AI AND E-LEARNING.
FOR A CO-DISCIPLINARY APPROACH BETWEEN EDUCATION SCIENCES AND COMPUTER SCIENCES

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A relevant step

- We are currently in an important moment for a quality step forward in e-learning.
- In education area new perspectives were born (action theories and enactivism).
- The research both in the field of AI and of the semantic web is mature.
- But they are not always well used in e-learnig.
- It is needed to develop new synergies between computer sciences and education sciences.

Why?

- In the field of Education so far the amount of investment and of research is inferior to the amount spent in other fields.
- In the field of Human Sciences and mostly of education there exists prejudices towards technologies in general, and towards Artifical Intelligence specifically.

Other problems (connected to the previous ones)

- Educational complexity is underestimated.
- The role and the knowledge of the teachers are underestimated.
- In education there exists prejudices towards technologies.
- The synergies between the two sectors are not developed.

That implies:

1. Transmissive and instructivist models, which are not proper in complex situations.
2. A techicistic approach prevail.

Effects of the technicism (1)

If the experts on education prevail:

- Poor use of technologies and not significant use of AI.
- Simple and linear paths with a central role for the teacher and his opportunity to make changes in itinere.
- Environments which are still at the web 1.0 level.

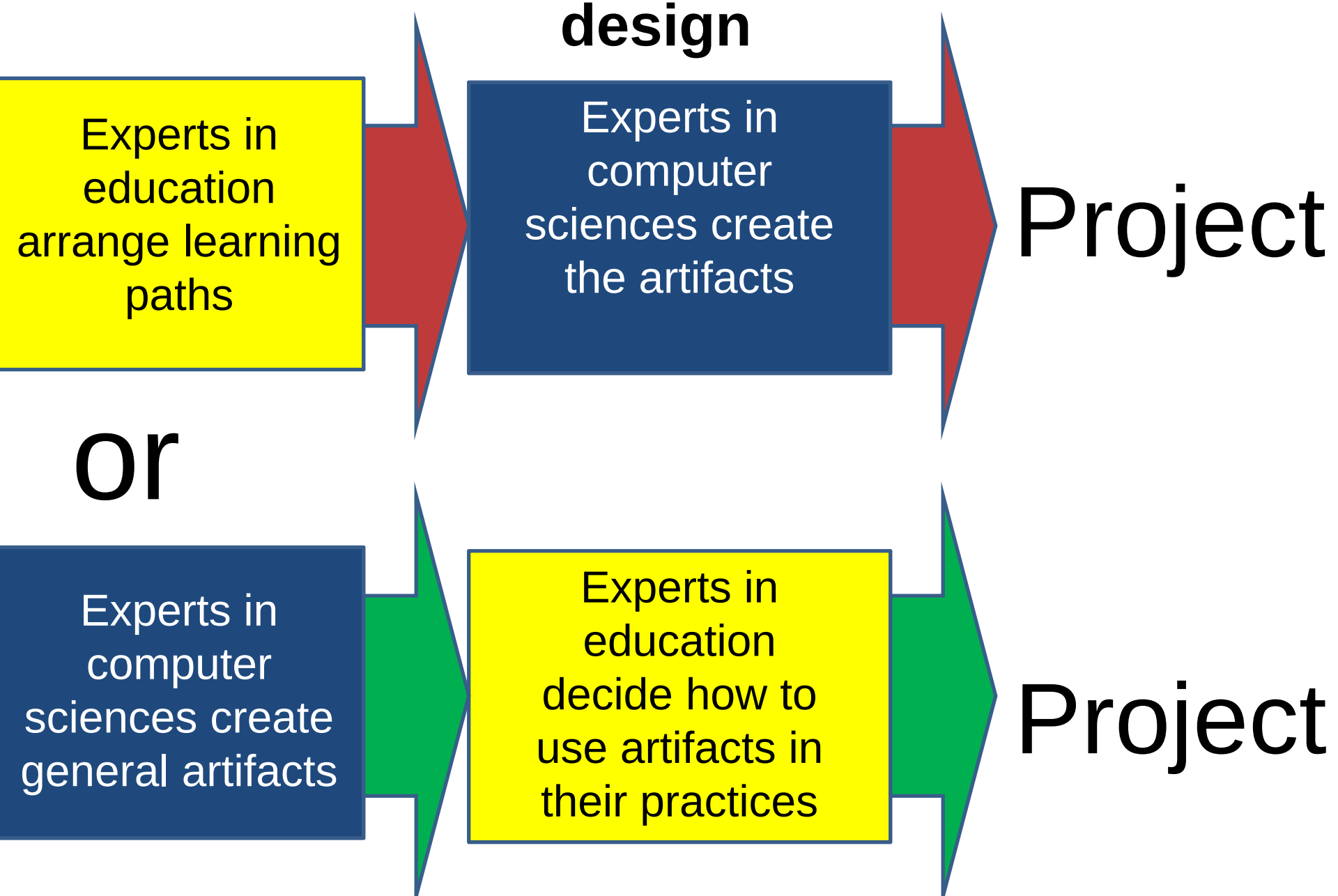
Effects of the technicism (2)

If computer science experts prevail:

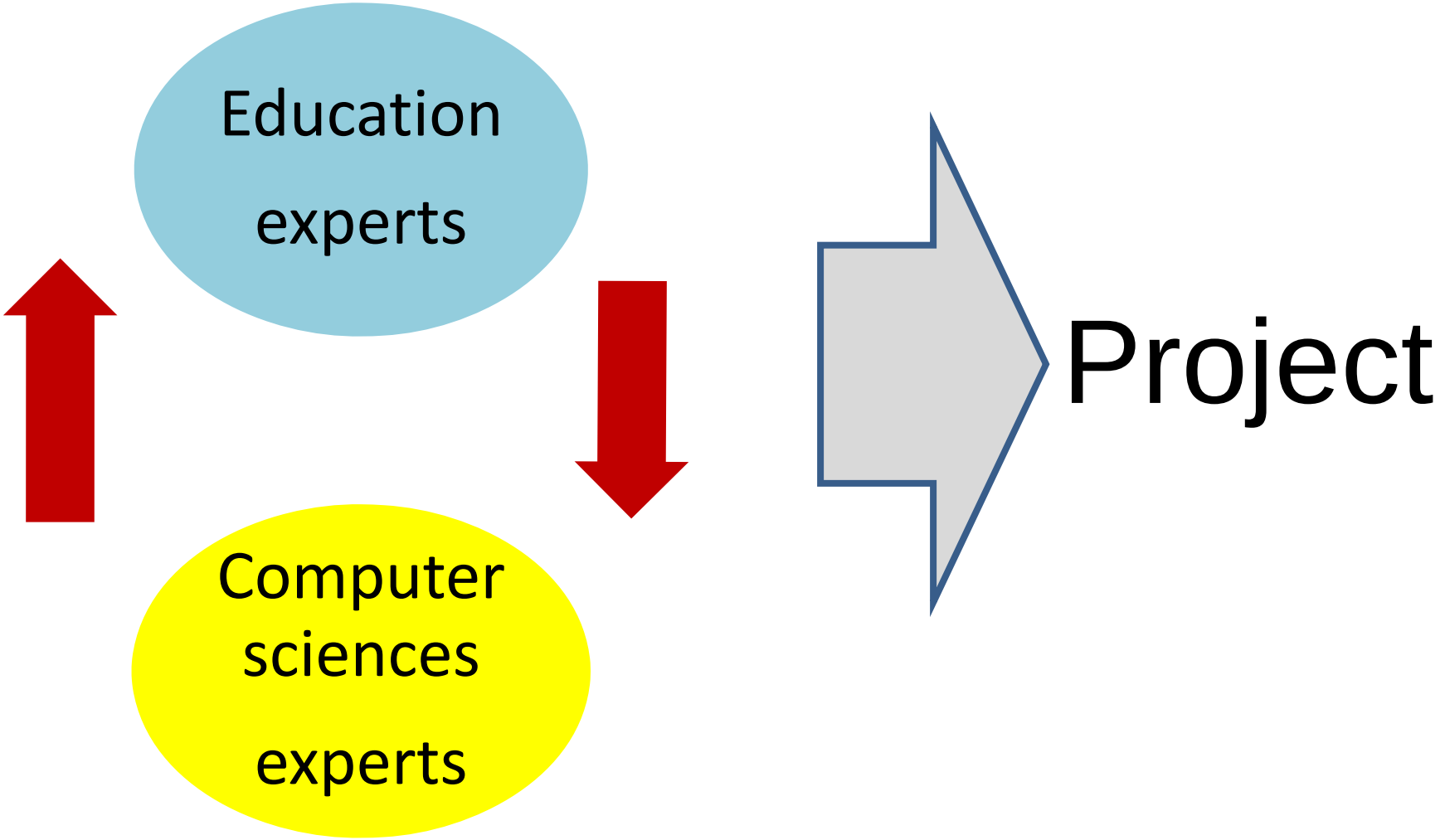
- Artifacts' production as neutral and pedagogically free.
- Creation of artifacts with high performance, but with a low usability and not addressed to educational problems.

(Two models arises from reductionist approach)

Reductionist approach – in the **instructional design**



In a non reductionist approach – **1. Instructional design**



What characteristics does the project have?

- The project presupposes an action without the teacher.

or

- The project presupposes an action with the presence of teacher.

First approach: ITS

- The state-of-the-art of the research shows in the last 10 years the collaboration between researchers in the computer science field and the cognitive psychologists.

- Some ITS:

- Baghera, an environment that supports students and teachers in teaching/learning Geometry .
- MyClass, an environment for the managers' training. The i-tutor can replan the teaching strategies and adapt them to the student or the group of students, in every phase of the teaching/learning process.
- Andes, an environment created for learning Newtonian Physics, used in many colleges and high schools in the USA
- GRAMY, an environment to experiment the demonstrations of geometry theorems.
- Advanced Geometry Tutor: an environment to support students in the creation of the demonstrations of geometry theorems and to test their validity.

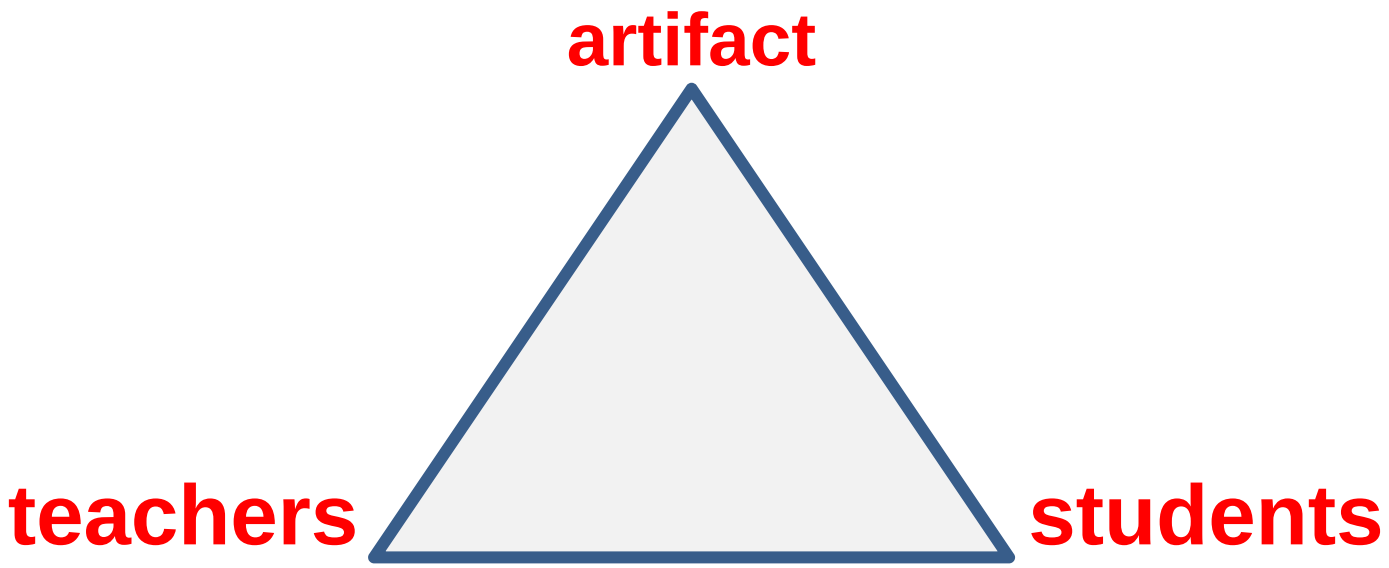
And the problem is…..

- The artifacts are subject-matter oriented.
- ITS are flexible in the learning direction, but not in the teaching direction.
- It's not required that the teacher intervene during the didactical action.

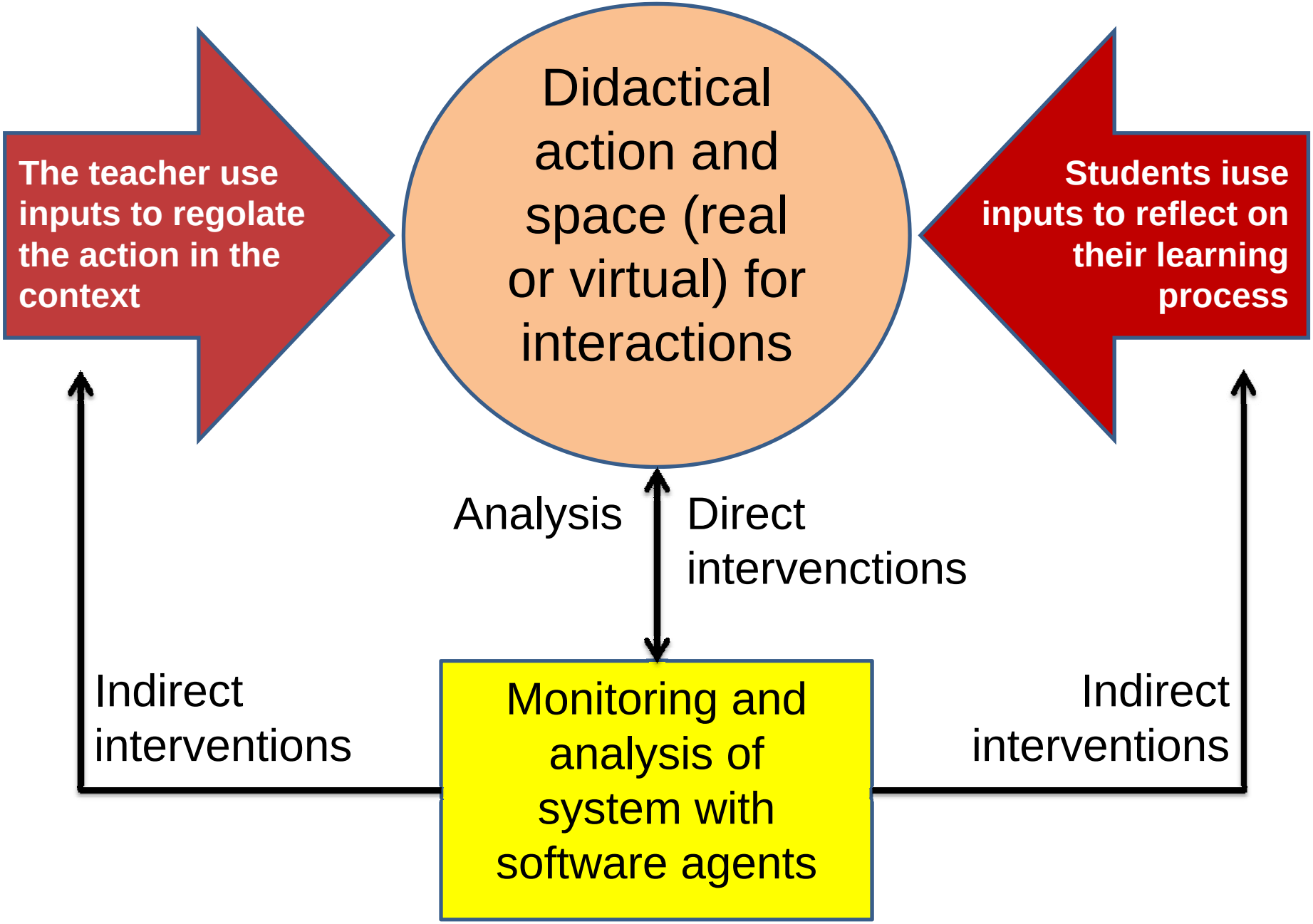
Second appraoch: After the design

2. situated action

- The interaction is not just between the artifact and the student.
- But teachers continue designing, acting regulating in action, activate a mediation.
- The artifact interact with teachers and students.



2. in action


Didactical action and space (real or virtual) for interactions
The teacher use inputs to regolate the action in the context
Students iuse inputs to reflect on their learning process
Analysis
Direct interventions
Indirect interventions
Monitoring and analysis of system with software agents
Indirect interventions

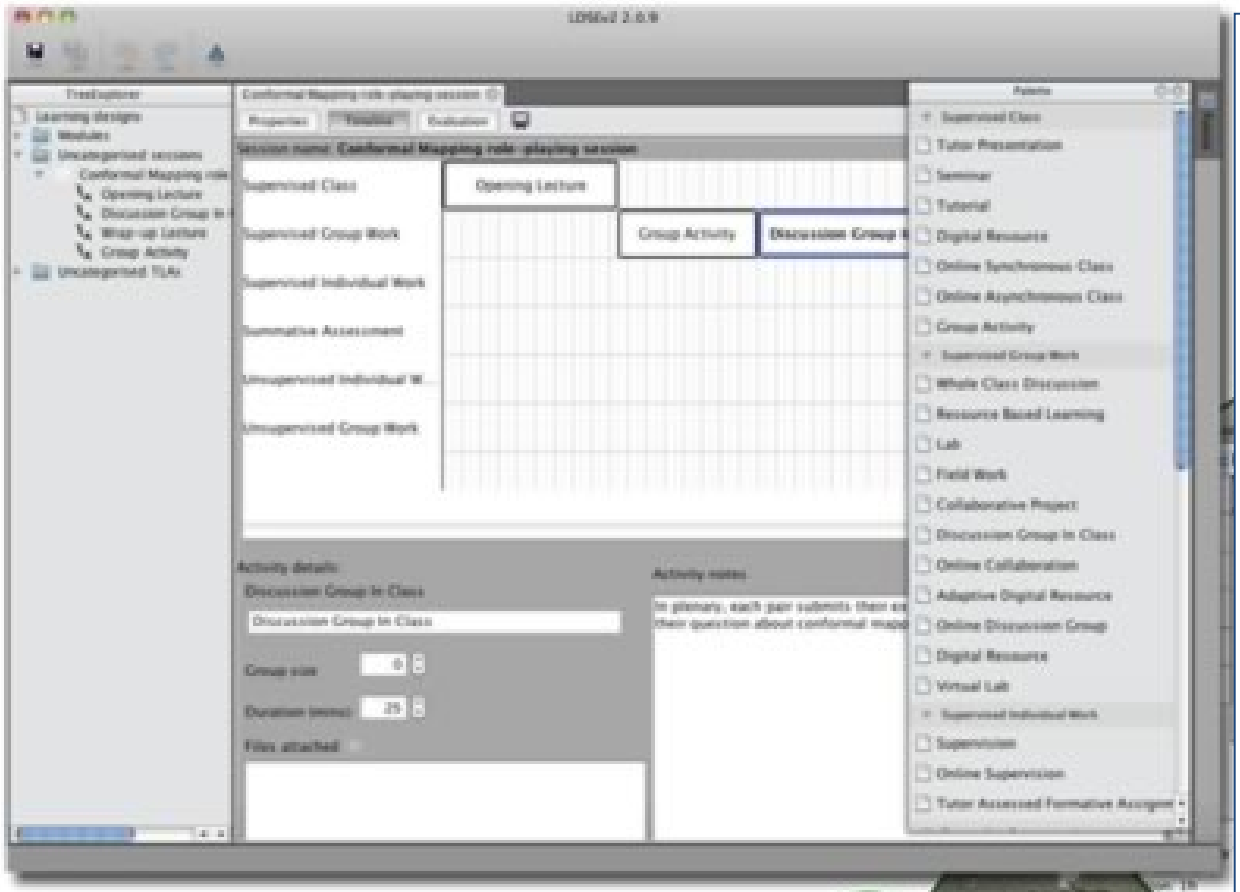
Two aspects for the teaching activity

1. Instructional designer
2. Mediator in action.

} Teaching as

Fist aspect: Instructional design

- EML and his evolution: LMSLD, one of the highest level is IMS LD:
  - But it's not broadly used in practice;
  - It's complex for teachers and designers in the educational field
- New paths and researches:
  - OUN group (Koper).
  - Dai Griffiths (ASTRO project),
  - Sheila McNeill (LMS LD and web 2 technologies).
  - LDSE Project managed by Diane Laurillard (LKL).



Learning Design Support Environment

To scaffold teachers' decision-making from basic planning to creative Technologies Enhancing Learning design.

https://sites.google.com/a/lkl.ac.uk/ldse/in-depth-information

Assumptions (1)

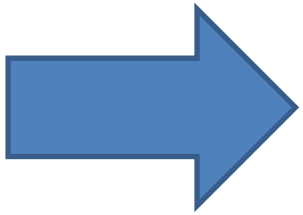
- Teachers will be required to use progressively more TEL.
- The teaching community should be at the forefront of TEL innovation, and not cede responsibility to other professionals.
- The development of new knowledge, in this case about professional practice, should be carried out in the spirit of reflective collaborative design.

Assumptions (2)

- The same technologies that are changing the way students learn can also support teachers' own learning in new ways.
- Computer-supported collaborative learning has long been established as an important form of TEL for students; we believe it is equally applicable to teachers' professional development.

Second aspect: didactical action

- Flexible and auto-poietic environments.

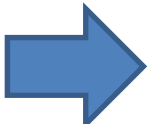


- Active monitoring, analysis and allarming with software agents.

- To support the self regulating learning.
- To support the teacher's work.
- To foster the auto-poiesis of the environment.

Environment

- It orients, motivates students and also provides a methodological guide for the path to develop.
- It reifies the didactical path with its structures, manages the time and marks the pace of the process.
- It arranges and delivers the materials and the didactical mediators in relation to the specific topic and the class context.
- It takes care of the group class as a collective subject and of students as individuals.
- It listens, observes and assesses the processes.

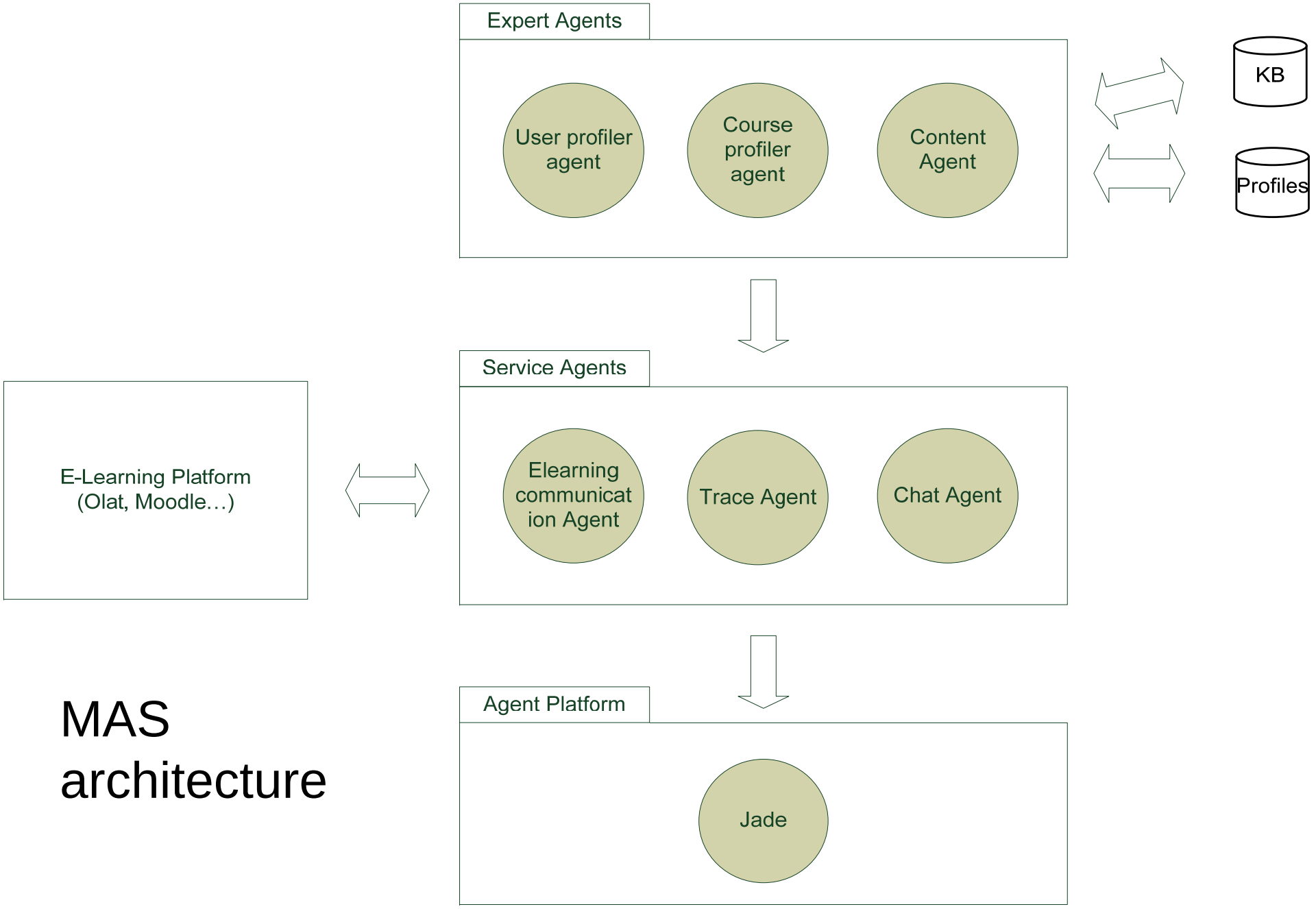


Enaction

The reference theories are:

- Action theories.
- Enactivism, for which knowledge is structured in action, in doing, and doing transforms real world and its representation at the same time.

MAS architecture



Next step: Design + Mediation

Tools for Instructional design allow:

1. To be aware of design.
2. To identify the indicators for the monitoring.
3. To predispose the texts and the deadlines with which the system can interact with students.

Tools for Mediation allow:

1. Foster autopoiesis.
2. To support the teacher: avoiding simple interventions, providing information on the system, support in action.

Goals

- To support the tutor and teacher’s tasks in the design and in the interaction during the didactical situation.
- To support reflection paths and students’ self regulated learning.
- To foster auto-poiesis of the environment.

Our current work at MC university

1. Implementation and use of OLAT: LMS as Learning world (now we have 3000 students in on line courses)
2. Experimentation of the design- LDSE project
3. Experimentation of ITS – Knowledge tutor
4. Implementation and check of MAS.

- The following step is to build, thanks to a pedagogical/didactical and computer science approaches, co-design process, a model that can consider both the viewpoints of the Education Sciences, and the viewpoints of Computer Science to create an integrated system.
- The main aspect is to overcome a technicistic approach. The Education Sciences have an epistemology that implies at the same time a philosophy and a technique, in the same way the Computer Sciences are a philosophy and a technique.

- Any questions?
- Thank you!

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