal					
Naturalistic					

Reuse and varied goals / assessments

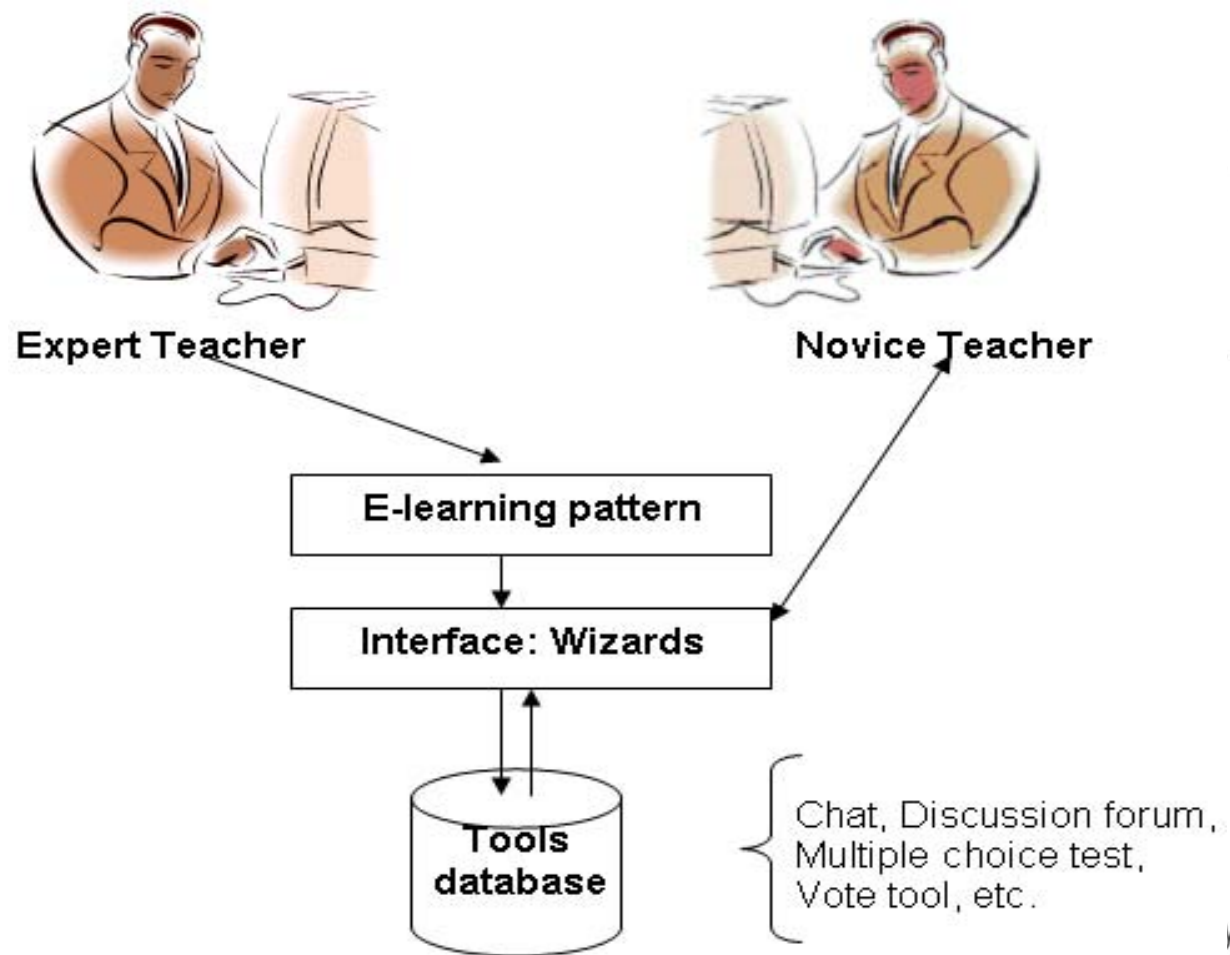
- Didactical triangle:
 - What to be learned (content)
 - The facilitator for learning (teacher)
 - The learner:
 - Knowledge
 - Skills
 - Attitudes
- Digital assessment tools that give students with different individual needs the same opportunity for fair results.
- Digital portfolios
 - Need to consider varied learning styles

Conclusions

(Variation and reusability)

- Saving money (reuse) \leftrightarrow quality (variation)
- Reuse may also give better quality, but needs to be seen in connection with other aspects, e.g. variation
- Learning objects and learning activities are not the only important aspects if the goal is quality *and* reuse.

Best practice & design patterns



E-learning design pattern

Name: “Moderation of an asynchronous online group”

Category: Pedagogical design pattern

Problem: What should moderators do in order to facilitate effective learning in asynchronous online groups?

Analysis: ...

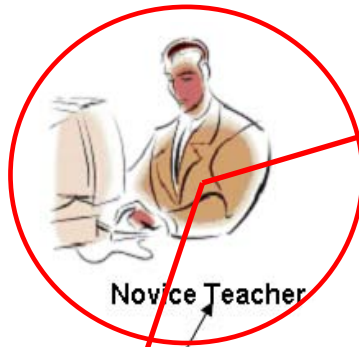
Solution: 3 main moderating activities:

- Organizational moderating activities
 - *(setting the agenda, objectives, procedural rules, netiquette, encourage the participants to introduce themselves)*
- Social moderating activities
 - (sending welcoming messages, thank you notes, prompt feedback, set a positive tone),
- Intellectual moderating activities
 - (asking questions, provide low-effort contributions, probing responses, refocusing discussion).

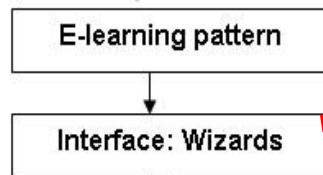
Support for the instructor: Wizards



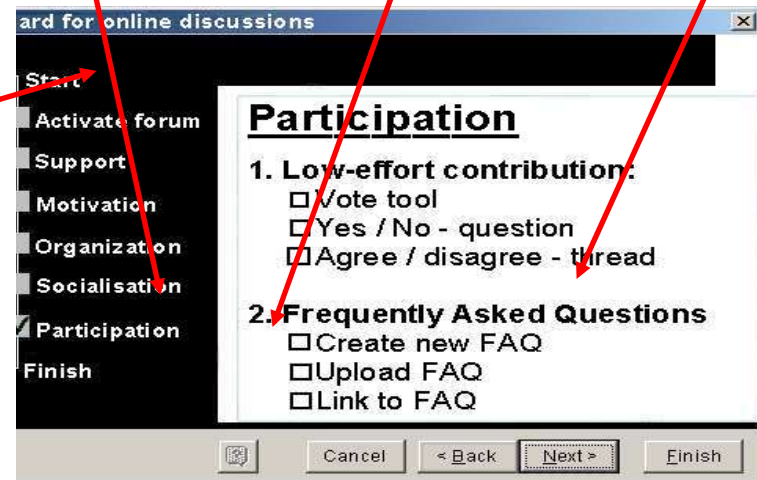
Expert Teacher



Novice Teacher



Chat, Discussion forum,
Multiple choice test,
Vote tool, etc.



The Dunn & Dunn model

- 21 elements grouped as 5 stimuli;
 - Environmental
 - Emotional
 - Sociological
 - Physiological
 - Psychological preferences.
- Visual learning style
- Aural learning style
- Kinesthetic learning style
- Tactile learning style



Multiple intelligences

1. Visual / spatial intelligence
2. Verbal / linguistic intelligence
3. Logical / mathematical intelligence
4. Bodily / kinesthetic intelligence
5. Musical / rhythmic intelligence
6. Interpersonal intelligence
7. Intrapersonal intelligence
8. Naturalistic intelligence

H. Gardner



Dreyfus

- Novice → needs rules, models, prescriptions
- Advanced beginner
- Competence → chooses a plan of progress based on experience
- Proficiency
- Expertise → see what needs to be done, and see how to achieve the goal.



Bloom's taxonomy for the cognitive domain

Knowledge	Observation and recall of information
Comprehension	Understanding information
Application	Use information, methods, concepts, theories in new situations
Analyses	Seeing patterns, organization of parts, recognition of hidden meanings
Synthesis	Use old ideas to create new ones, generalize from given facts, relate knowledge from several areas
Evaluation	Compare and discriminate between ideas, assess value of theories...

Krathwohl et al.'s taxonomy for the affective domain

Receive	Open to experience, willing to hear
Respond	React and participate actively
Value	Attach values and express personal opinions
Organize or conceptualize values	Reconcile internal conflicts, develop value system
Internalize or characterise values	Adopt belief system and philosophy

Bloom's taxonomy for the psychomotor domain

Imitation	Copy action of another, observe and replicate
Manipulation	Reproduce activity from instruction or memory
Precision	Execute skill reliably, independent of help
Articulation	Adapt and integrate expertise to satisfy a non-standard objective
Naturalization	Automated, unconscious mastery of activity and related skills at strategic level



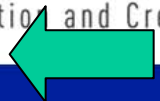
Koschmann

Paradigms	Event marking emergence of paradigm	Theory of learning	Model of instruction	Research issue
CAI	Coursewriter I	Behaviorism	Programmed instruction	Instructional efficacy
ITS	Carbonell's Dissertation	Information processing theory	One-to-one tutorial, interactive	Instructional competence
Logo-as latin	Publication of "Mindstorms"	Cognitive constructivism	Discovery based learning	Instructional transfer
CSCL	NATO workshop	Socially oriented theories of learning	Collaborative learning	Instruction as enacted practice



Grasha

- **Expert:**
 - Possesses knowledge and expertise that students need.
 - Transmitting information / insuring that students are well prepared.
- **Formal Authority:**
 - The correct and standard ways to do things
 - Providing students with the structure they need to learn.
- **Personal Model:**
 - Believes in “teaching by personal example”
- **Facilitator:**
 - Emphasizes the personal nature of teacher-student interactions, with the goal to develop in students the capacity for independent action, initiative, and responsibility.
- **Delegator:**
 - Developing students’ capacity to function in an autonomous fashion
 - Teacher is available as one of many resources



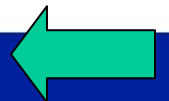
Bloom et al: 3 domains of educational activities

- The cognitive domain: for mental skills (Knowledge)
- The affective domain: for growth in feelings or emotional areas (Attitude)
- The psychomotor domain; for manual or physical skills (Skills)



Assessment in the cognitive domain (Bloom)

Category	Verbs for evaluation of each category
Knowledge	Reproduce, define, describe, identify, list etc
Comprehension	Explain in own words, give examples, summarize etc
Application	Solve, apply, compute, demonstrate etc.
Analysis	Analyze, compare, contrast, identify, illustrate etc
Synthesis	Categorize, combine, create, design, modify, reconstruct etc
Evaluation	Conclude, criticize, defend, discriminate, evaluate etc.



Conole's Toolkit: Assessment

