Networked Learning Conference 2008

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From design to evaluation of scripted networked collaborative learning environments

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Some provocative questions (I)

Are there any convincing (definite) answers?

- Are ICTs (New Technologies)? already at "class"
  - *Almost YES*: Computers, local networks and Internet access (and software?): at homes, classes, virtual environments
- Has the class really changed due to ICTs?
  - *Somehow NO*: If mainly used for Powerpoint presentations, "copy&paste-ready" material at the Internet
- Are teachers willing-ready to use ICTs at class?
  - *Almost NO*: Visit the "computer-based" class, when necessary, as e.g. with the chemistry lab

Some provocative questions (II)
Are there any convincing (definite) answers?

- Are ICTs missing or insufficient?
  - *Generally NO*: Lots of proposals in all sectors with a high rate of change/innovation (and consolidation?)
- Is there sufficient research in TEL?
  - *Almost YES*: many conferences, groups, journals, etc.
- Is there a shift from individual or class learning?
  - *SCARCE*: group activities mainly in K-6 or K-12 education …
- Is there formal class planning (Ins. Design)?
  - *SOMEHOW*: lectures, lesson plans, school plans (perceived as part of burocracy?)

And a provocative diagnostic

- *Teachers* are typically afraid of ICT in classes, they focus mainly on individual learning and in lectures, they use plans mainly for the administration
- *Research* in TEL is strong, with an equally strong disassociation between technology and educational experts, quantitative and qualitative advocates, without a tradition in case studies, focusing either on extremely macroscopic phenomena or in psychological experiments
- *ICT* is moving fast, and almost always ahead of educational needs, without clear standards and interoperable systems, suggesting always new packages

Some elements of a proposal (I)

- Improvisation, creativity and experience are not contradictory with planning, modeling: find a *compromise* bringing them together and use them through *patterns*
- No technology is sufficient by itself, but there are many useful pieces that can be put together: *Search* for adequate tools and *integrate* in situations, as *tailored* by practitioners

Some elements of a proposal (II)

- Standards and interoperability can be handled in a loose way in practice, so that people can keep up with the use of the technology: Use simple technology and loose coupling that can *scale up* and be *sustainable*
- One can bring together *individual* and *group activities* (with different schemes and flavors) in real practice

Some elements of a proposal (III)

- It is possible to have *non-dogmatic mixed* approaches (qualitative / quantitative, technologists / educators, academics / practitioners), consider the *full life-cycle of case studies*

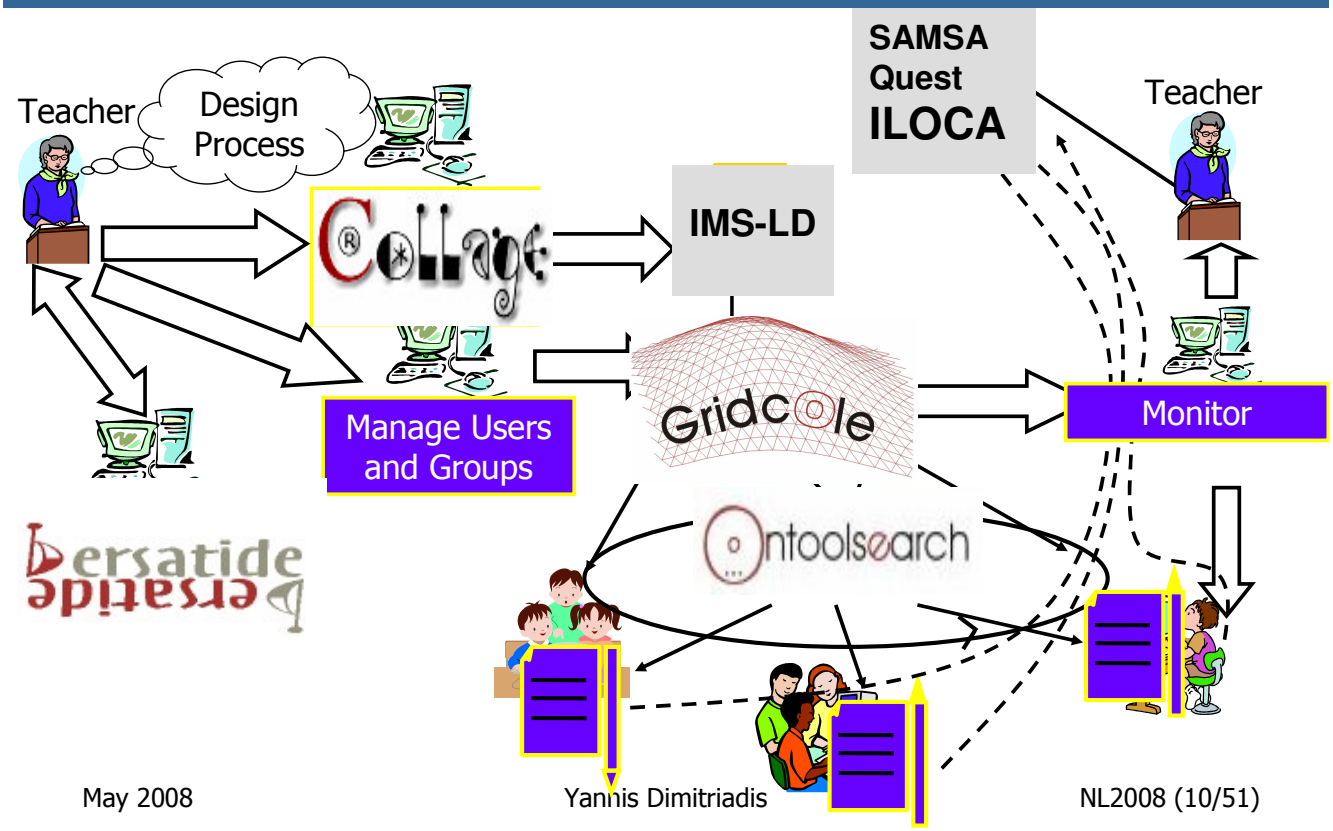
And for the rest of the talk (I)
(coherent with the proposal's spirit ?)

- Suggest support for full cycle (*from design to evaluation*)
- Focus on all actors (*special attention to practitioners*)
- Survive technology changes, lack of standards, insufficient capacity of specific tools and developers (*search and integration of loosely-coupled tools and service orientation*)
- Find a compromise (*experience-patterns, planning-scripting, improvisation, monitoring, scaffolding-regulation*)

And for the rest of the talk (II)
(coherent with the proposal's spirit ?)

- Suggest our *dream of CSCL* supported by patterns, services, ontologies, interaction analysis, mixed evaluation case studies and support of scripting, integration, flexibility, tailorability
- Contribute with all these reflections that come from a *multi(trans)-disciplinary team* of education and technology researchers and practitioners for more than 13 years (in a small-medium scale)

An overview of the proposal-"dream"



Not an easy proposal – "dream" …

- Learning Design Process (Participatory Design)
  - Use Educators' abstractions (but … Technologists do not have educational knowledge!)
  - To produce computer interpretable artifacts (but … Educators do not have technical knowledge!)
- Design Enactment (Adaptability, Reusability, …)
  - Integration of (distributed) software "building blocks" (but what blocks? And how to integrate them?)
- Monitoring - Evaluation – Regulation
  - What and how? (E.g. only data collected from applications? And how to employ them?)

So we "struggle" to work on … (I)

- Design Process
  - Improve educ./tech. mutual understanding (TELL project framework and patterns)
  - Employ Authoring and Advising tools for scripting – planning oriented to educators (Collage and Bersatide)
  - Use "standard" languages to formalize designs and conciliate activity and data flows (IMS-LD, BPEL4WS)
- Design Enactment
  - Interpret formalized designs (Coppercore)
  - Support tailorability through grid service-oriented middleware and ontology-based tool search (Gridcole and Ontoolcole/Ontoolsearch)

So we "struggle" to work on … (II)

- Monitoring - Evaluation – Regulation
  - Propose mixed evaluation methods and support them computationally for improved efficiency (Quest, Samsa, Iloca)
  - Advocate for common computational representations for "interactions" and suggest Interaction-Aware architectures (Common Format, Kaleidoscope)
  - Study ways of regulating the learning process flexibly and appropriately for actors (role-based framework)

Collaborative Learning Flow Patterns (I)

- Collection of
  - Broadly accepted techniques repetitively used by CL practitioners (best practices) when structuring the flow of types of (collaborative) learning activities
- Formalized as patterns (recurrent solutions to recurrent problems)
  - What flow of activities is recommended from educational practice to promote desired objectives?

Collaborative Learning Flow Patterns (II)

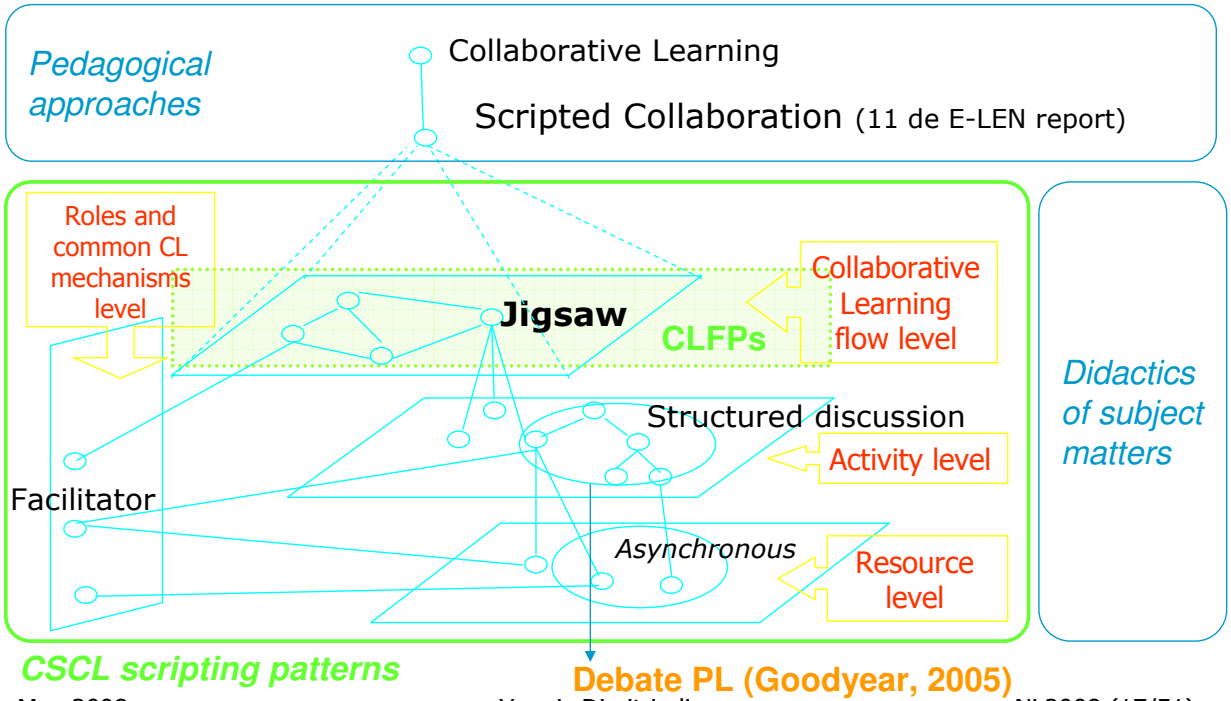
- Expected advantages
  - Way of communicating Collaborative Learning expertise
  - Conceptual common ground among practitioners and developers
  - Promote software reuse: identification of reusable software tools
  - Intermediate step for computer-based formalization

A Collaborative Learning Flow (CLFP): Pyramid

Each individual participant studies the problem and proposes a solution. Groups of participants compare and discuss their proposals and, finally, propose a new shared solution. Those groups join in larger groups in order to generate new agreed proposals. At the end, all the participants must propose a final agreed solution

Facet	Explanation	Example
Name	CLFP name	***Pyramid***
Problem	To be solved	Complex
Context	Environment	Several participants – same problem
Solution	Collaboration structure	Gradual consensus
Actors	Participants	Teacher, learner, evaluator
Types of tasks	Performed by the actors	(Ej.) LEARNER ... 6. Common solution proposal
Educational objectives	Promote by the CL technique	To promote positive interdependence ...
Types of groups	Identified in the CL technique	Growing pyramid groups

A pattern language that "encloses" CLFPs

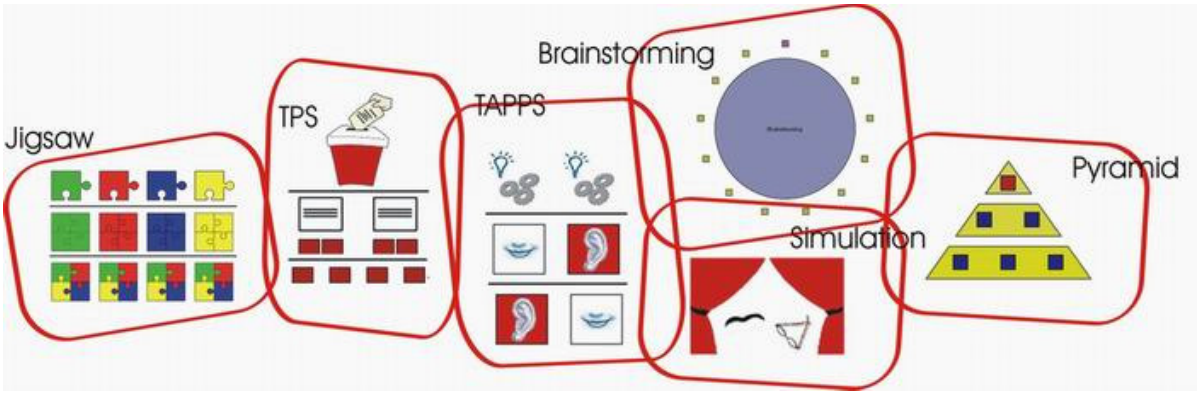


COLLAGE Authoring Tool

(COLlaborative LeArning desiGn Editor)

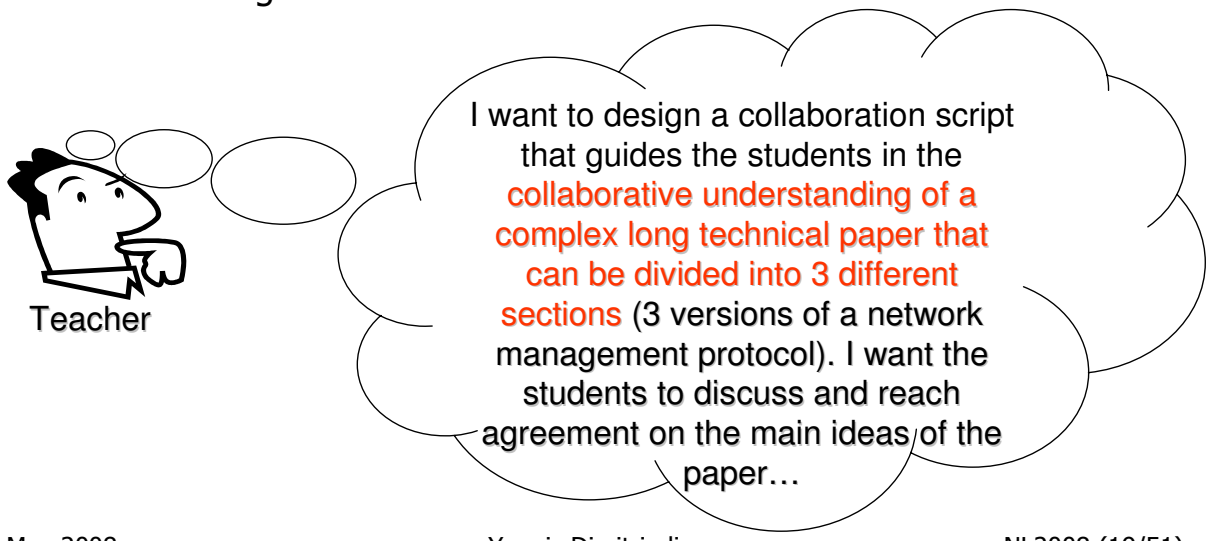
http://gsic.tel.uva.es/collage

(Graphic-based high-level specialized authoring tool for collaborative learning.
Based on **Reload**. IMS-LD level A compliant)

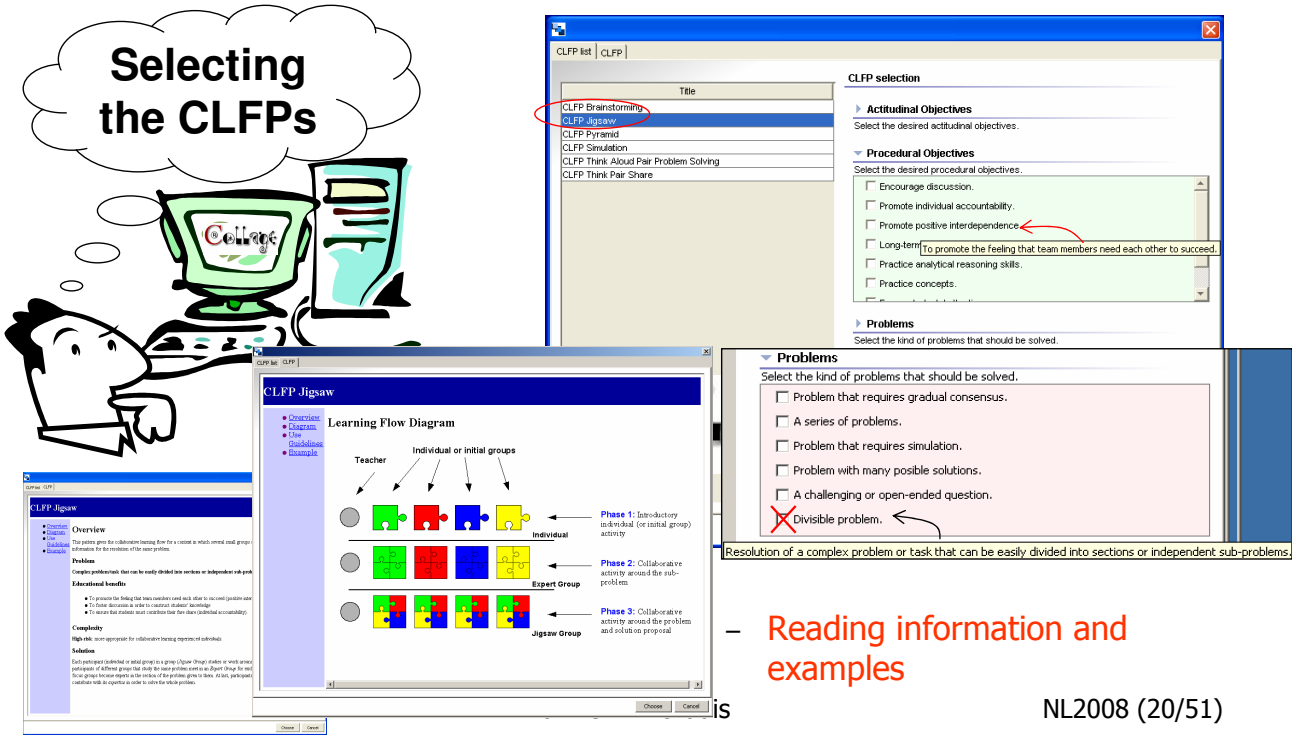


Sample of Collage use (I)

- "CTM2" script (applied in the "Network Management" case study)
  - Optional undergraduate course on Network Management technologies

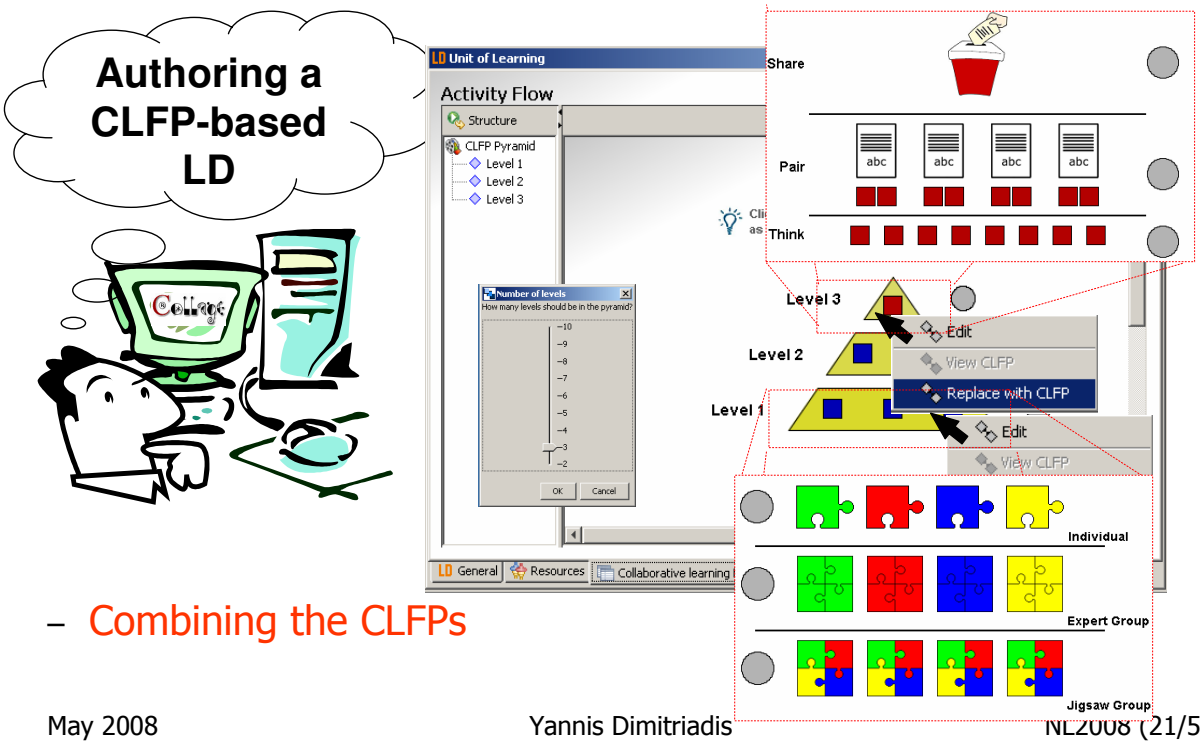


Sample of Collage use (II)



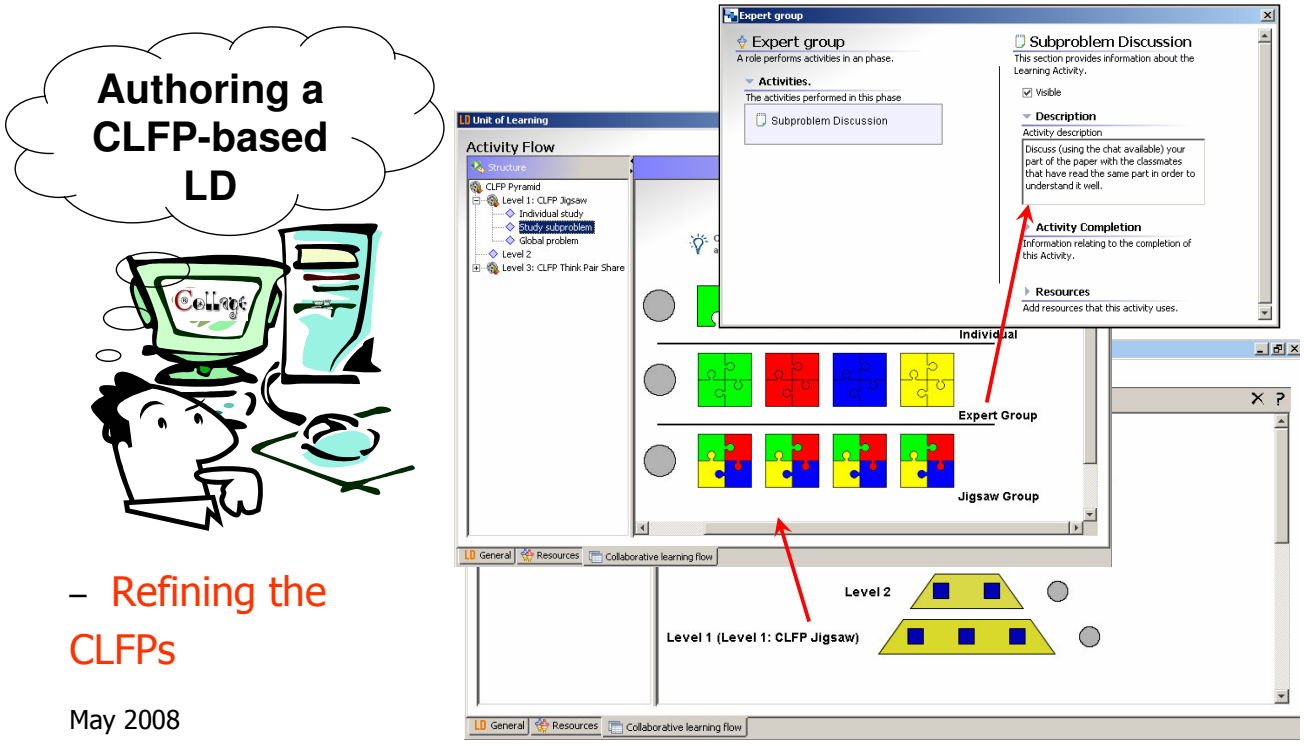
- Reading information and examples

Sample of Collage use (III)



– Combining the CLFPs

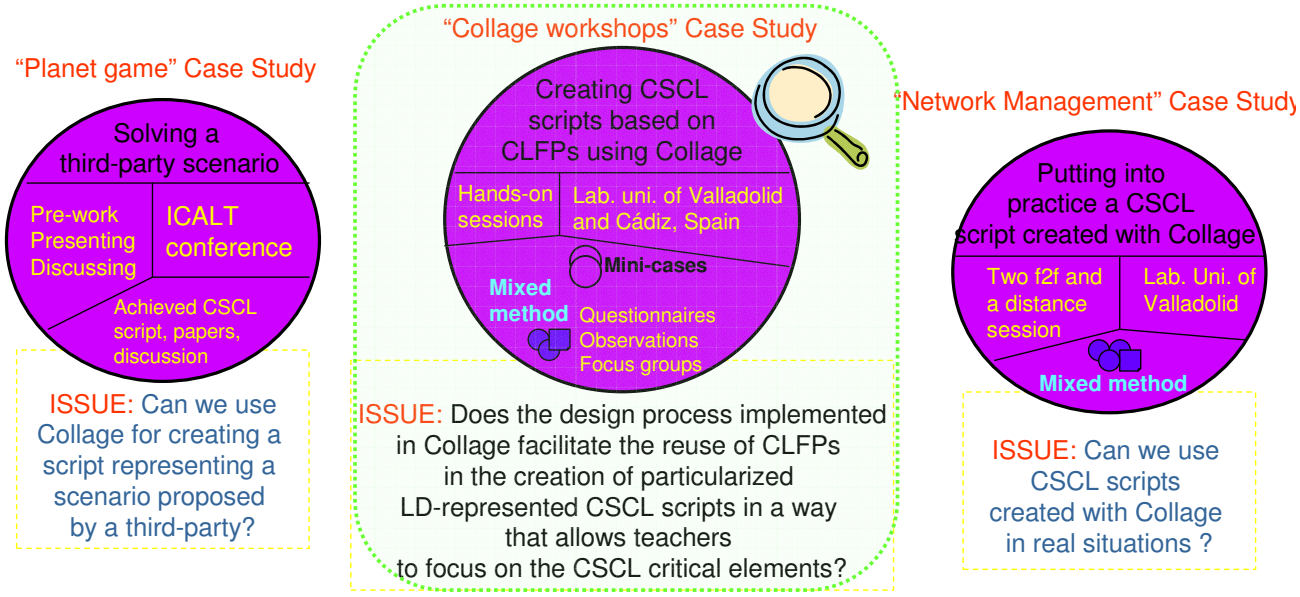
Sample of Collage use (IV)



– Refining the CLFPs

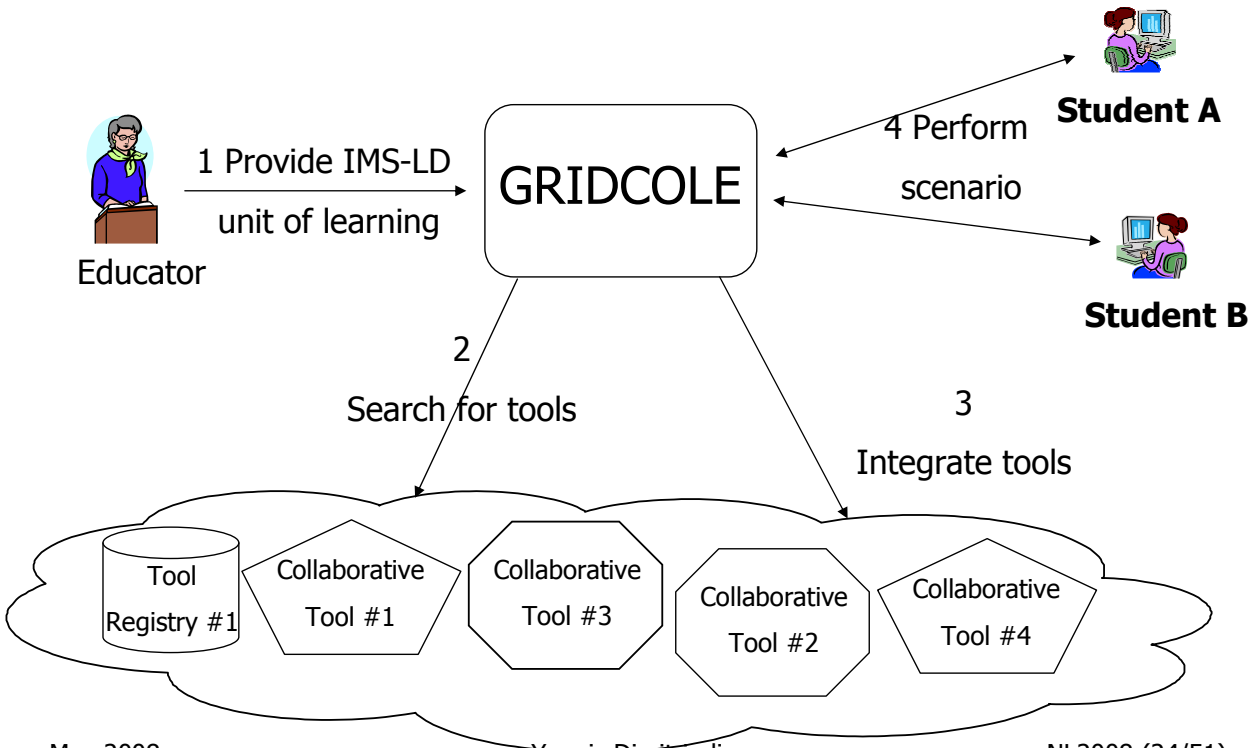
Collage evaluation

- Multicase study (Stake, 2005)

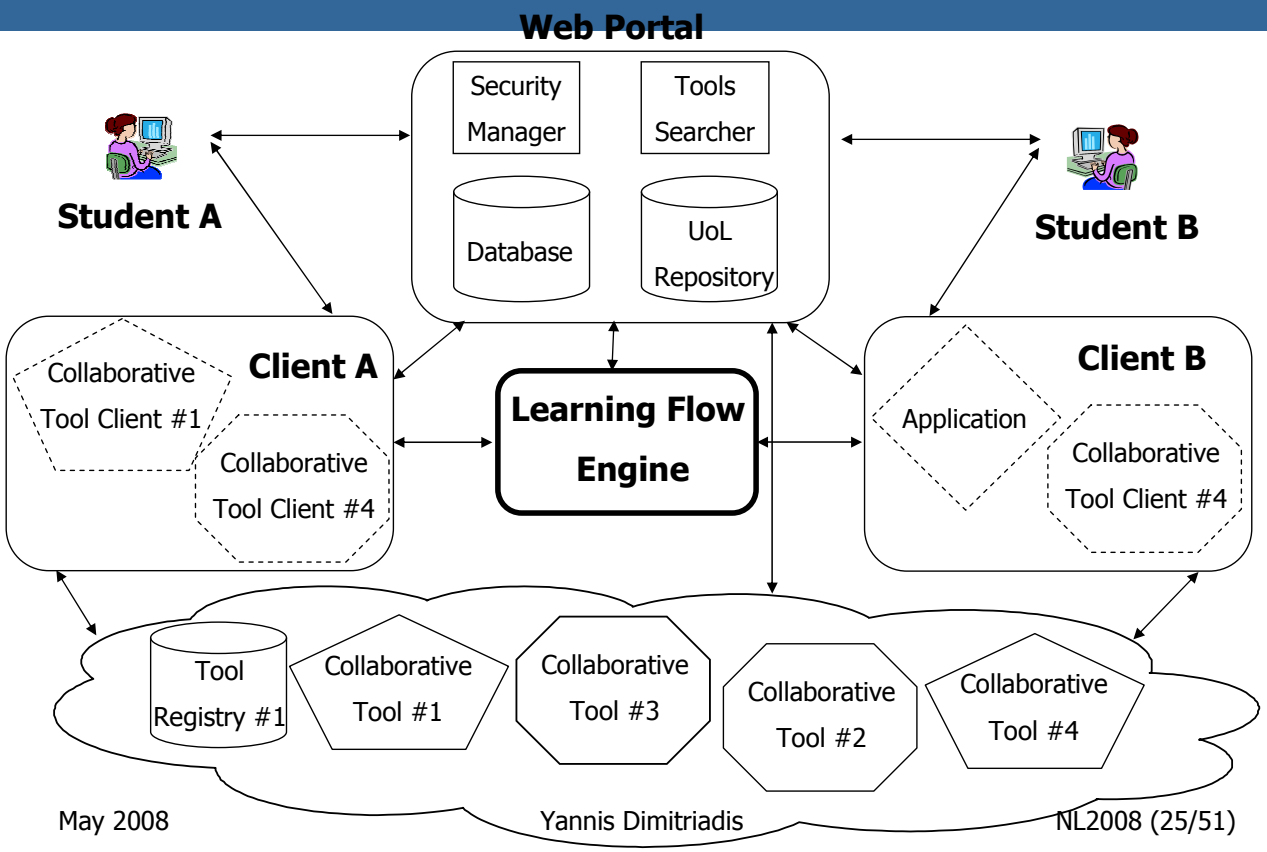


QUINTAIN: The proposed pattern-based design process for CSCL macro-scripts computationally represented with IMS LD

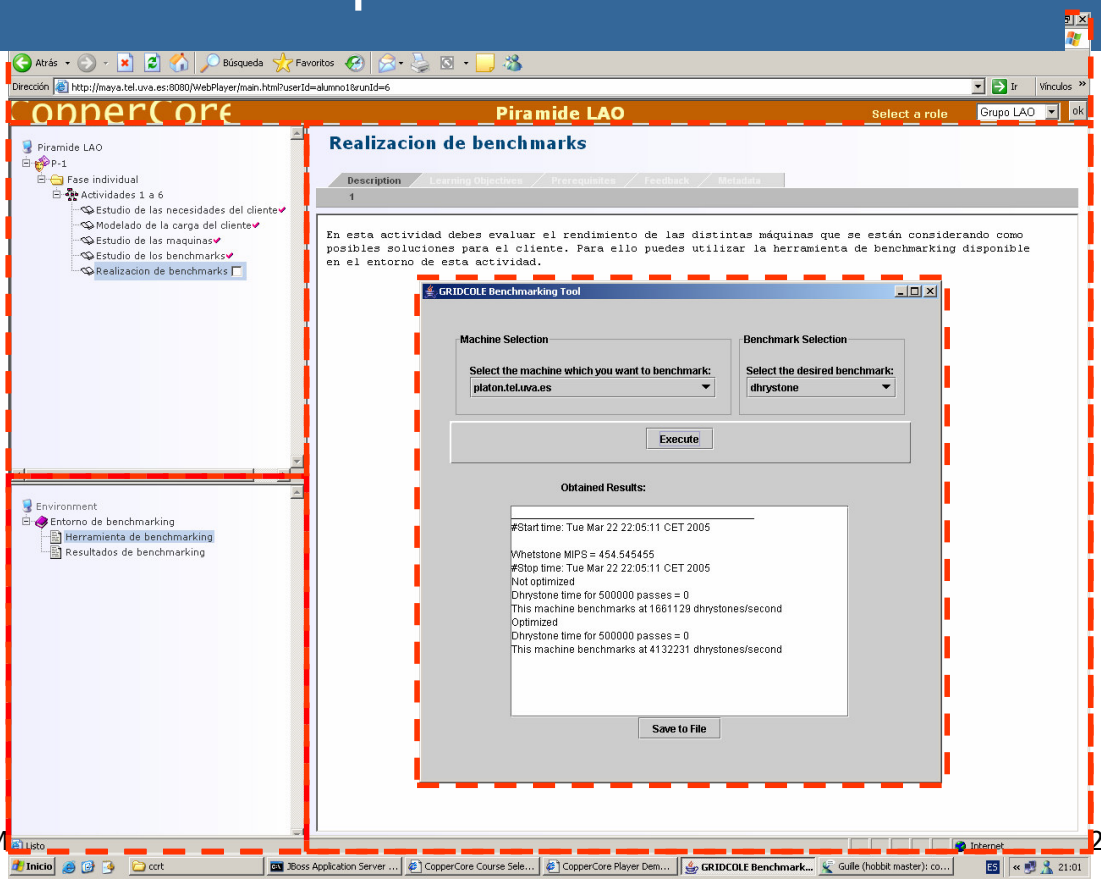
Gridcole: functionality



Gridcole: Generic architecture



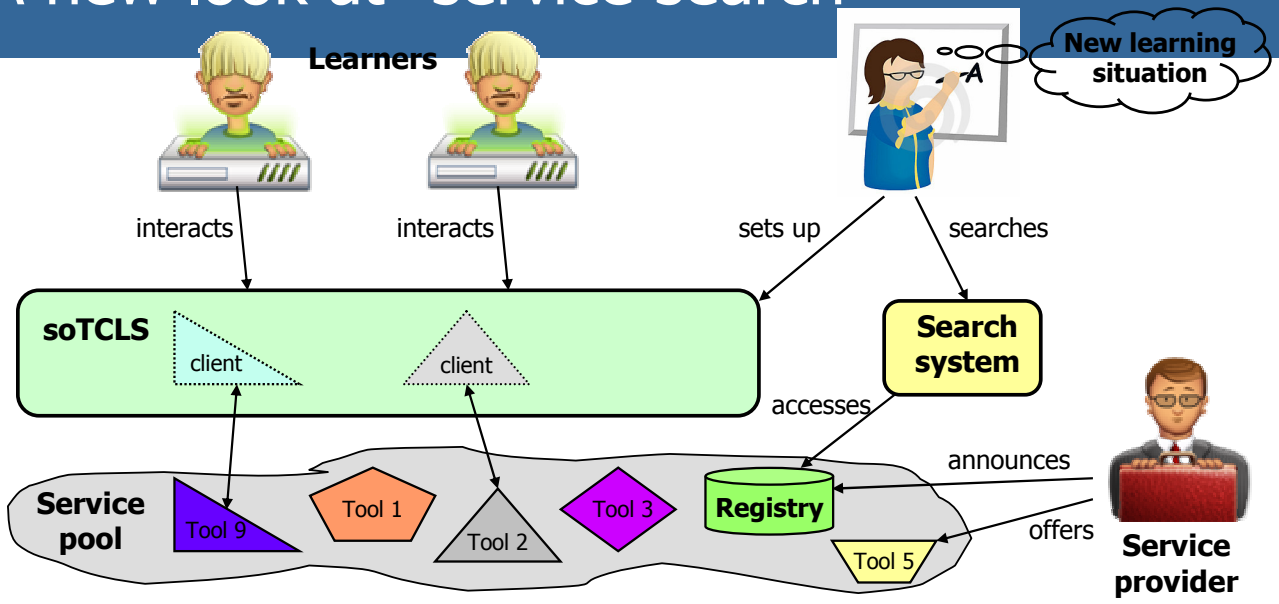
Gridcole: Sample of use



Gridcole: Evaluation

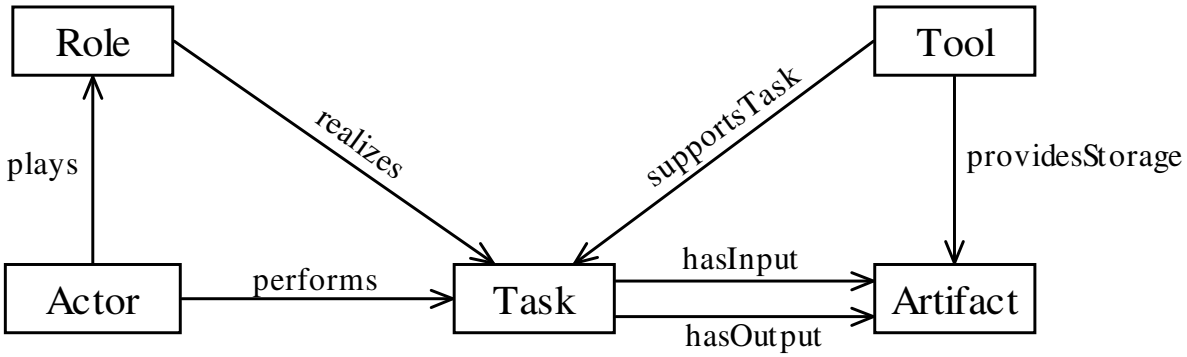
- Prototype developed and tested
  - Use of stable and "standard" technologies (see convergence of Grid and Web services)
- Educational evaluation
  - Validation of its properties in 4 small-scale case studies (tailorability by educators, integration and execution of different types of tools)
  - Very positive subjective evaluation from participants (teachers and students)
  - Tests in medium-scale distance environments that involve multiple organizations

A new look at "service search"



- Service-Oriented Tailorable Collaborative Learning Systems (SOTCLSs)
  - **Services have to be searched**

Ontoolcole: An ontology for CSCL

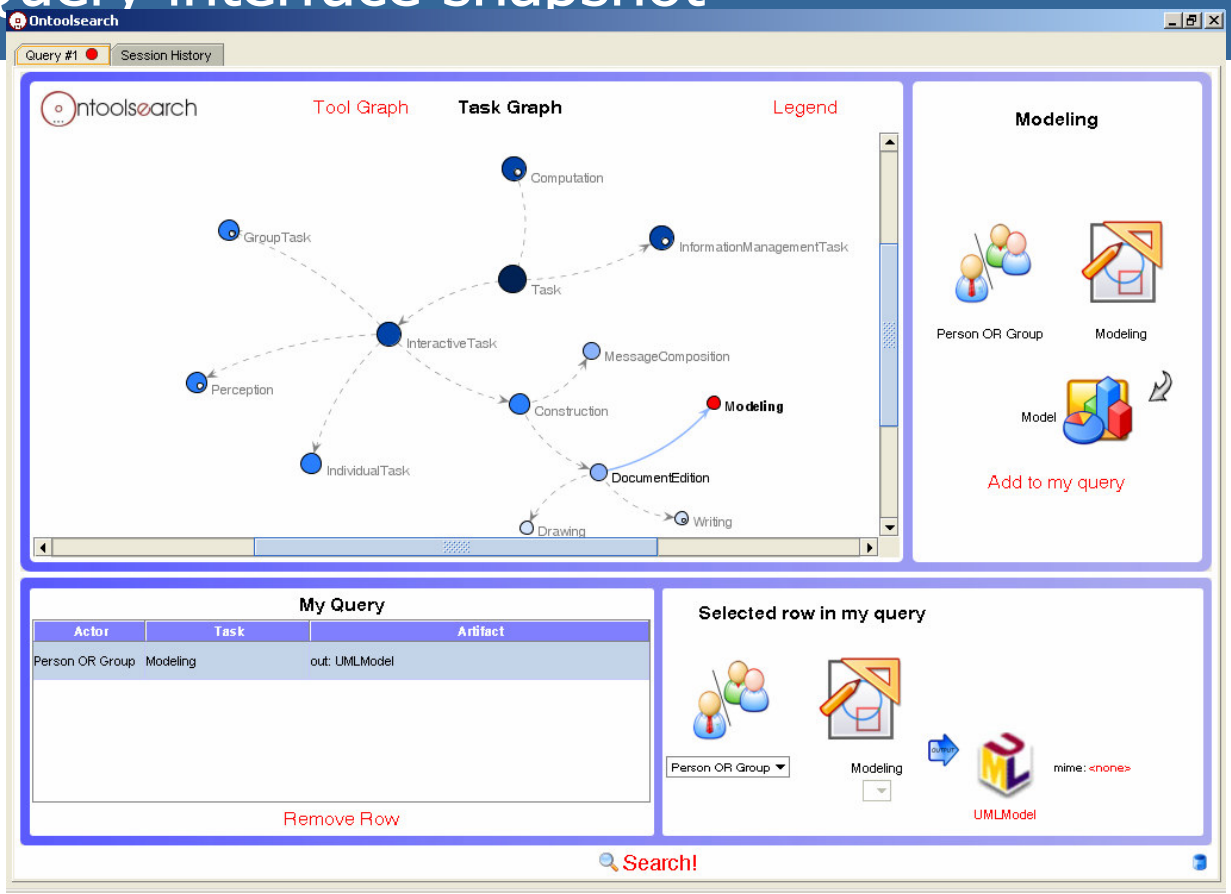


- Simple, extensible model which considers
  - collaborative (or not …) **tasks** (simple and composite)
  - performed by **actors** (persons, groups or systems) who play **roles**
  - that employ **tools**,
  - need and produce **artifacts**

Ontoolsearch: Requirements

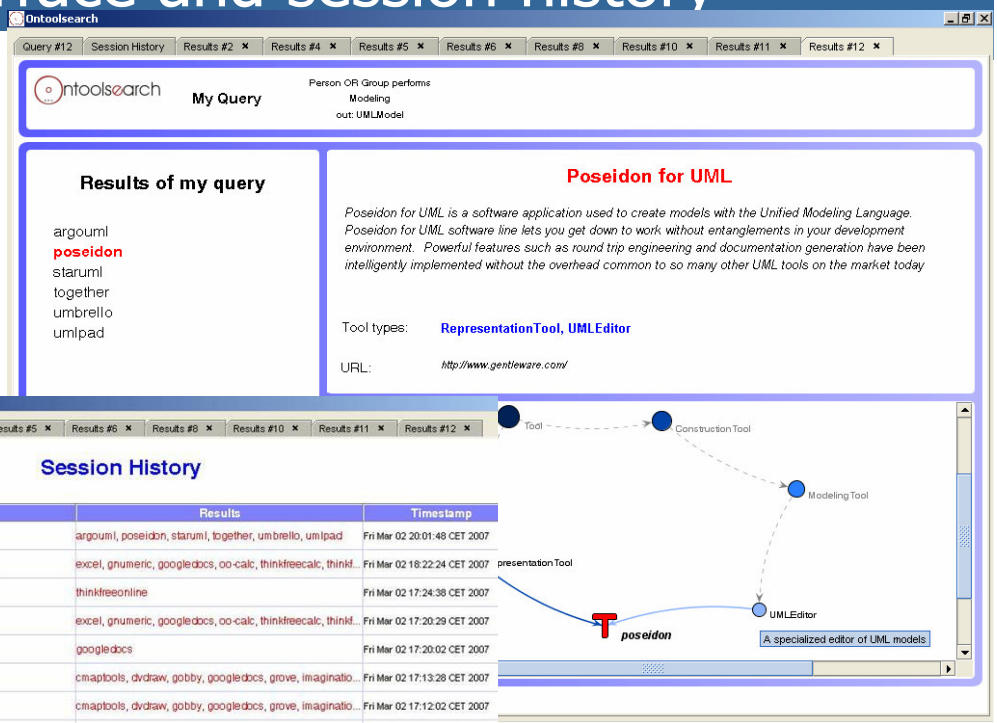
- Educator-centric
  - Reflect educator's view of learning services
- Search for CSCL tool capabilities
  - Relevant for CSCL scenarios
- Some sample queries
  - *I want a TCP/IP simulator for a course on computer networks*
  - *I want a tool for the edition of a .doc formatted document by a group of four members*
  - *I want a tool to support asynchronous debates among twenty participants*

Query interface snapshot



Result interface and session history

- Result interface
  - Present retrieved tools to the user



- Session history interface

Ontoolcole/Ontoolsearch: Evaluation

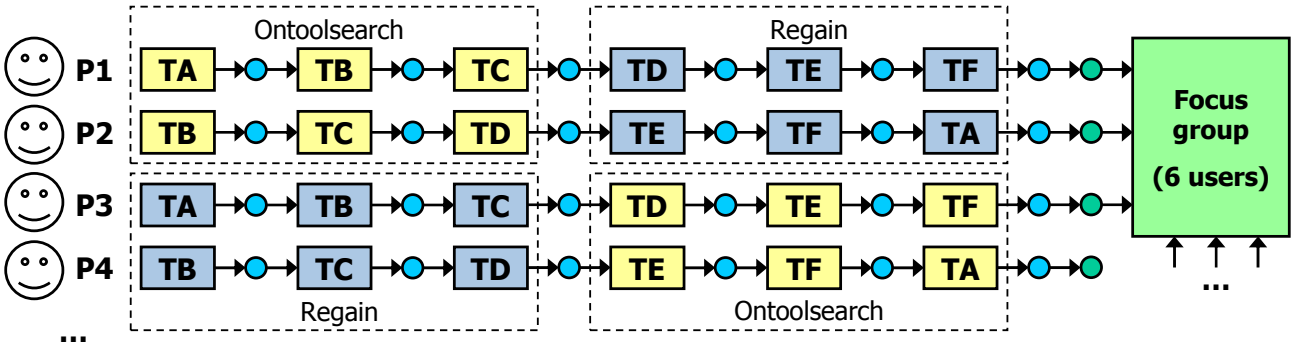
- **Goal**: Assess with educators whether Ontoolcole/ Ontoolsearch is better for the search of CSCL services than other existing systems
- **Method**: Formal comparison with a search system involving educators
  - Six predefined search tasks based on real educational settings
  - Control system: **Regain**
    - Representative information retrieval system based on keywords
- Following a mixed methods approach

Overview of the six search tasks

- Criteria
  - Authenticity of search tasks
  - Focus on CSCL settings
  - Mix of open and close search tasks
- Example
  - "*In a laboratory session involving students organized in groups, a shared whiteboard tool is required that allows a group of students to make annotations and drawings at the same time*"
  - Target tools: DVDraw, Imagination Cubed, ipChart, wb

Realization and data sources

- **18 educators**
- Telecom., CS, Philology, Maths
- Long exp. keyword-based searches
- Some exp. education tech.



Data sources: system logs search questionnaire final questionnaire

Quantitative results

- **Retrieval performance is better with Ontoolsearch and is significantly different**
  - Mean difference = 0.17
  - Standard 95% confidence interval for difference = (0.08, 0.25)
  - *p*–value < 0.01 (**highly significant**)
- Special relevance of the **synonymy** problem in 4 search tasks

Qualitative results (I)

Search process [FINAL QUESTIONNAIRE]		
System	**Finding**	**Comment**
Regain	**Flexible and fast**	"I have more freedom to submit a question" [P5] "You can begin very quickly" [P7]
	Conscious of the synonymy problem	"It is difficult to find appropriate keywords. It always seems there are less tools than with Ontoolsearch" [P14]
	Requires revision of tool descriptions	"It is necessary to read a tool description in order to assess its suitability" [P16]
Ontoolsearch	**Comprehensible conceptual model**	"The best is the structuring in tasks, the relationships among tools and using graphs for searching" [P9]
	Search guidance facilitates the search	"Guidance makes easier to find what I search" [P14]
	Different paths for a search	"There are multiple possible paths to perform a search. Very useful!" [P15]

Qualitative results (II)

- Usability of Ontoolsearch [FINAL QUESTIONNAIRE, FOCUS]
  - Graphs considered adequate for searching
  - Good learnability and user satisfaction
- Weakest points of Ontoolsearch
  - Categorization not always intuitive
  - No feedback to users and lack of help
- Other results [FINAL QUESTIONNAIRE, FOCUS]
  - Perceived quality of retrieval performance (from 1 to 6)
    - 4.0 (Regain) vs. 5.3 (Ontoolsearch)
  - Considered appropriate for their real practice

Mixed evaluation method

- Context integration
- **Real Situations**
- Participants' vision

→ • ethnographic sources • qualitative analysis

- **New ways of interaction**

→ • computer data

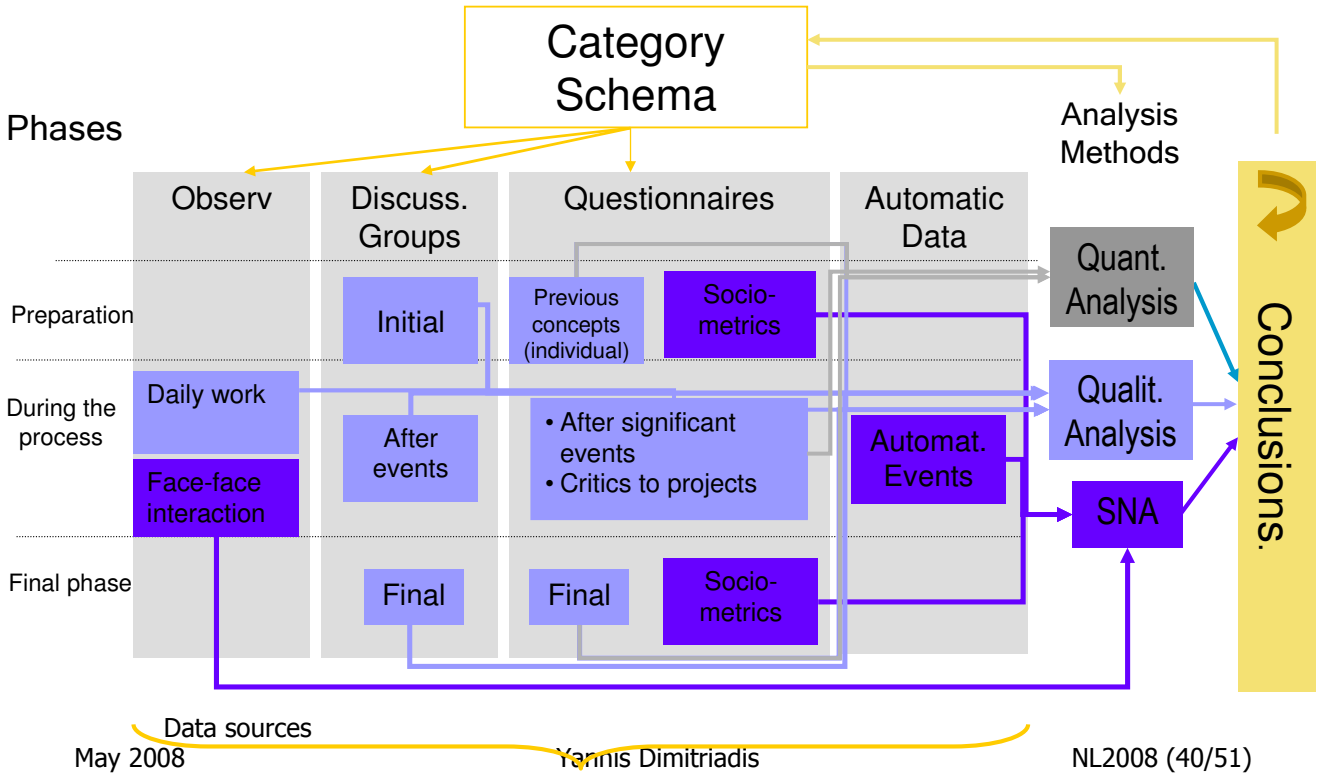
- Efficient and scalable processes

→ • quantitative analysis • automatic tools

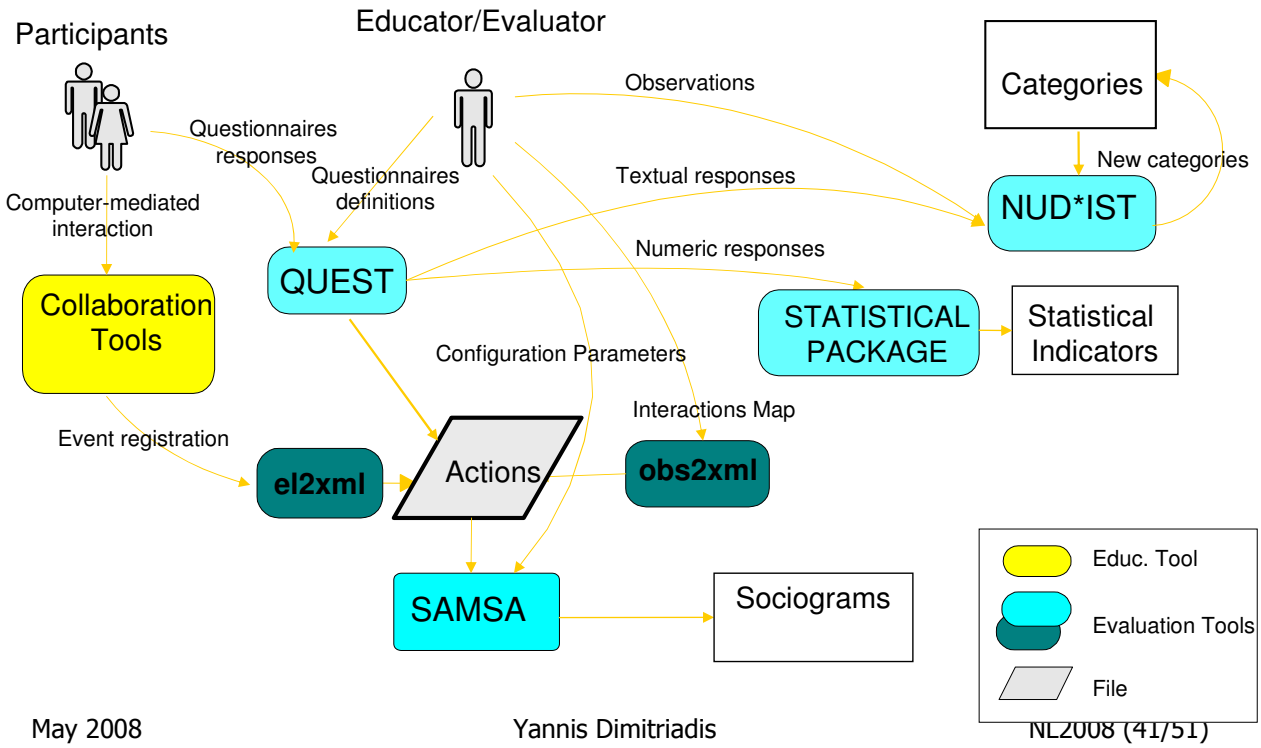
- Visualization systems
- Participatory aspects

→ • social network analysis

A workflow view of the method



Tools for the evaluation



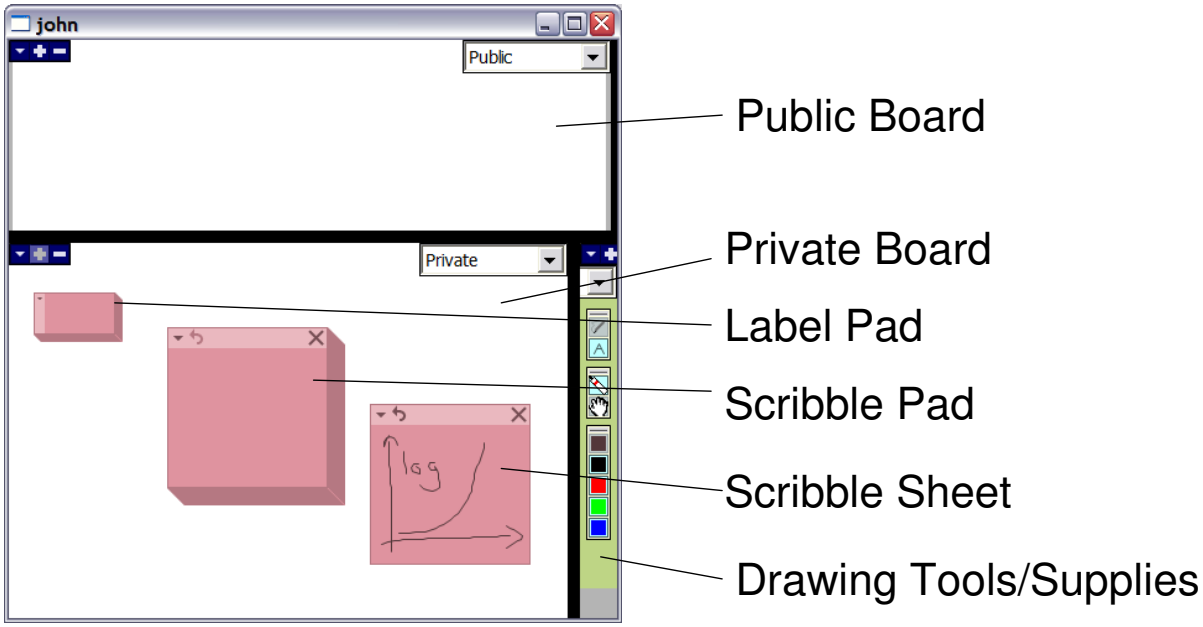
But ...

- What is the setup time?
  - Need to learn and use several tools for authoring, search, evaluation …
  - Need for infrastructure to design, enact, evaluate
- Is Instructional Design adequate?
  - (Over)-scripting damages teacher improvisation
  - (In)flexible (although tailorable) scripting does not take into account unexpected (but common) phenomena
- Design tensions are always present

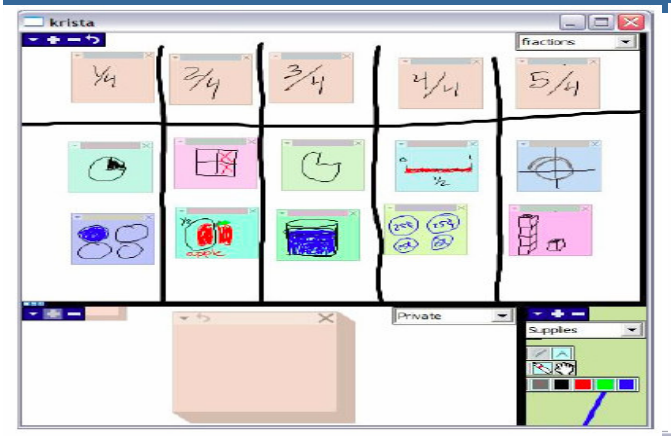
Group Scribbles (I)

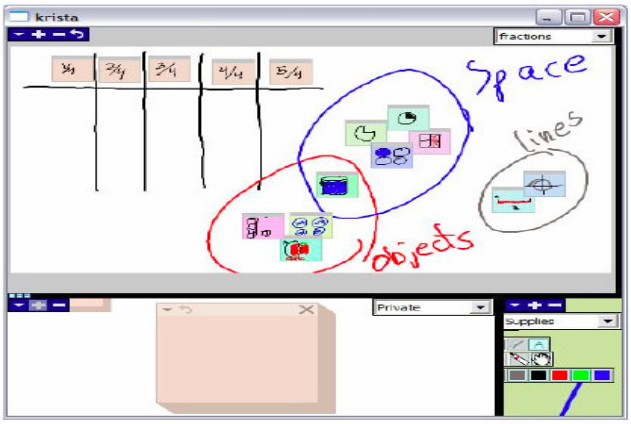
- Tool developed at SRI International (Center for Technology in Learning) and funded by NSF
- Joint further development, use and evaluation in Spain, Taiwan, Singapore, etc.
- Support for "disciplined improvisation" and "distributed coordination"
- Simple "physical" metaphor (Post-it)
- Lightweight, extensible infrastructure
- Almost "immediate" set-up

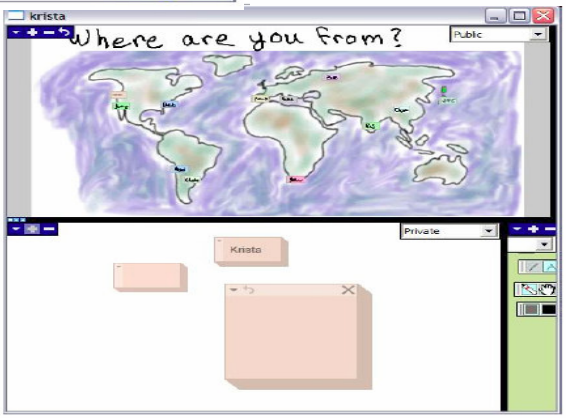
GroupScribbles (II)



GroupScribbles (III)

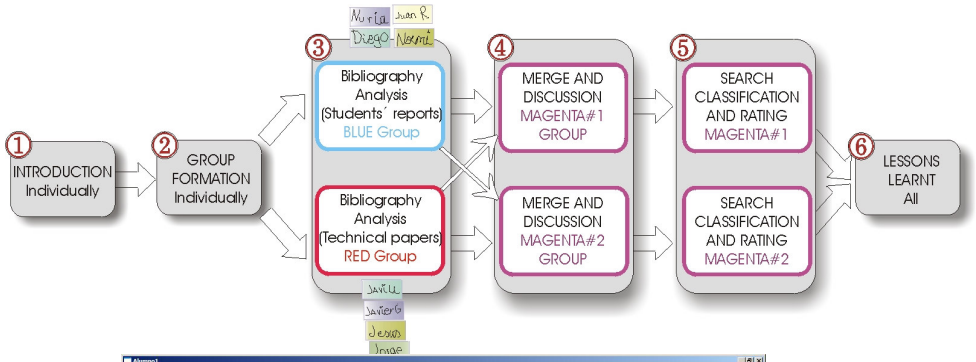


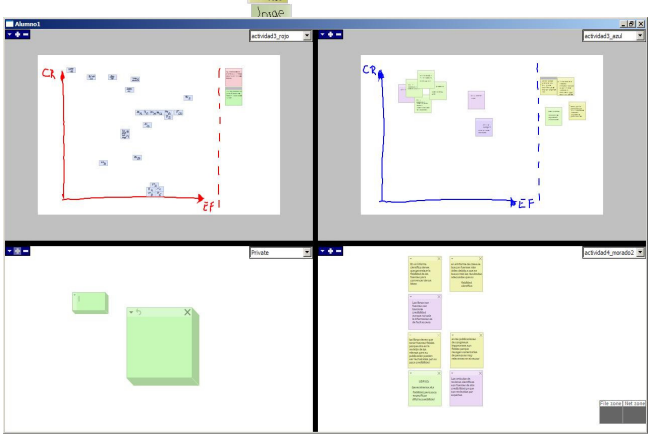




And several case studies in Spain ...

Script based on Jigsaw and Pyramid CLFPS





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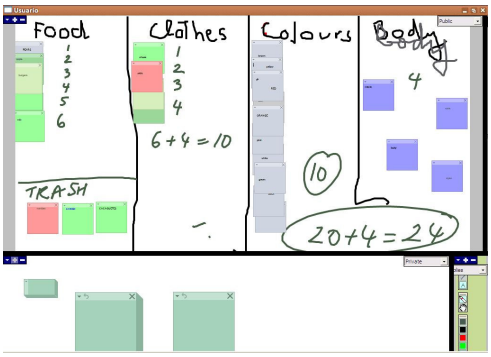

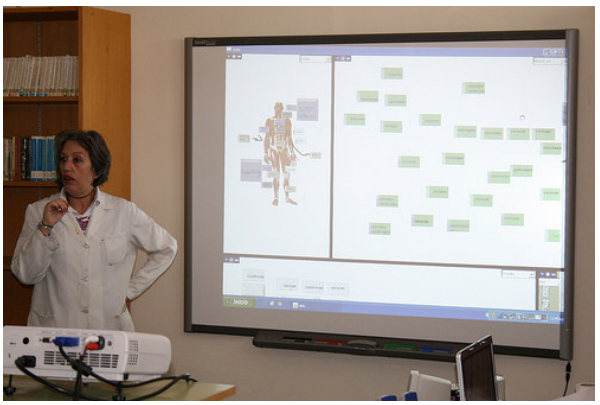

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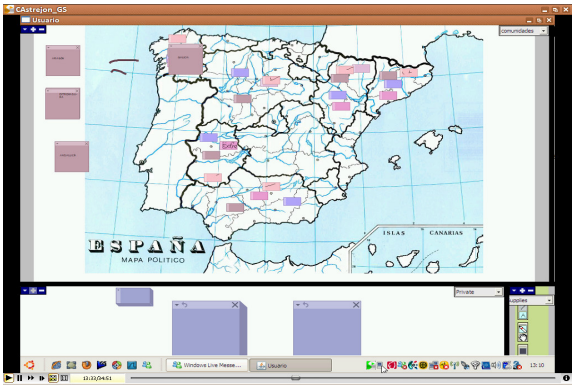

And what can we finally suggest?

- **Scripted CSCL** is possible and useful in order to enable more effective interactions, although (in)**flexible** (non)**fading** (over)**scripting** can be scaring
- There is a strong design tension between **improvisation and scripting** but they may and can co-exist
- There is a lot of experience in designing teaching / learning activities, that can be exploited in terms of **design patterns**.
- Authentic **case studies** in different contexts may involving the principal actors (mainly teachers, but also technology designers or pedagogy people) may prove to be an essential element to elicitate design patterns
- A teacher and learner-centric approach requires the **creation of bridges** between approaches, worldviews, or research methods (engineers/social scientists, qualitative/quantitative, etc.) and hopefully employ **non-dogmatic** approaches

And what can we finally suggest?

- There is a need to **take teachers into account within their real life**, and consider their abstractions and limitations (e.g. fear or limited time)
- Teachers need to **tailor** scripts according to their particular needs and produce flexible learning scripts
- **Search and integration of existing tools** offered by third-party providers allow for sustainable ICT use in education
- **Service orientation** can be the basis for such a sustainable approach, although **standards and domain frameworks** should converge
- Use of **shared knowledge** in terms of ontologies can aid semantic searches

And what can we finally suggest?

- One can employ simple but motivating, extensible existing tools with a limited setup time, so that they can be integrated effectively in real "classes"
- And …
- There is no recipe, even with this proposal
- And …
- Be patient… The way is too long but challenging, since we have to be realists, i.e. look for the "utopia"

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