

Instructional Design Models and Methods

revised version of a talk at

Online Learning in Diplomacy Workshop

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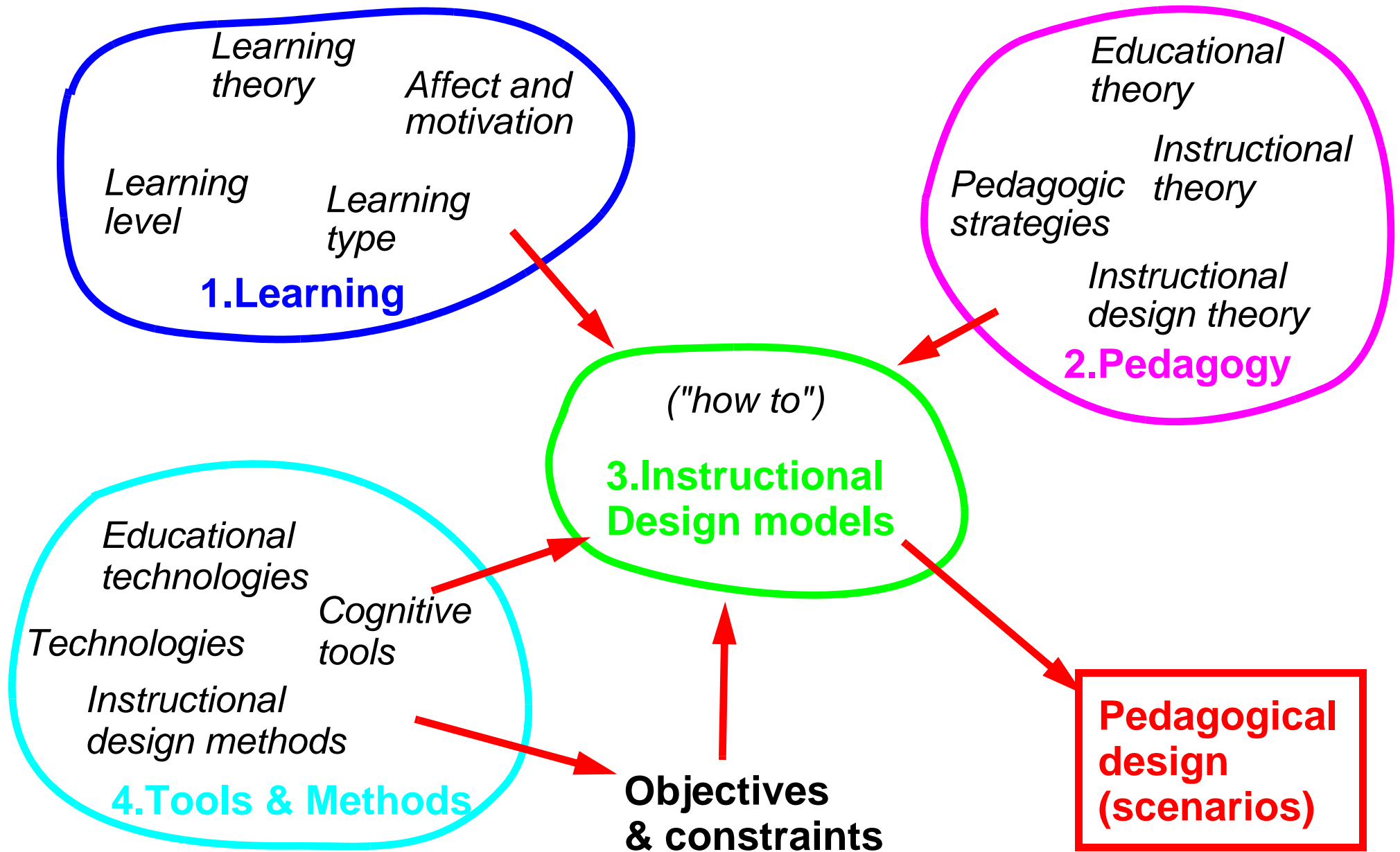
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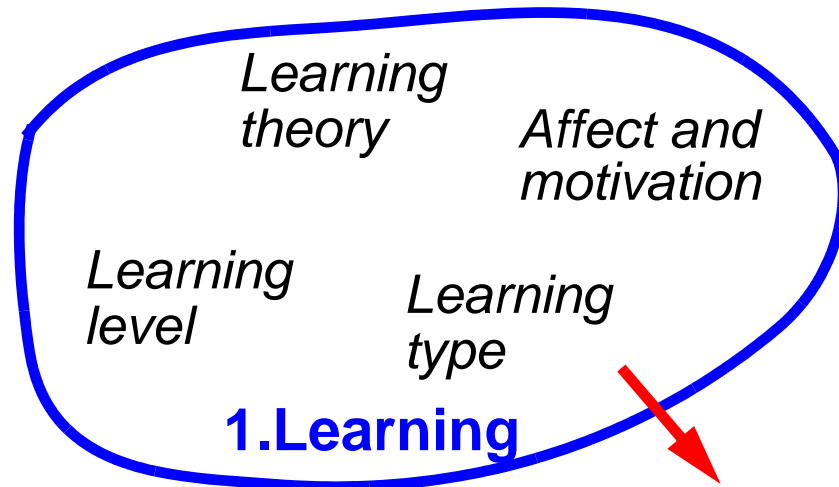
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1. What's behind a pedagogical design ?



2. Learning



Why bother ?

- "Learning" is a complex multi-dimensional phenomenon
- There are different learning types, learning levels etc.
- It's not obvious to identify learning goals
 - ... learning theory can help a bit, in particular its taxonomies
- **Learning theory strongly influences pedagogical theory & practice**

2.1.Types of Learning

1. **Attitudes:**

- Disposition or tendency to respond positively or negatively

2. **Factual Information** (Memorization):

- Processing of factual information and remembering

3. **Concepts** (Discrimination):

- ... how to discriminate and categorize things. It is not related to simple recall and must be constructed.

4. **Reasoning** (Inference, Deduction):

- thinking activities that involve making or testing inferences

5. **Procedure** Learning:

- being able to solve a certain task by applying a procedure.

6. **Problem solving:**

- identification of subgoals, use of methods to satisfy subgoals.

7. **Learning Strategies:**

- learning how to learn, very difficult to teach !

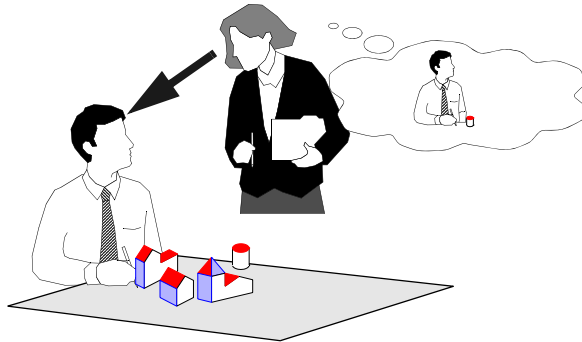
2.2.Levels of Learning

(Bloom's taxonomy of the cognitive dimension)

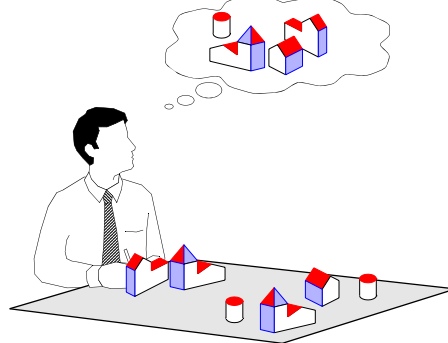
1. **Knowledge**: recall data or information
 - ... describe, identify, recall, arrange, define, duplicate, label, list,
2. **Comprehension**: be able to translate into own words.
 - ... give example, classify, describe, discuss, explain, express, identify, ...
3. **Application**: Use a concept in a new situation
 - ... apply, change, construct, compute, choose, demonstrate, write, ...
4. **Analysis**: split concepts into parts and understands the structure
 - ... analyze, break down, relate, appraise, calculate, categorize, compare, ...
5. **Synthesis**: Produce something from different elements
 - ... summarize, arrange, combine, categorize, assemble, collect, compose, ...
6. **Evaluation**: Make judgements, justify a solution, etc.
 - ... appraise, interpret, argue, assess, attach, compare, defend, predict, ...

2.3. Learning theories

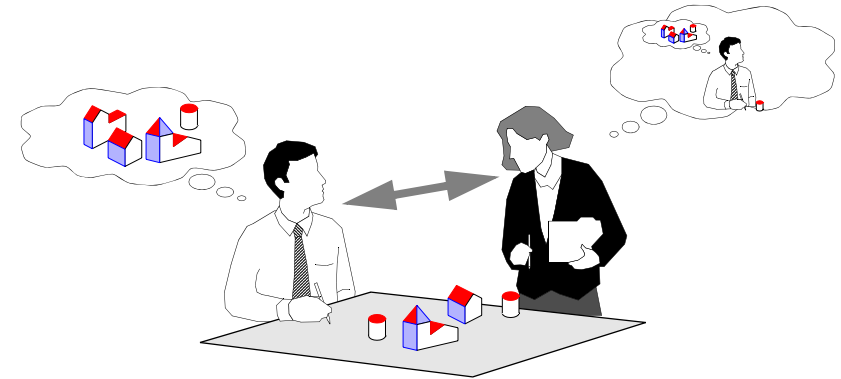
look at learning in different ways ... lead to different designs



behaviorism
(change behavior)

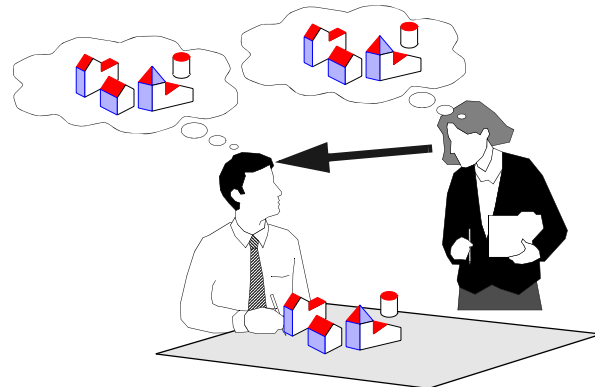


constructivism
(construct knowledge)

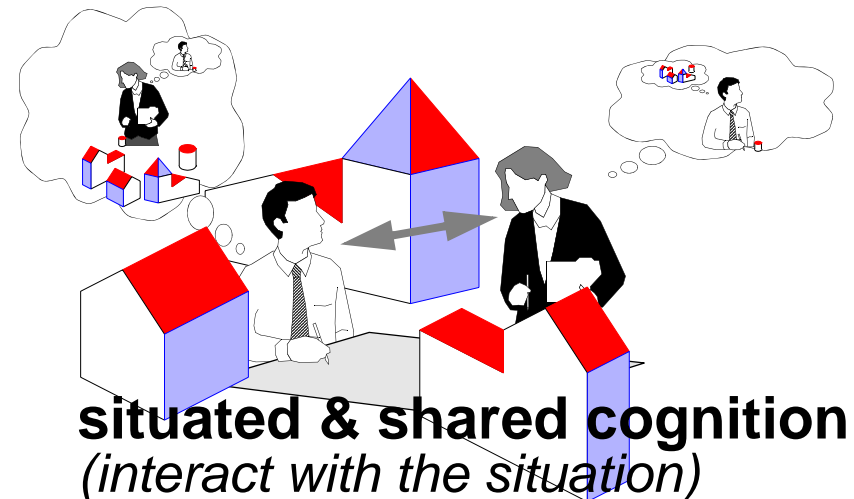


social cognition
(interact with others)

higher learning
levels →

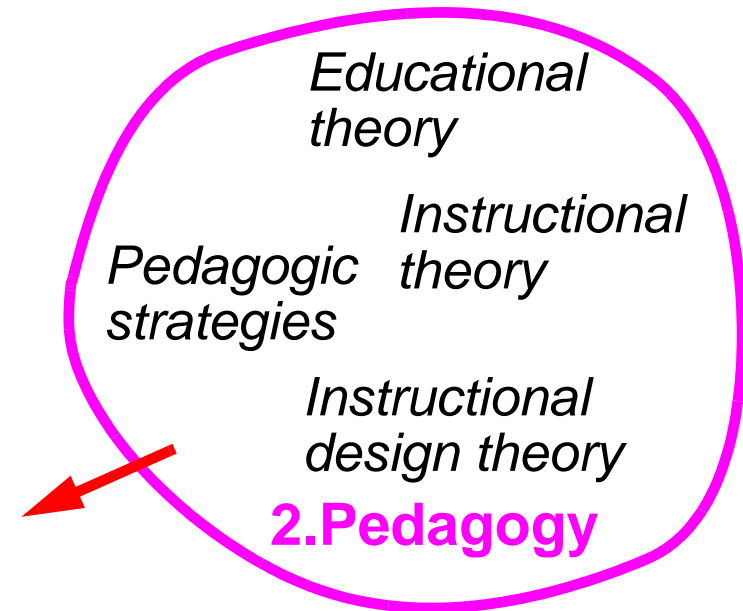


cognitivism
(reach knowledge objectives)



situated & shared cognition
(interact with the situation)

3. Education, pedagogy, instruction



Why bother ?

- **There are very few generally applicable principles**
 - **Different pedagogies relate to different learning goals & types & levels**
- ... try to have a "vocabulary" of strategies and tactics

3.1. Major pedagogical approaches (strategies)

(Baumgartner & Kalz), there are many other typologies ...

<i>Learning I Transfer</i>	<i>Learning II Tutor</i>	<i>Learning III Coach</i>
Factual knowledge, “know-that”	Procedural knowledge, “know-how”	Social practise, “knowing in action”
Transfer of propositional knowledge	Presentation of predetermined problems	Action in (complex and social) situations
to know, to remember	to do, to practise	to cope, to master
Production of correct answers	Selection of correct methods and its use	Realization of adequate action strategies
Verbal knowledge, Memorization	Skill, Ability	Social Responsibility
to teach, to explain	to observe, to help, to demonstrate	to cooperate, to support
<i>Teaching I</i>	<i>Teaching II</i>	<i>Teaching III</i>

(see “Overview of pedagogic strategy models” [p. 19])

3.2.A rough typology of learning types

<i>Learning categories - suitable for instructional design planning</i>	
<i>I: know that</i>	I-a Facts: <i>recall, description, identification, etc.</i>
	I-b Concepts: <i>discrimination, categorization, discussion, etc.</i>
<i>II: know how</i>	II-a Reasoning and procedures: <i>inferences, deductions, etc. + procedure application</i>
	II-b Problem solving and production et strategies: <i>identification of subgoals + application of heuristics/methods</i>
<i>III: knowing in action</i>	III Situated action: <i>action strategies in complex and authentic situations</i>
<i>IV: Other</i>	IV Other: <i>e.g. motivation, emotion, reflection, i.e. elements that could intervene in all the other categories</i>

- This typology reflects a combination from “Major pedagogical approaches (strategies)” [p. 11], “Types of Learning” [p. 7] and “Levels of Learning” [p. 8]

- **It's purpose is to facilitate planning of an instructional design (teaching)**

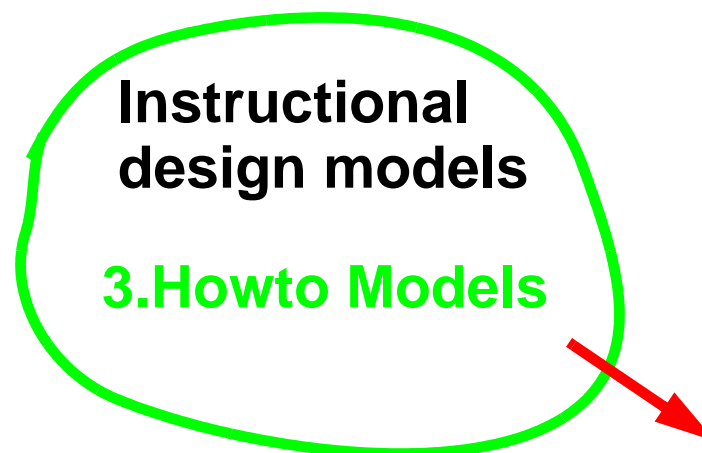
3.3. Pedagogical strategies and methods?

E.g. Khan's (2000) list of Methods and Strategies

Presentation	Exhibits
Demonstration	Drill and Practice
Tutorials	Games
Story Telling	Simulations
Role-playing	Discussion
Interaction	Modeling
Facilitation	Collaboration
Debate	Field Trips
Apprenticeship	Case Studies
Generative Development	Motivation

... some (combinations of) strategies work better for some learning goals

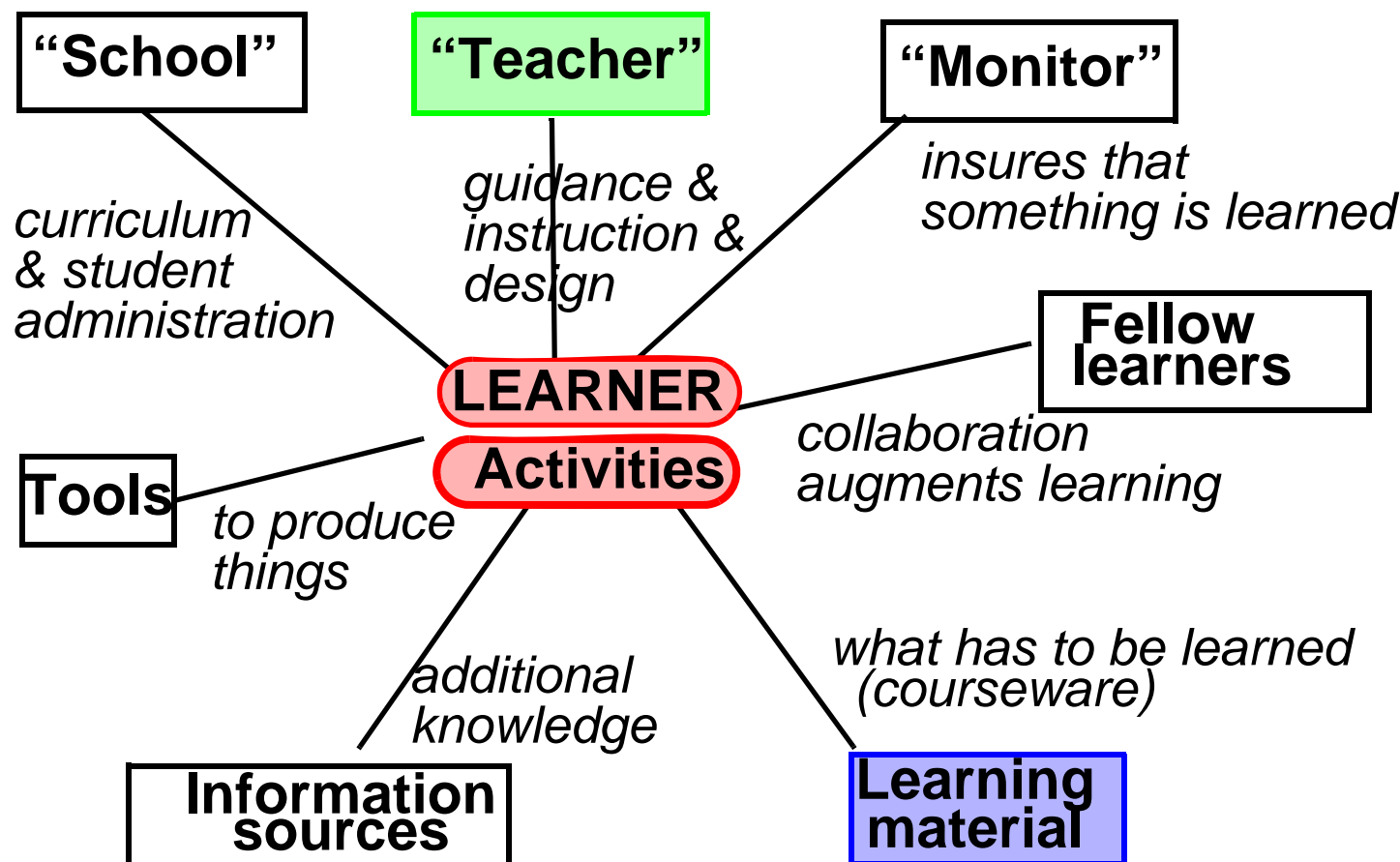
4. Instructional design models



Types of instructional design models:

1. **Functions** of a learning environment
2. **Quality** of a design
3. **Complementary** models that will enhance a design (*not in this talk*)
4. **Change management** models (*not in this talk*)
5. **Pedagogic strategy models**
6. Instructional design **methods**: how to implement a design (later)

4.1. **Functions** of a learning environment



modified from Sandberg

- **Focus can change**
 - E.g. **teacher role** is central in activity-based designs
 - E.g. **Learning material** is important for mass-education

4.2.What is good learning design ? (Quality)

- **The debate is open, several grids exist**

Example 1:

Merril's model for 5 Star Instructional Design's

Not applicable to transmissive ("spray-and-pray") / or exploratory designs ("sink-or swim").

- 1. Does the courseware relate to real world problems?**
- 2. Does the courseware activate prior knowledge or experience?**
- 3. Does the courseware demonstrate what is to be learned ?**
- 4. Can learners practice and apply acquired knowledge or skill?**
- 5. Are learners encouraged to integrate (transfer) the new knowledge or skill into their everyday life?**

Example 2:

Socio-constructivist features of on-line teaching (Taylor and Maor)

1. **Relevance** : How relevant is on-line learning to students' professional practices?
2. **Reflection** : Does on-line learning stimulate students' critical reflective thinking?
3. **Interactivity** : To what extent do students engage on-line in rich educative dialogue?
4. **Tutor Support** : How well do tutors enable students to participate in on-line learning?
5. **Peer Support** : Is sensitive and encouraging support provided on-line by fellow students?
6. **Interpretation** : Do students and tutors make good sense of each other's on-line communications?

4.3. Overview of pedagogic strategy models

- There are dozens ...

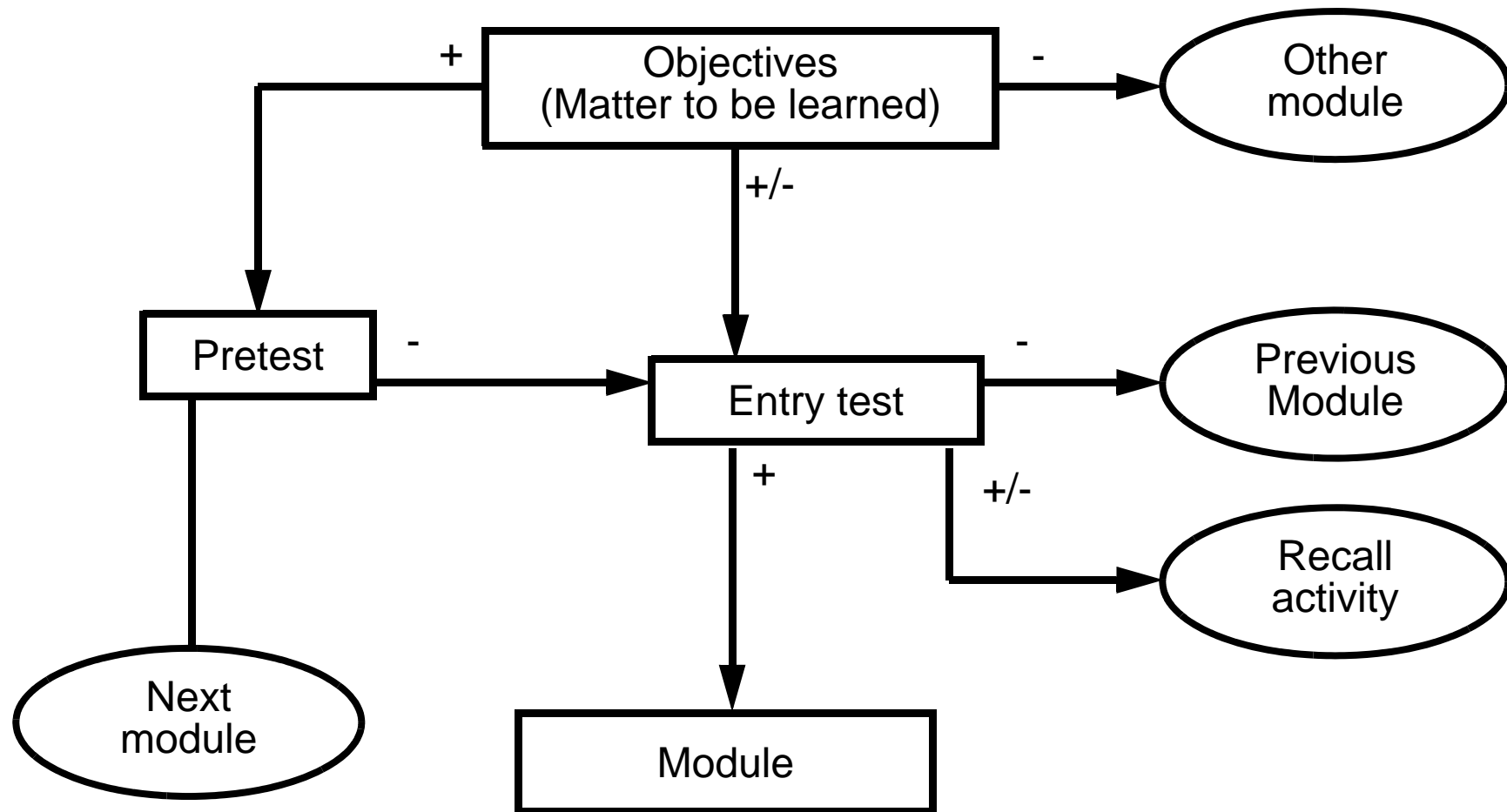
A few models sorted by 2 dimensions:

	<i>formal</i>	<i>open / informal</i>
<i>Learning I-a (information)</i>	Lecturing, "page turners", drill & practise,	on-demand tutorials, handbooks,
<i>Learning II-b (concepts)</i>	Writing-to-learn Exploratory concept learning	Literature review
<i>small scale Learning II-a (know how)</i>	exercising, e-instruction , simulations,	on-demand e-instruction, self-learning with textbooks,
<i>large scale Learning II-b (know how)</i>	Problem-based learning , Inquiry-based learning , simulation & gaming,...	help desk model , on-demand tutoring, knowledge management,...
<i>Learning III (knowing in action)</i>	Project-based learning formal e-portfolios	Communities of practice Mentoring ,

4.4.E-instruction model

Part 1: A modular course architecture

- collections of reusable learning objects



Part 2: Module design

- **Should follow (some) sound behaviorist/cognitivist design principles, e.g. Gagne's 9 steps of instruction**
 - a. **Gain attention** e.g. present a good problem or a new situation.
 - b. **Describe the goal**: e.g. state what students will be able to accomplish.
 - c. **Stimulate recall of prior knowledge** (facts, rules, procedures or skills) and show how knowledge is connected.
 - d. **Present the material** to be learned e.g. text, graphics, simulations, figures, pictures, etc.
 - e. Provide **guidance for learning** (instructions on how to learn on a different channel)
 - f. Elicit **performance "practice"**, let the learner do something with the newly acquired behavior, practice skills or apply knowledge. At least use MCQ's.
 - g. Provide **informative feedback**, show correctness of the trainee's response, analyze learner's behavior, etc.
 - h. **Assess** performance test and also more general progress information
 - i. Enhance retention and **transfer**: inform the learner about similar problem situations, provide additional practice. Put the learner in a transfer situation.

4.5.Problem-based learning model

- **Main purpose: develop problem-solving skills in a subject area**

Outline of the model:

1. Students receive the following learning materials:

- a.the problem;**
- b.a list of objectives that the student is expected to master while working on the problem;**
- c.a reference list of materials that pertain to the basic objectives;**
- d.questions that focus on important concepts and applications of the knowledge base.**

2. Students work in teams to complete the project, resolve the problem, and accomplish the learning objectives.

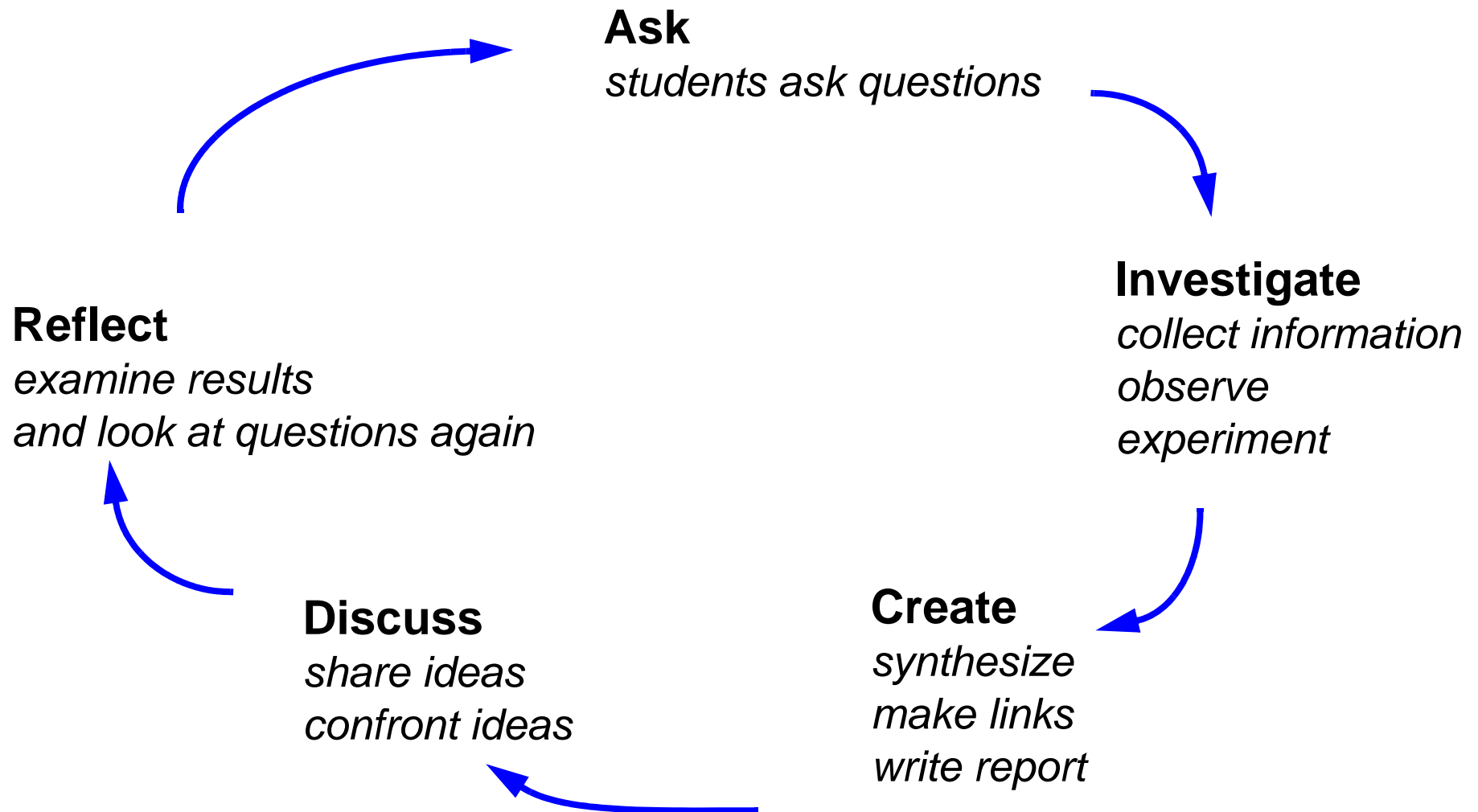
- a.each student has a particular role in the team - leader, facilitator, recorder, or team member**
- b.time allotted to each project is fixed**
- c.the team schedules its own activities and decides how to use the allotted time**

3. Student performance is evaluated by instructors, peers, and self using questionnaires, interviews, observation, and other assessment methods.

4.6. Inquiry-based learning model

Purpose: concept learning and investigation methodology

Typical cycle of student activities (done several times)



4.7. Project-based learning model

- **Main purpose: "deep learning" (applicable knowledge)**

Outline of the model defined by "Moursund":

- **A typical project has 4 phases:**

(1) Getting started

- a. Define the topic of overall course**
- b. Define timelines, milestones and assessment methods**
- c. Identify resources**
- d. Identify prerequisites**
- e. Advance organization (project-methodology, skills that will have to be acquired etc.)**
- f. form teams**

(2) Initial Team Activity - Project Planning

- a. Knowledge pooling by team members**
- b. Initial project specification, e.g. formulate objectives and questions. At university level, this should lead to a research design.**
- c. Planning, e.g. definition of work packages, milestones and timelines**
- d. Formal teacher feedback**
- e. Revision of the project specification and plan (if need return to steps 2 and 3)**

(3) Project Implementation

- a. Have students complete one task and milestone at a time. Make sure that students engage in regular meetings**
- b. Refining of project definition**
- c. Sharing between team members (make sure that there is collaboration and cooperation, you decide)**
- d. Provide feedback (this includes peer-to-peer tutoring, global feedback to the class for all projects, etc.)**
- e. Move toward completion.**
- f. Repeat all steps until all milestones have been met**

(4) Completion

- a. Students have to polish the final product and prepare associated presentations.**
- b. Assessment: The whole class should assist at the presentation of the results. Students may have the occasion to integrate a last feedback.**
- c. Closing session with the whole class discussing the experience**

Notes:

- There are many variants of this kind of model**
- ICT-enhanced models put more emphasis on intermediary products and exchange activities (see next)**

4.8. Structured project-based learning model (variant)

Level 1: Teacher roles and the overall design

- Strong story-boarding, projects are done individually or in small groups
- Teacher role is crucial & complex



Teacher as orchestrator

designs the environment
designs the global project
designs flexible tasks
designs exchange activities



Teacher as monitor

makes audits
reads blogs
controls project plans
evaluates



Teacher as facilitator

gives feedback
answers questions
writes tutorials
provides examples
provides links

Projects

Scenario 1

Goals and questions
 stage 1
 stage 2
 stage 3 ...
 output: objectives+
 research questions

discussion at class level

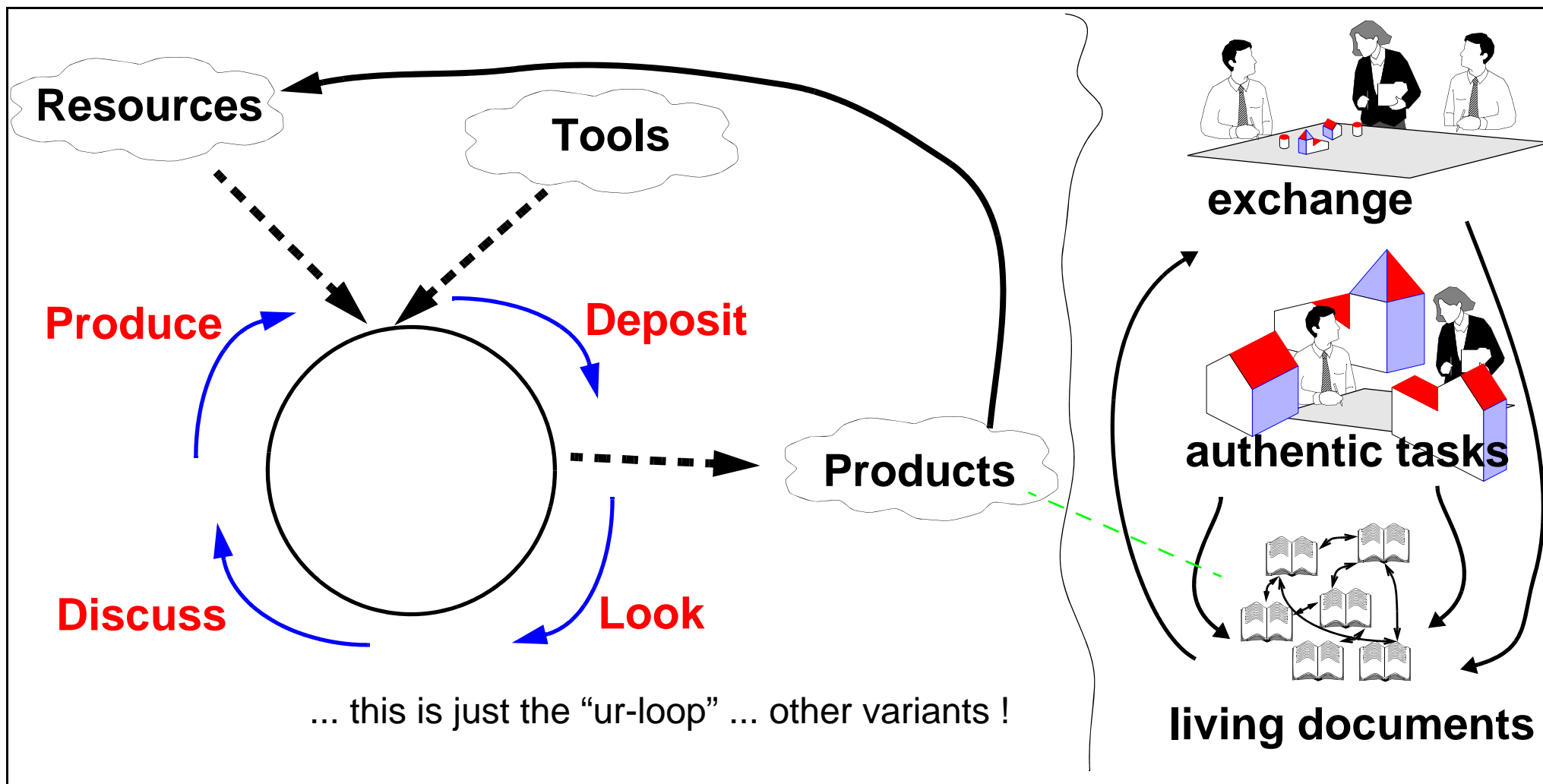
Scenario 2

R & D plans
 stage 1
 stage 2
 stage 3
 output: plan v.1

.....

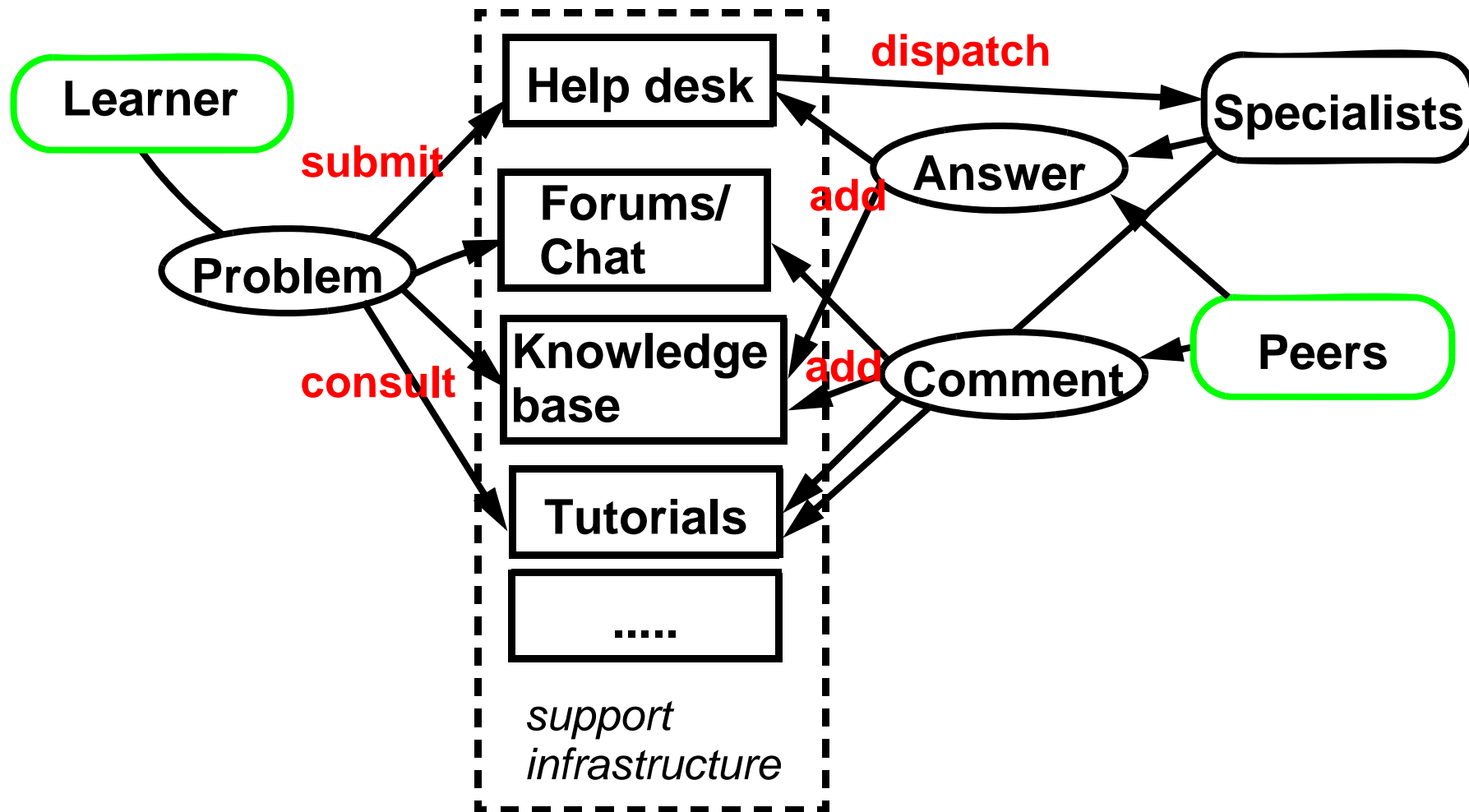
Level 2: Scenario orchestrations with workflow loops and ICT:

- Scenarios are **sequences of activity phases (stages)** within which group members **do tasks** and **play specific roles**
- Each activity leads to a product that can be discussed and reused



4.9.A "help desk/knowledge management model" for life-long learning

- Purpose: support informal workplace learning
- Needs involvement of several organizational units



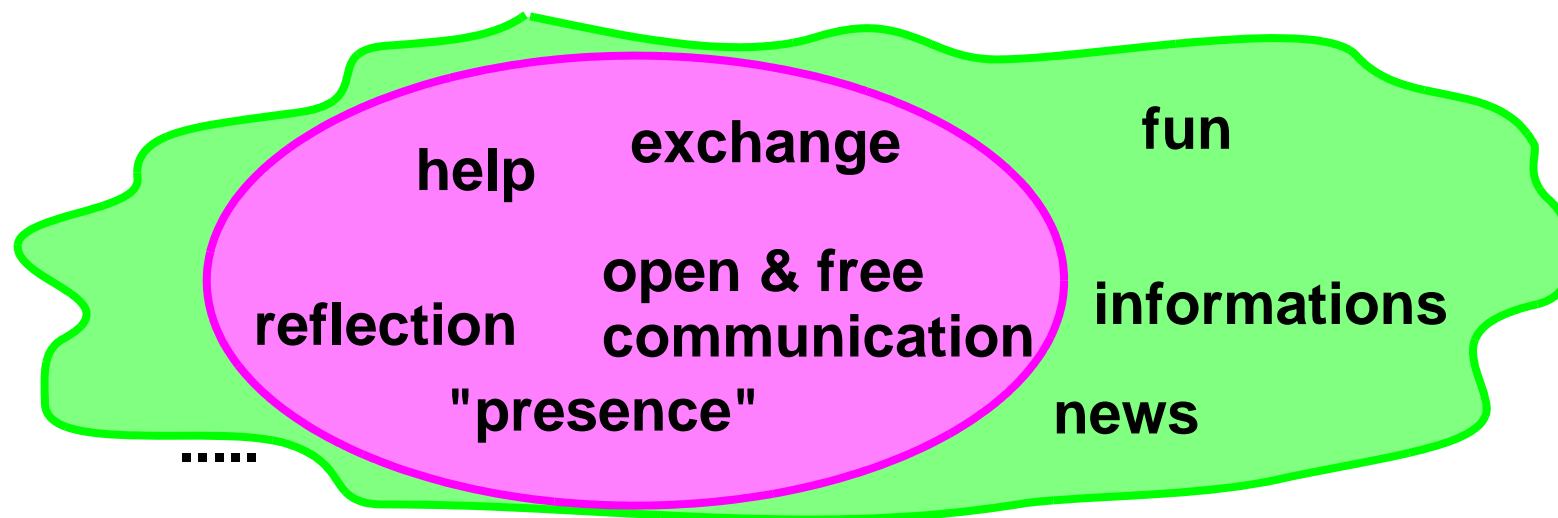
4.10. Community of practise model

Purpose: Engage actors in communities that learn

- often used in professional development, e.g. teacher training
 - members of a community tend to make better progress
 - knowledge through **enculturation** (collective memory)
 - good communities are **knowledge management** aware

Use of portal software

- A place to find informations, news etc.,
- A place to exchange, to reflect, to be,



... difficult to set up (people don't collaborate naturally)

4.11.Mentoring

Purpose: Formal or informal "elder" to "younger" training

1. Conditions: Mentoring works when:

- individuals are committed to it,
- there is a goal (see the mentoring contract),
- there is a supportive environment.

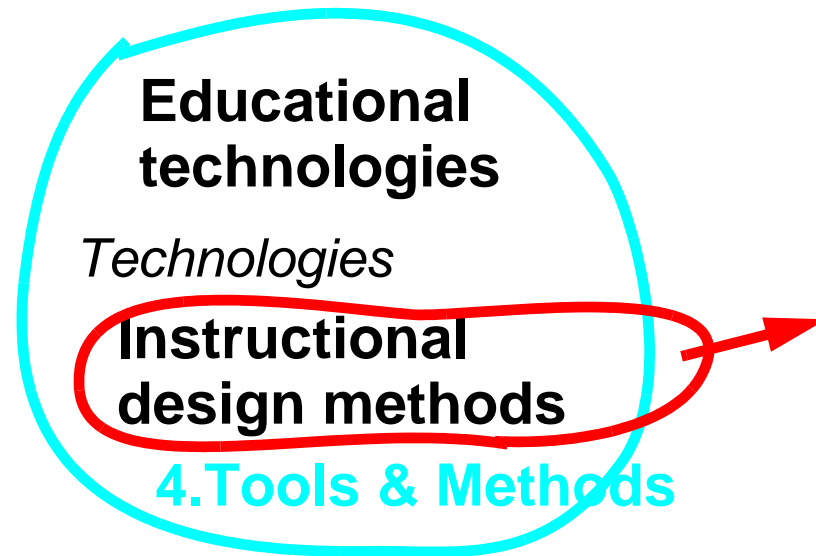
2. Stages to set up a mentoring program

- Identify development needs of protégé(s)
- Identify and recruit mentor(s).
- Prepare/train mentor.
- Mentor and protégé negotiate a mentoring agreement (see below).
- Carrying out (implementation can include meetings with a facilitator).
- Evaluation.

3. Contract:

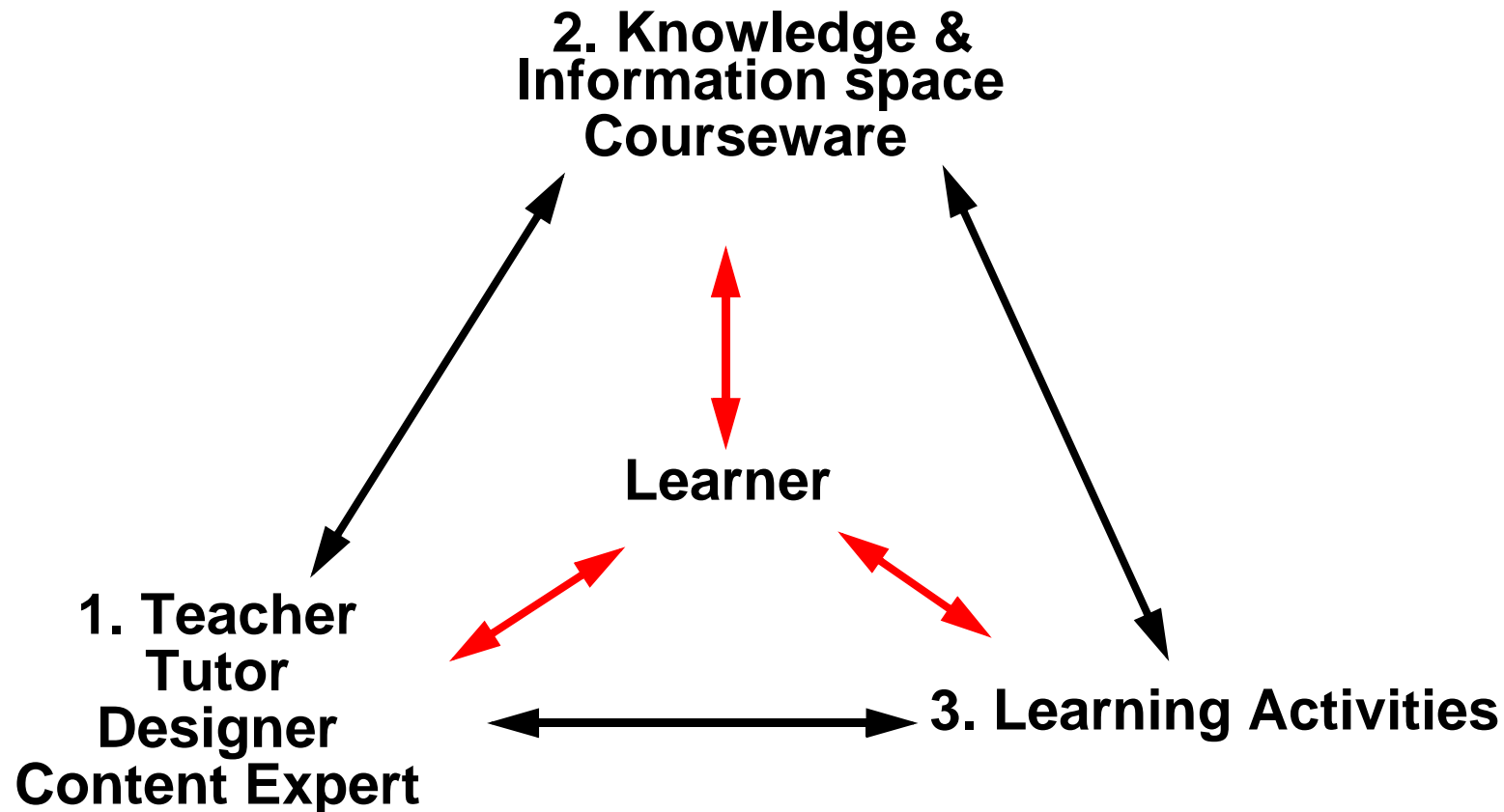
- Mentors and proteges should agree on a formal contract.
- Contents: development objectives, roles and expectations, duration, ground rules, other comments.
- Both have to sign it (and believe in it).

5. Tools & Methods



- Provide methodologies for design and implementation
- Note: Often instructional design methods are also called "instructional design models"

5.1. Plan at least for 3 areas



Define: who does what and where (before, during and after)

- **1. Roles, structures and relations between actors**
- **2. Contents (including places for knowledge exchange)**
- **3. Learning activities**

5.2.Method: heavy duty industrial design ?

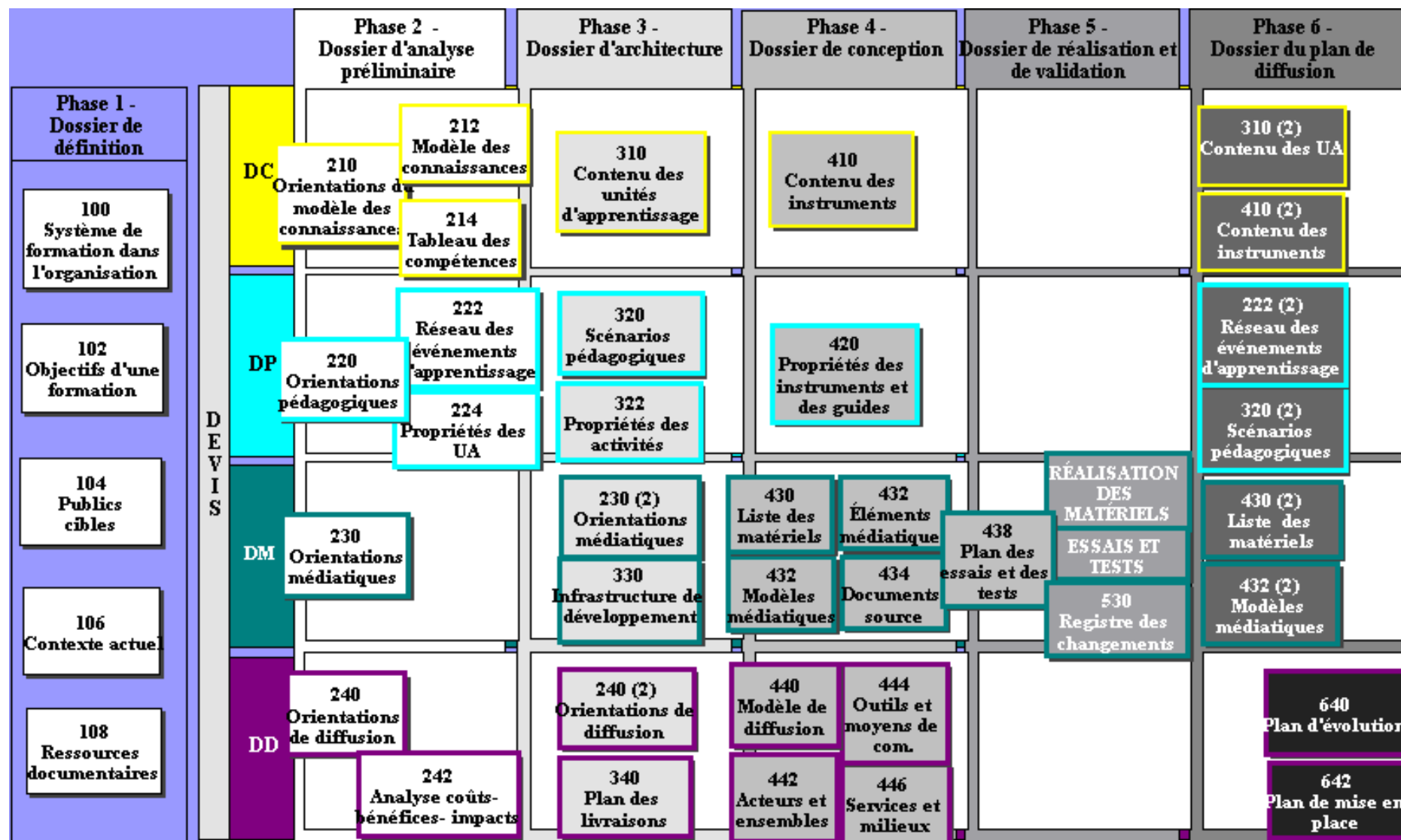
E.g. MISA/MOT/ADISA: Course designer works on "4 models"

1. **Knowledge** and **Skill** Representation
DC: Design of Content (know-that **and** know-how)
2. Application of **Teaching Methods** and Approaches
DP: Design of Pedagogical specifications
3. Specification of **Learning Materials**
DM: Design of Materials
4. **Delivery** Planning
DD: Design of Delivery

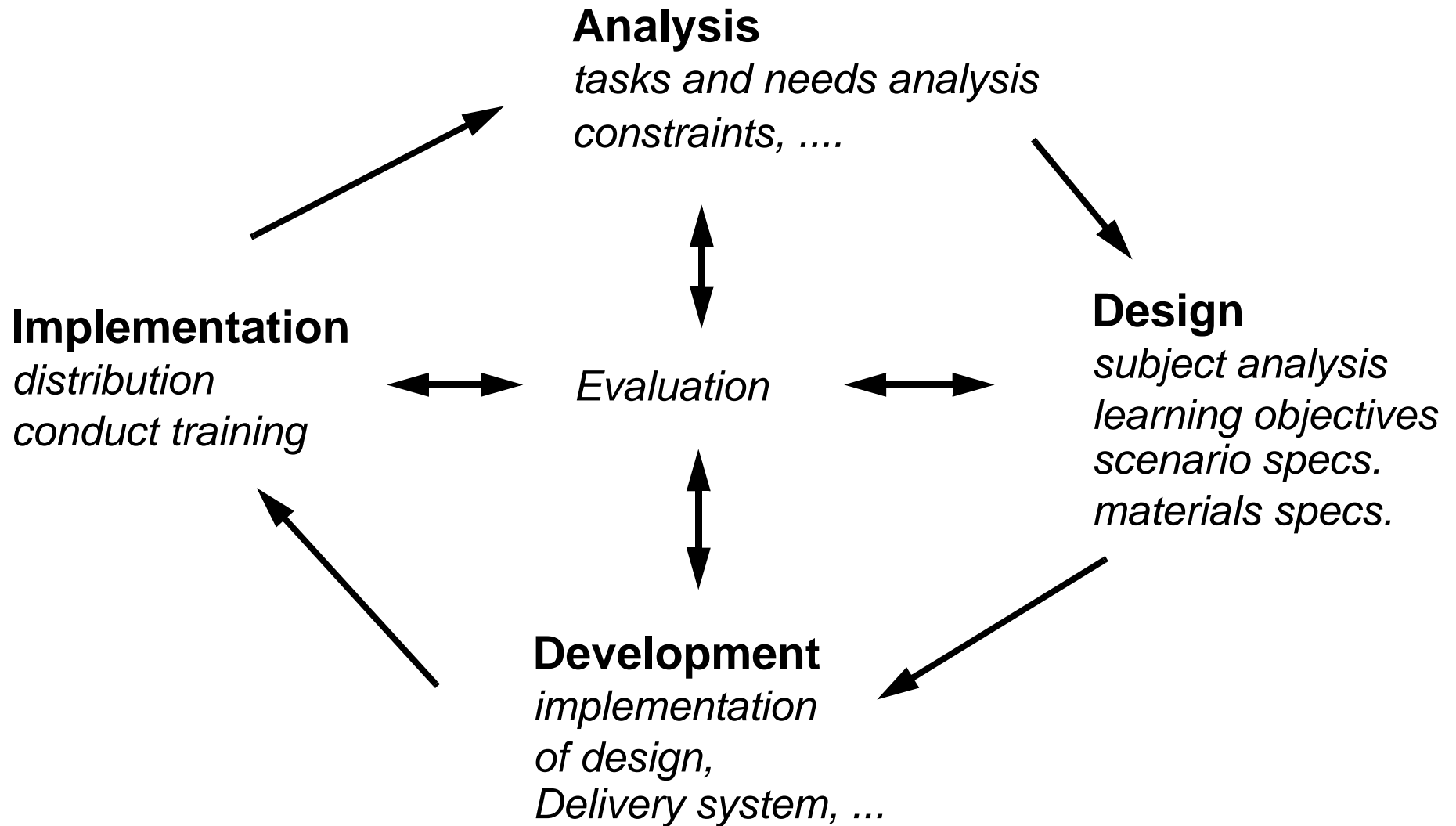
Using such a complex method (see next slide) is worth the effort:

- if you plan do it right
- if your projects are large scale

url: <http://www.cogigraph.com>



5.3. Method: Medium-weight instructional systems design



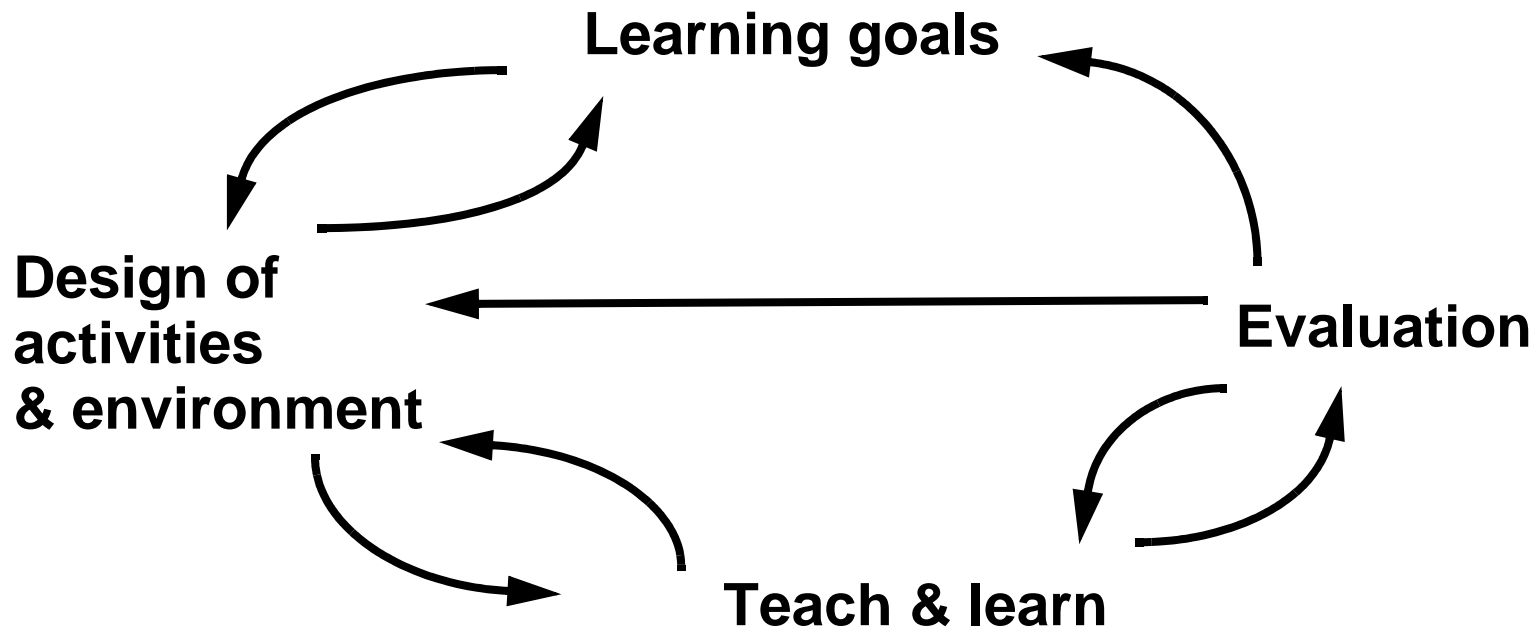
An ADDIE-like model

5.4.Method: Rapid participatory prototyping

Principles:

- a.Cooperating: all stake-holders (including learners) participate
- b.Experimenting: ideas are or may be embedded within current conditions, e.g. they may emerge during teaching
- c.Contextualizing: Setting and situations are particular, e.g. each class may evolve differently
- d.Iterating: The not-yet-known, draws from the point of view of use

The implementation cycles:



5.5. Technology (not part of this talk)

Technology is not innocent !

.... do not trust vendors who make universal claims

	Teaching I know-that	Teaching II know-how	Teaching III knowing-in-action
E-learning Systems	***	*	
Hypertext, Wikis, CMS (exploring, reading)	***	*	
Groupware (help desk, discussion)	*	***	**
Microworlds (exercising, simulating)		***	*
Hypertext, Wikis, CMS (producing, collaborating)	**	*	***
C3MS (community portals), linked blogs	*	*	***
Comp. Supp. Coll. Learning	*	***	*

6. Executive summary

- Define **objectives** (what will your learners be able to do ?)
=> Only then look at pedagogical strategies and design models
- Reading is not learning, educational ICT is not just e-learning
=> One must “**do**” to learn, i.e. you must design **learning activities**
- Most people need **guidance** to achieve instructional goals
=> External conditioning (teaching, tutoring, monitoring)
- There are many ways to implement these principles

Some further reading:

<http://EdutechWiki.unige.ch/en/>

(under construction, unstable until 9/2006)