Designing Collaborative Learning Systems: Current Trends & Future Research Agenda

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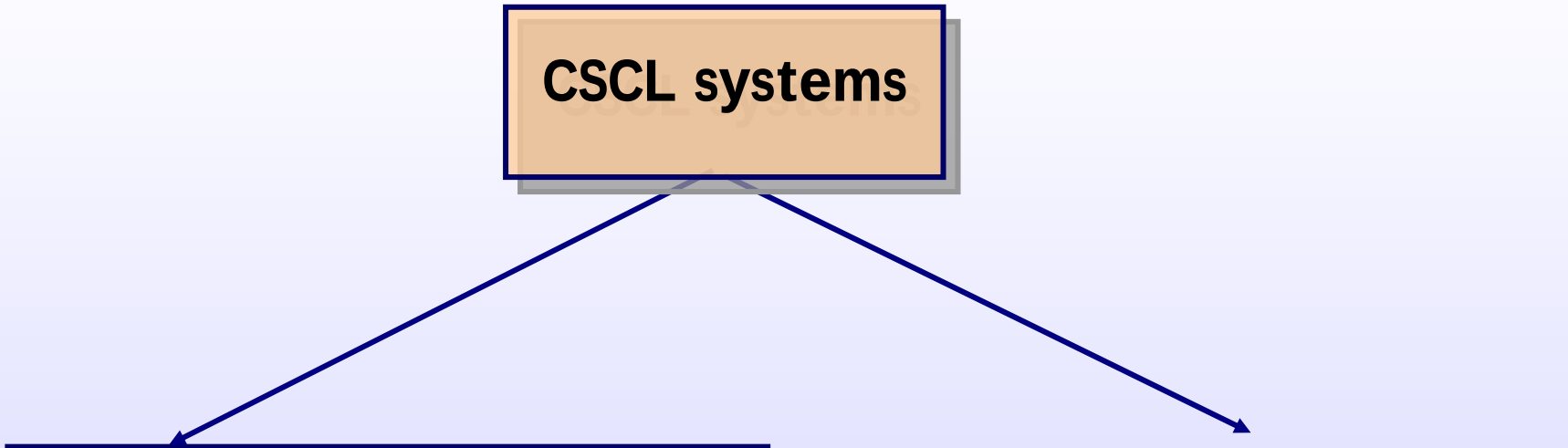
A view on CSCL design ⇨… Structure

⇨ **"What are the *main design achievements* of this research field?"**

⇨ **"What are the *current trade-offs* and what are the various designers' choices concerning significant design aspects?"**

⇨ **"What are the main *actual design questions* that preoccupy researchers and form a *research agenda* for the next years?"**

CSCL systems categories



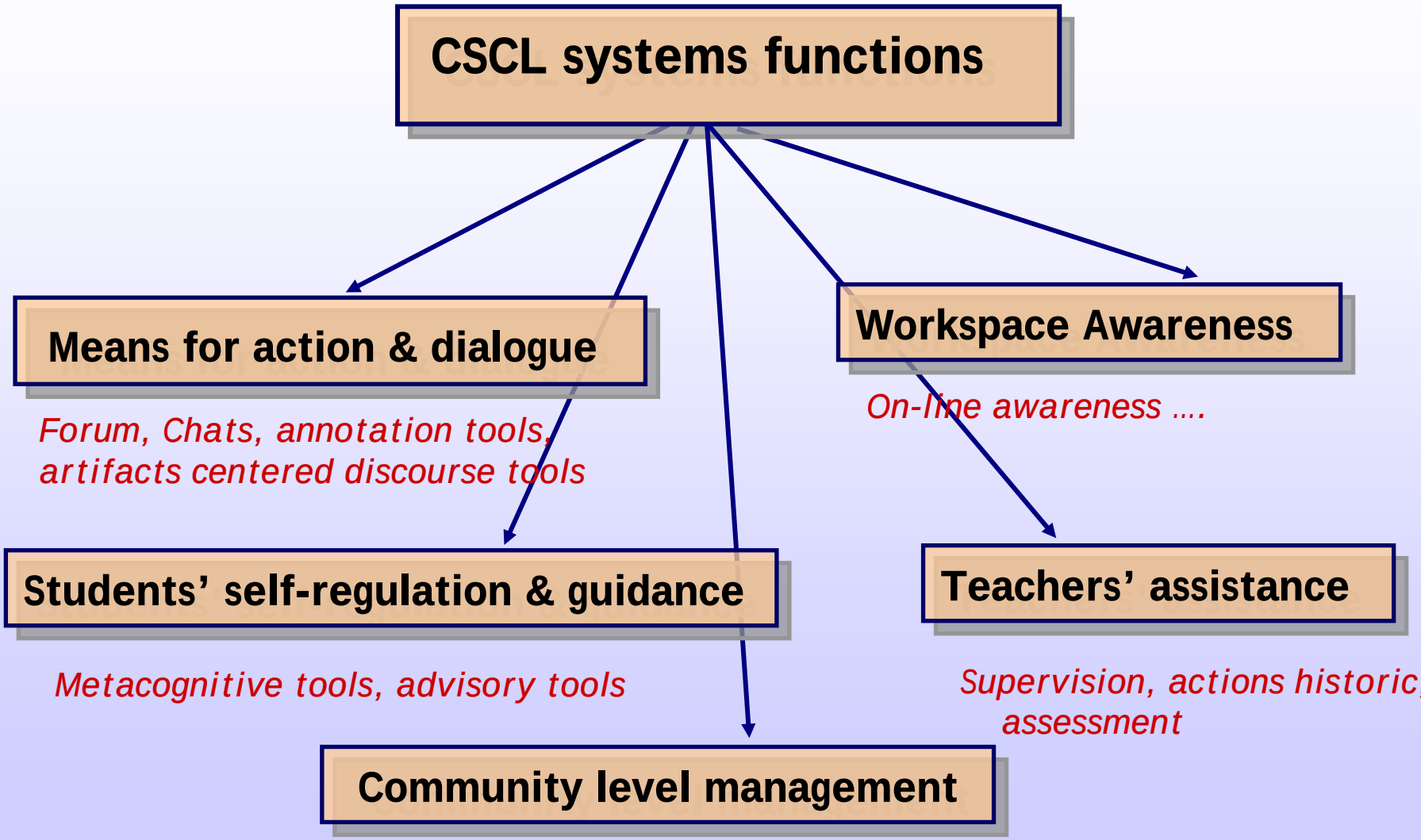
COLER, COMET, COOL-MODES,

ALGEBRA JAM, SENSEMAKER

COLAB, MODELLINGSPACE

Knowledge Forum, FLE3, CoVis

CSCL systems functions



CSCL Design trade-offs

Trade offs on the Means of Dialogue

Trade off on the Coordination of action-dialogue

Trade offs between ⇨ self regulation vs guidance
⇨students vs teachers' support

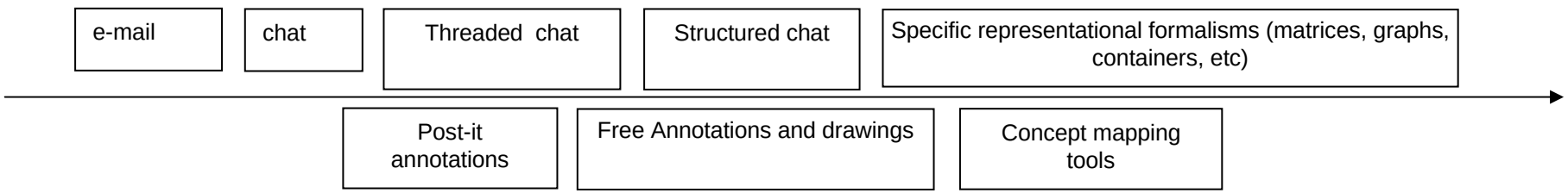
Design trade-offs on the means of dialogue

Trade offs on the means of dialogue between:

Free vs structured dialogue

Parallel vs embedded communication tools

Text based vs oral based dialogue tools



Design trade-offs on the means of dialogue

1.1 Trade off between free and structured dialogue

⇨ **Structured dialogue:** **(e.g. via chat) intended to promote argumentative dialogue**

⇨ **Free dialogue:** **immediacy, liberty in expression**

Questions/problems of structured dialogue

- **if users select/prefer or not the structured one**
- **if the structured chat changes the nature of communication**
- **if it provoke cognitive load phenomenon**
- **if the predefined sentence openers are not used as intended**

Design trade-offs on the means of dialogue

1.1 Trade off between free and structured dialogue

- ***The appropriateness of free vs structured dialogue depends from:***

  - **the various phases of the activity:** **[e.g. initial brainstorming, discussion on strategy to follow, role distribution-management => free dialogue, task contribution= structured one]**
  - **the difficulty of the task -> cognitive overload effect:**
  - **the level of familiarisation:** **with the environment, the task, the collaborative activity itself**

Design trade-offs on the means of dialogue

1.2. Trade off between parallel and embedded tools

⇨ **Parallel :** the shared artifacts and the discussion tools are on entirely separate windows.

⇨ **Embedded:** assure coordination between the discourse and the disciplinary representations of the shared workspace

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↳ ***Tools that contribute to the embedded approach:***

- **Annotation tools:** e.g. sticky notes
- **Drawings:** enclosing a 'region'
- **Highlighting:** the parts on which users they discuss

Design trade-offs on the means of dialogue

1.2. Trade off between parallel and embedded tools

- ***Disadvantages to recover in case of embedded tools:***
  - **record of discourse is fragmented across the artifact => 'negative' for students and teachers, intended to reflect on the previous process**
  - **the artifact becomes cluttered with comments**

- ***Propositions to recover the conflict*:**
  - **Linked dialogue- representations: logical linkage between them**
  - **Switching between parallel and embedded:**

Design trade-offs on the means of dialogue

1.3. Trade off between written and oral dialogue

➢ ***Disadvantages of oral dialogue (voice group-wares):***

(a) The noise produced in a school class

(b) It facilitates the communication, but allow avoiding the cognitively demanding written argumentation

(c) The data based on free-natural language cannot be analysed

Resolving the conflict: Estimate the learning value

⇨ **Voice groupware especially for initial or brainstorming discussions**

⇨ **For foreign language students, dialogue via audio is used for practice oral skills (*Luceum's Project, Open University*)**

Design trade-offs on the means of dialogue

2. Trade off on the coordination of action or dialogue

⇨ **Coordinated action on the shared workspace : restricted protocol of synchronous collaboration, using metaphors (key-pencil/exchange, traffic light, or 'microphones')**

⇨ **Free synchronous activity :students must assure the coordination of their contributions**

Coordinated action:

⇨ **Disadvantage: deadlocks can be created in cases when one partner refuses to pass the key over to the other partner**

⇨ **Advantage: the protocol maintains clear semantics of actions and roles in the shared activity space**

Design trade-offs on the means of dialogue

2. Trade off on the coordination of action or dialogue

Free action:

⇨ **Disadvantage: the one does not follow the other, or delete 'entities', many 'tools' or objects opened simultaneously (chaos)**

⇨ **Advantage: fluidity of action**

↳ ***Resolving the conflict:*** **Their appropriateness depends from factors:**

- **the previous familiarisation with syn collaborative activities,**
- **the pre-existing' friendship of members, etc**

⇨ **Dispose, both possibilities and leave the members of the students' groups to choose by themselves**

Design trade-offs on action coordination

2. Trade off on the coordination of action or dialogue

Locked mechanisms vs free permission

Rights on partners modifications and authorship identification

⇨ **Disadvantage of free permission:**
delete or modify 'contributions' without mentioning

↳ **Optimistic concurrent control by supporting awareness:**
a clear indication of the 'authorship' indicating who uses currently which component. Gives freedom, fosters teamwork, avoiding modifications of others work

Design trade-offs on (self)-regulation

3.1. Trade off on guiding vs self-regulation

Supportive Scaffolding ⇨

⇨ *Artificial agents-Advisors*

⇨ *Guiding*

Meta-conceptual Awareness ⇨

⇨ *strategic awareness*

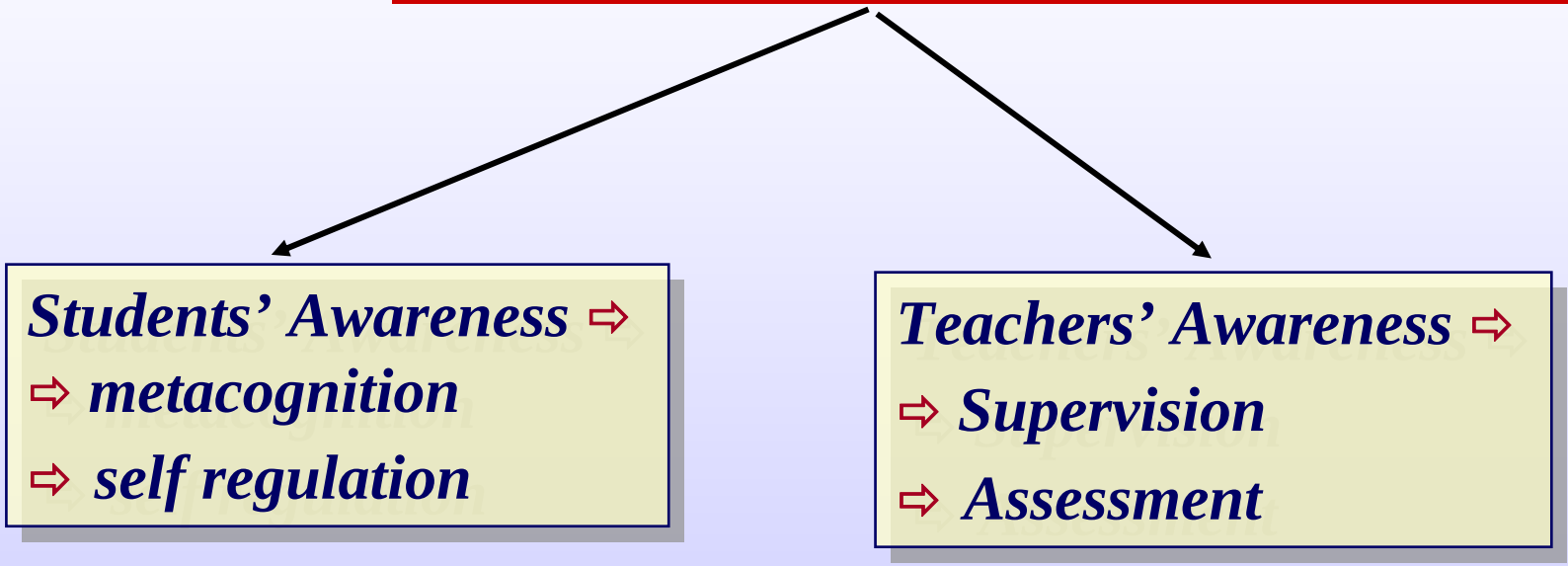
⇨ *metacognition*

⇨ *self regulation*

⇨ *More Research is required focusing on complementarities*

Design trade-offs on (self)-regulation

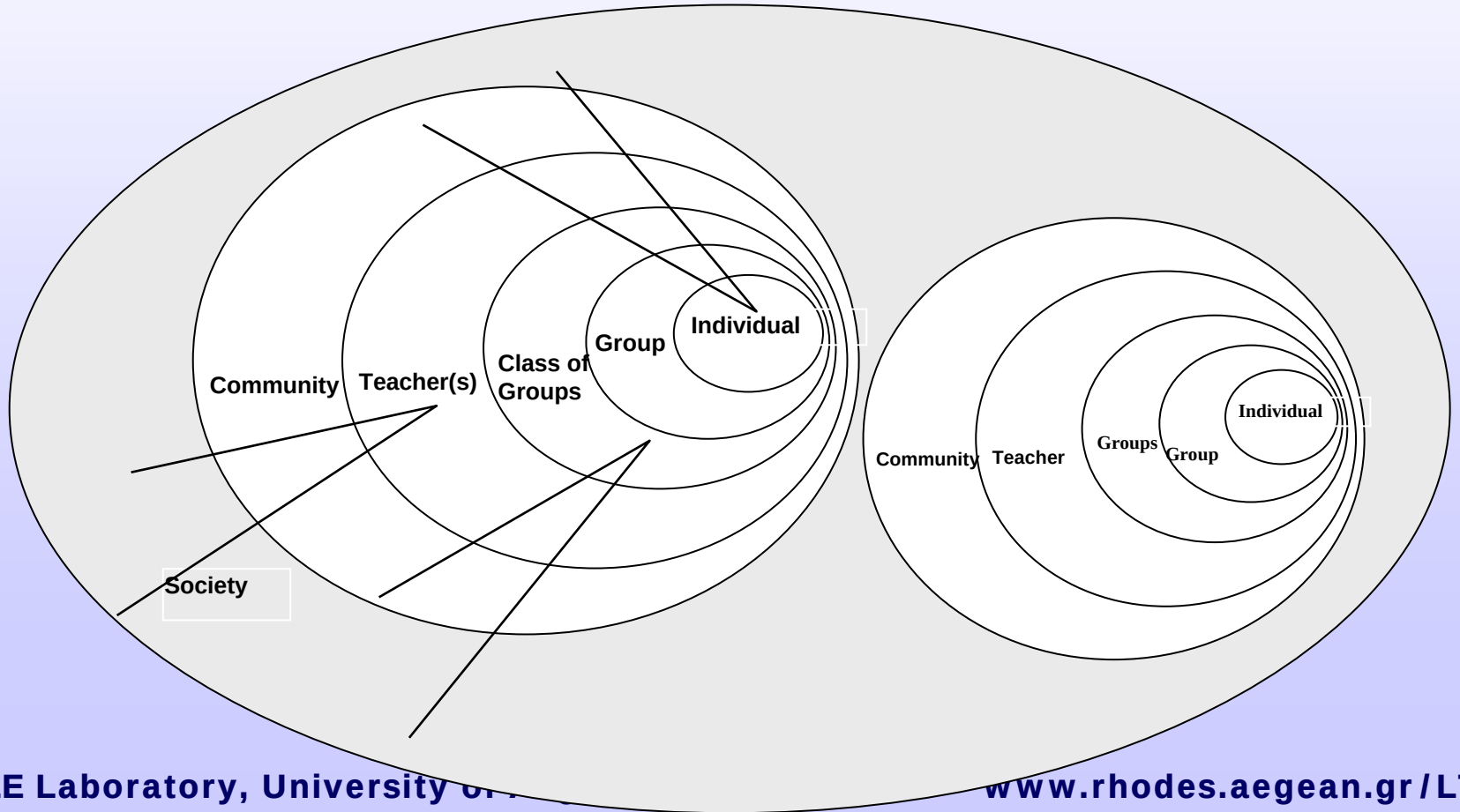
3.2. Trade off on students‘ metacognition vs teachers sup.



⇨ *More Research is required focusing on complementarities*

Trends on tools and functionalities

1. *A vision of all agents and cognitive systems involved in collaborative learning settings*



Trends on tools and functionalities

2. *A vision of a ‘‘unified’’ category of CSCL*

Action driven ⇔ text driven

Small group ⇔ wide community

synchronous ⇔ asynchronous communication

These two categories are actually sufficiently developed. It is currently possible to develop systems that are enriched from both.

Trends on tools and functionalities

3. *A complete view of necessary tools and functions supporting collaborative learning*

(a) Action and discussion functions

⇩

(b) Workspace awareness' functions

⇩

(c) Course Management

⇩

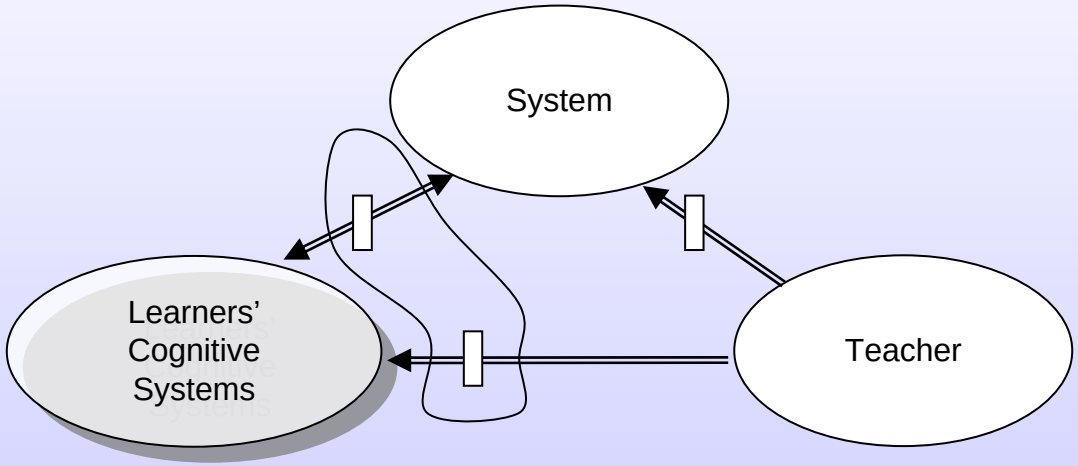
(d) Interaction Analysis for supervision, self-regulation

⇩

(e) Help and Advising functions

Trends on tools and functionalities

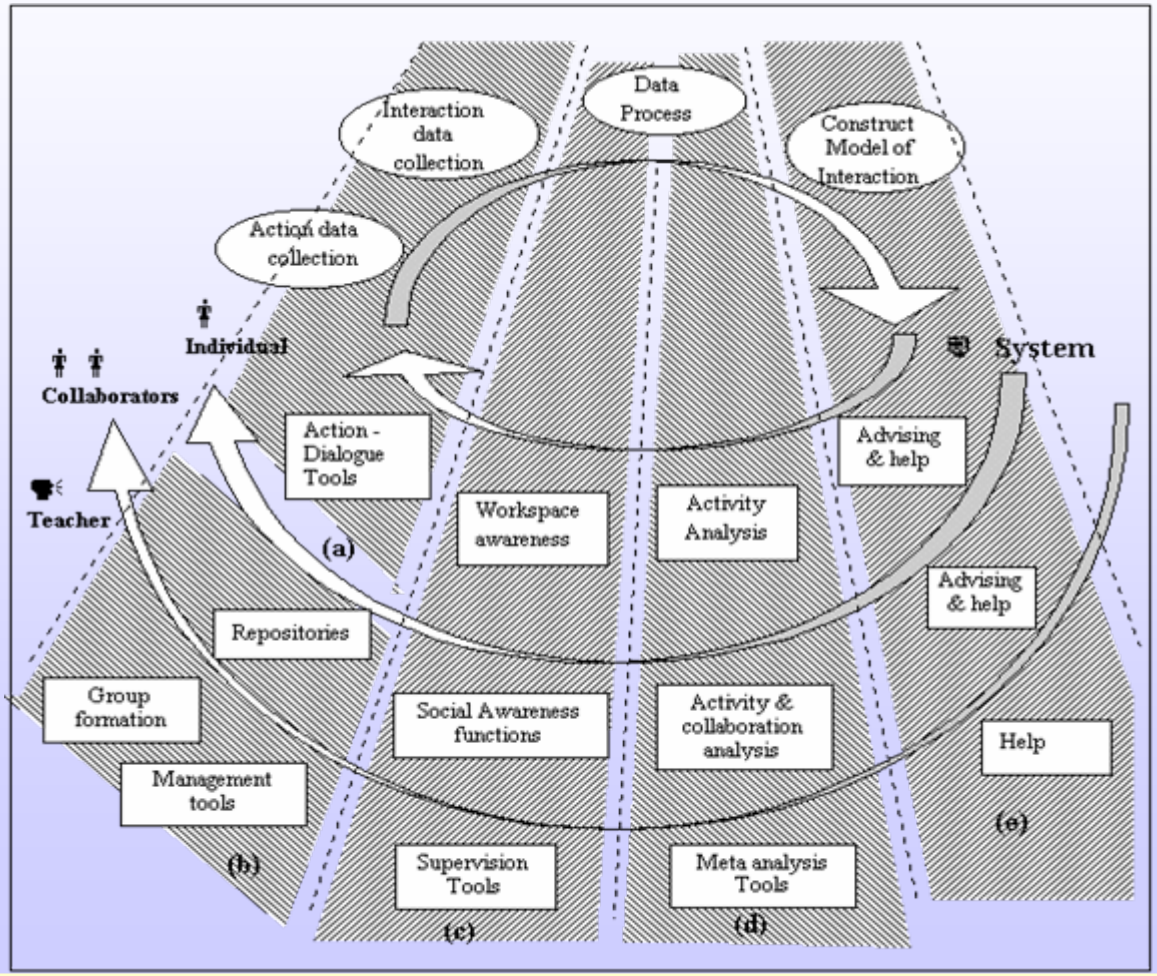
4. *A vision of the control of collaborative process as distributed to all the agents*



- **Self-regulation (via metacognitive support)**
- **Teacher supervision and/or evaluation & also self-assessment**
- **Advisors ('pedagogical agents') from the system**

Trends on tools and functionalities

Generic System



Research Agenda => advanced CSCL systems

- *Accentuation of the effort to produce rich, more complete & appropriate systems*

- *Production of flexible and negotiable environments (optional and customisable) that respect the sustainability and reusability of the elaborated work*

Research Agenda => advanced CSCL systems

- *Elaboration of powerful analysis methods of collaborative interactions:*
  - *Development of meta-cognitive tools addressed to students*
  - *Development of analysis tools addressed to teachers*

Research Agenda => advanced CSCL systems

- Parallel agenda:

  Collaborative learning activities and tasks regarding various collaboration modes

- New agenda:

  Exploration of the new possibilities offered by technological advances (ubiquitous computing, wireless devices, etc)