8 Computer-Supported Cooperative Learning

Literatur:

J. Haake/G. Schwabe/M. Wessner (Hrsg.): CSCL-Kompendium, Oldenbourg 2004 (Kap. 2.1.5)

Computer-Support in Physical Learning Rooms

- Main scenarios:
  - Enhanced classroom
    - » Learners and tutor(s) are present at the same time in the same room
    - » Electronic aids are applied to improve presentation, communication and documentation
  - Distributed enhanced classroom
    - » Learners and tutor(s) are present at the same time in different rooms
    - » Various segmentations into groups possible
    - » Telecommunication is used to link rooms and to create “tele-presence”
- Possible roles of computer
  - Passive (pure support tool)
    - » E.g. slide presentation system, podcast recording and publishing
  - Active (guidance, partially replacing teacher)

Suitable Hardware for Learning Support

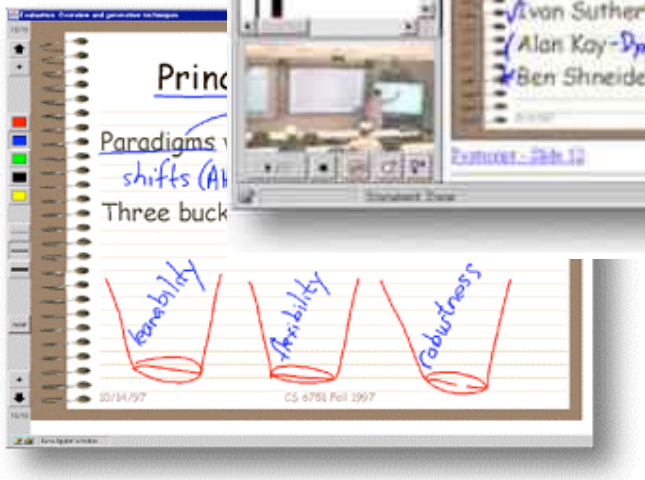
- Data projection systems
  - “beamer” and large displays
- Interactive surfaces
  - E.g. “Smartboard”
  - Sensitive to touch or pointing with special device
  - Single- or multi-touch
  - Multi-touch, multiple user: Problem of user identification
- Laptops
- Tablet PCs
- Furniture-integrated screens and keyboards
- Handheld devices (mobile phone, PDA)
- Specialised devices

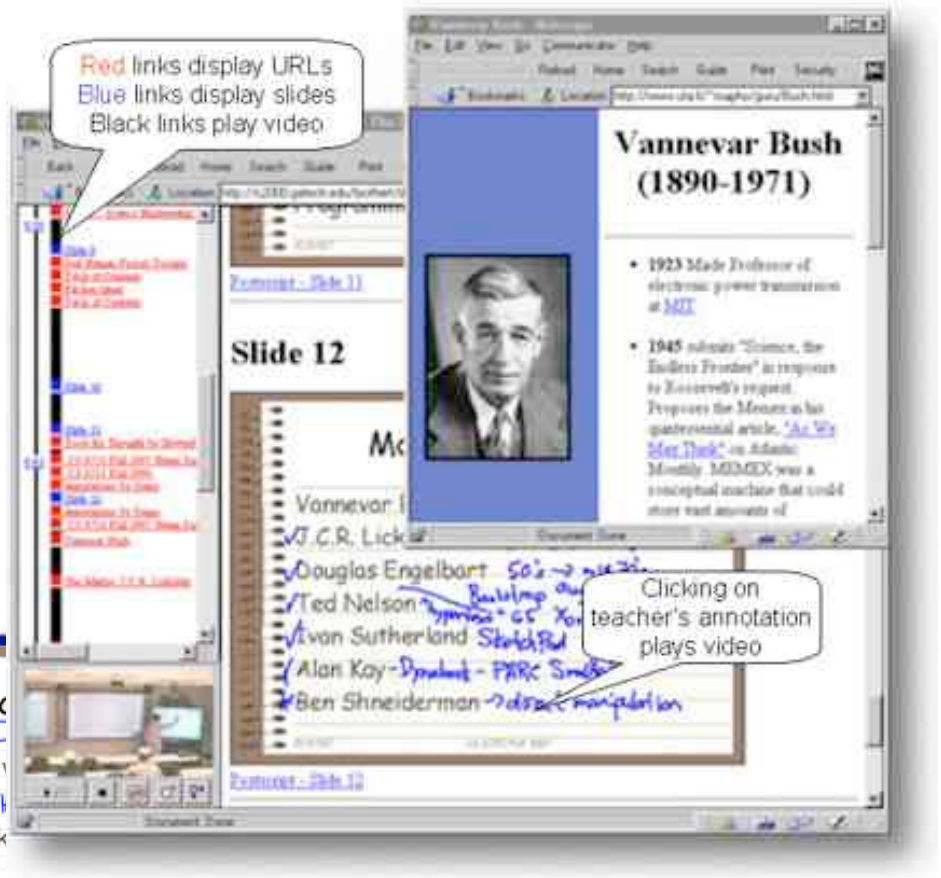
Basic Challenges for Learning Support

- Integration between social and technologically-mediated interaction
  - Not to replace but to enhance face-to-face communication
  - Not to inhibit face-to-face communication!
- Special features of computer-based working style in classroom:
  - Parallel work
  - Anonymisation of contributions
  - Structuring of process
  - Recording and playback
  - Interactive learning materials (e.g. simulations)
  - Automatic supervision of activities (e.g. in learning games).

eClass/Classroom2000

- Gregory Abowd, Georgia Tech
- Provision of electronic media
  - interactive whiteboards, tablet PCs
- Sophisticated automated recording (audio, video, pen strokes)
- Production of structured Web presentation





Example of Enhanced Classroom

- CONCERT Lab (Fraunhofer IPSI)

http://www.ipsi.fraunhofer.de/concert/index_de.shtml?concert_lab/01_start

Example for Integration of Handheld Devices (1)

- Concert Studeo (Fraunhofer IPSI)

ConcertStudeo: Configuration & Usage Scenario

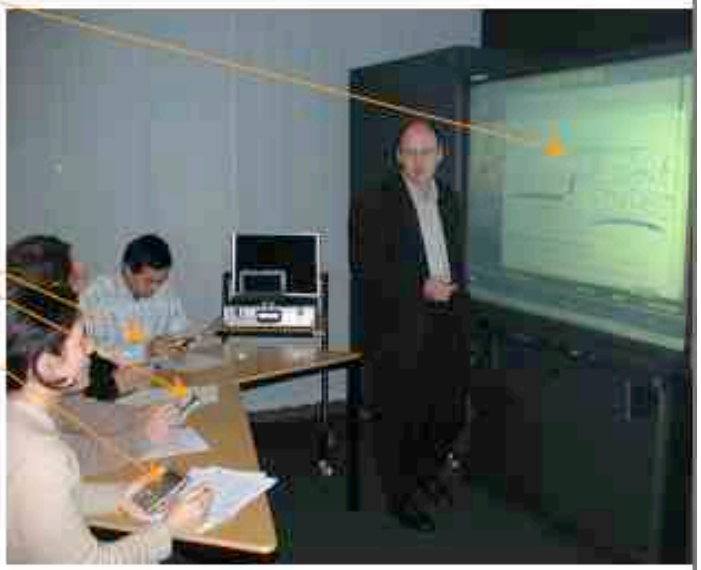
The ConcertStudeo system includes:

ConcertStudeo Board
Runs on the electronic blackboard, mainly used by teacher or tutor

ConcertStudeo Control
Runs on each of the PDAs, used by the students

ConcertStudeo Server
Runs on any PC, which is WLAN connected to ConcertStudeo Control and Board

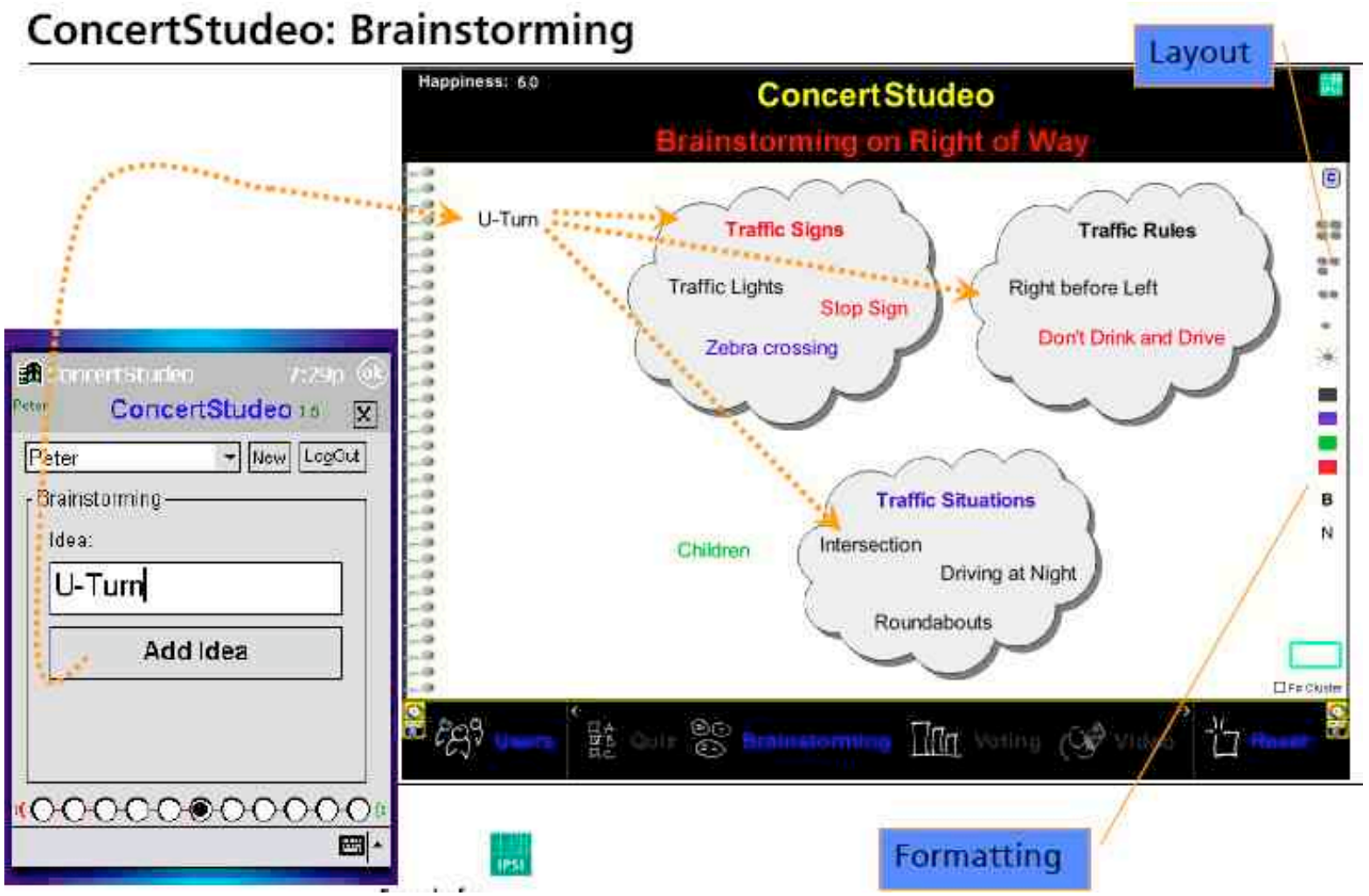
ConcertStudeo Weaver
Runs on the ConcertStudeo Board PC; is used to integrate interactions in advance or spontaneously ("on the fly") to already availabe learning content



http://www.ipsi.fraunhofer.de/concert/projects/past_projects/studeo/ConcertStudeo-englisch.pdf

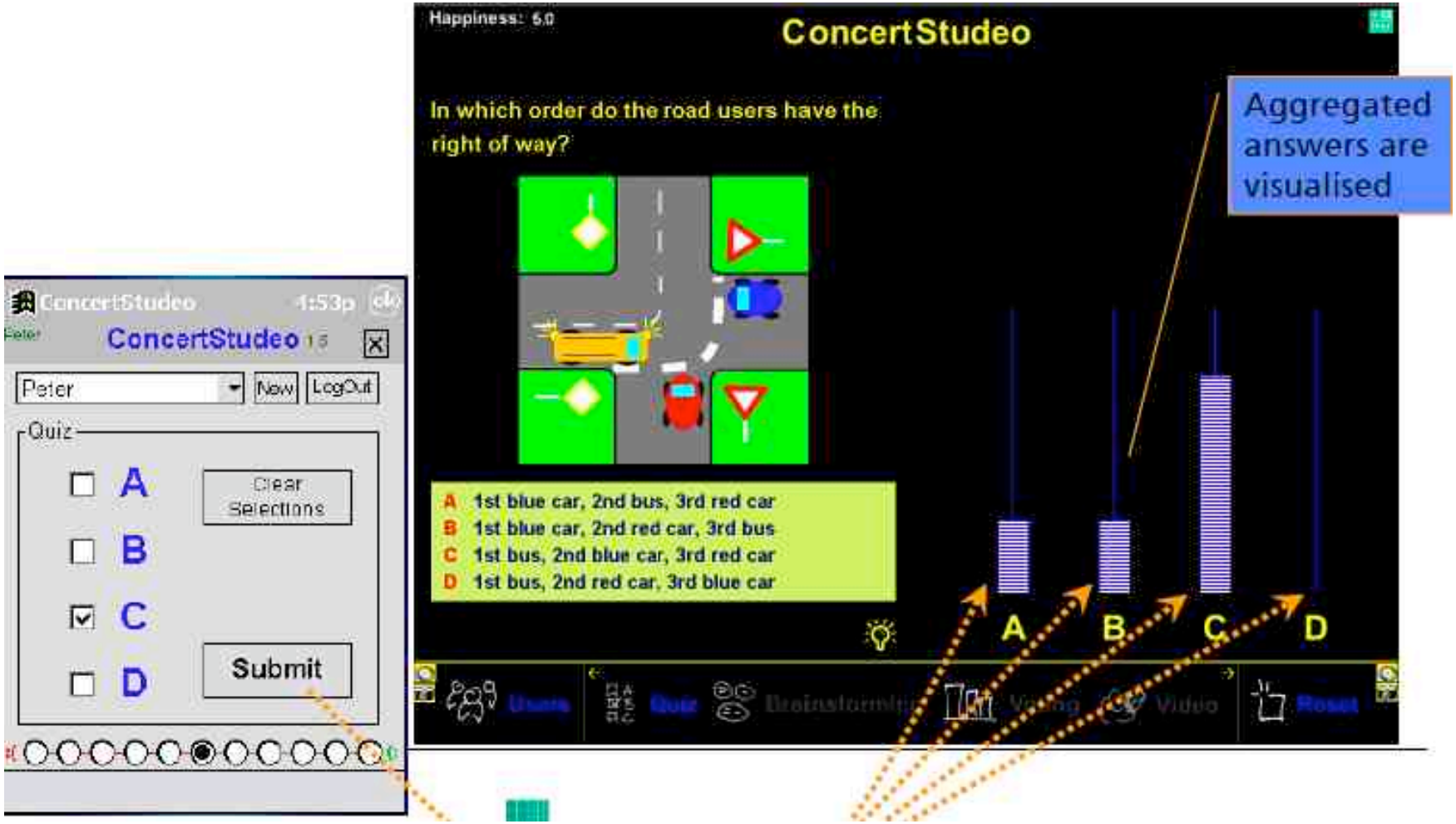
Example for Integration of Handheld Devices (2)

- Concert Studeo (Fraunhofer IPSI)

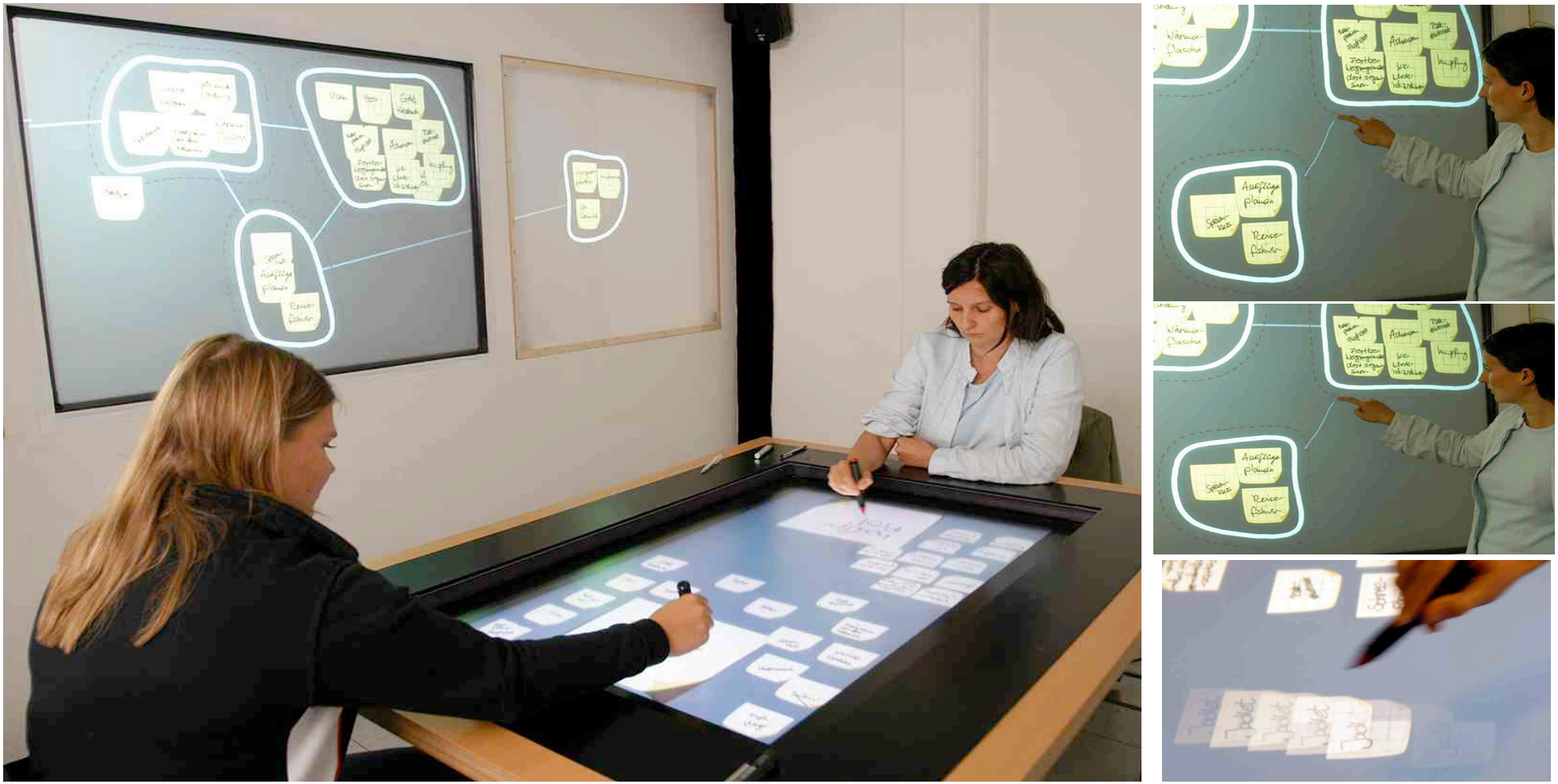


Example for Integration of Handheld Devices (3)

- Concert Studeo (Fraunhofer IPSI)



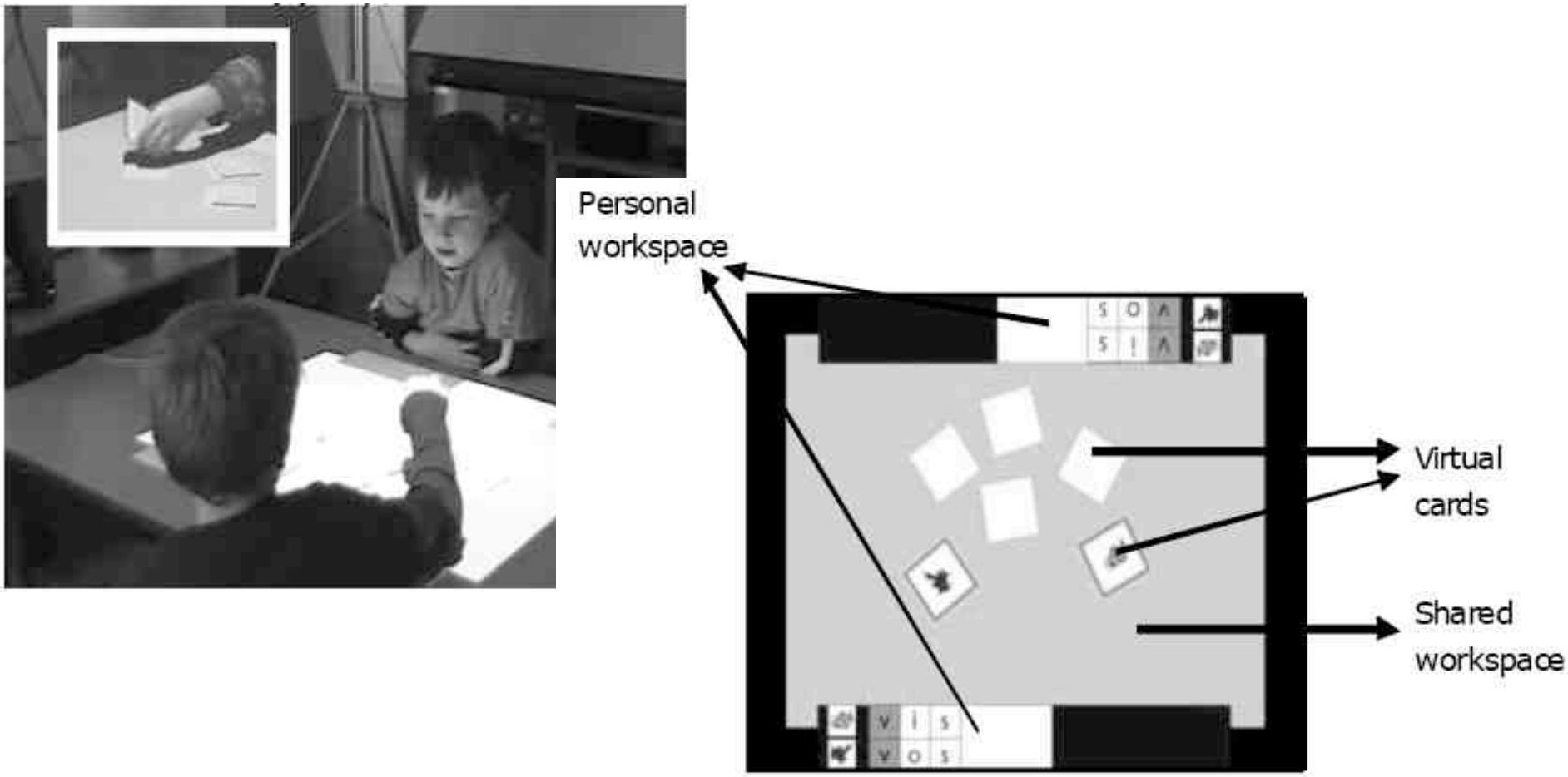
LMU Example: BrainStorm in Instrumented Room



[Hilliges, Terrenghi, Boring, Kim, Richter, Butz 2007]

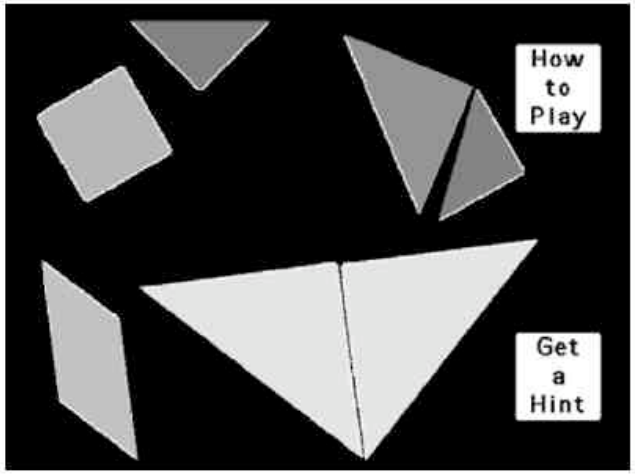
Tangible Interaction in Learning Game: Example 1

- "Read-It" (Weevers, Sluis et al. 2004):
  Memory game for children who learn to read, multimodal



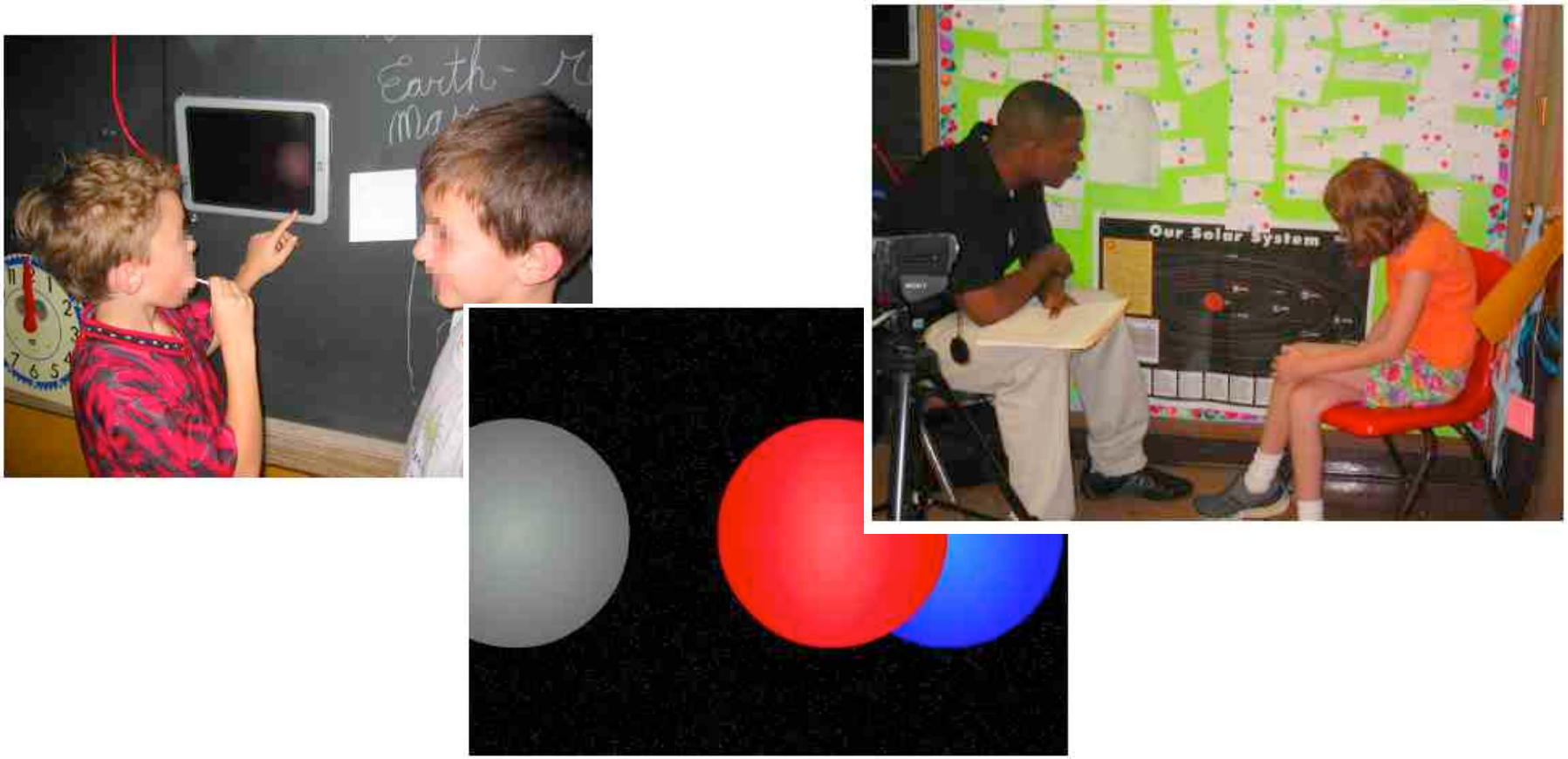
Tangible Interaction in Learning Game: Example 2

- Scarlatos 2002: Tangible Interfaces for Collaborative Learning Environments (TICLE)
  - Physical Tangram puzzle with computer assistance
  - Video-based tracking based on reflective patterns
  - Background problem analysing process, adaptive to situation
  - User interface created with Macromedia Director



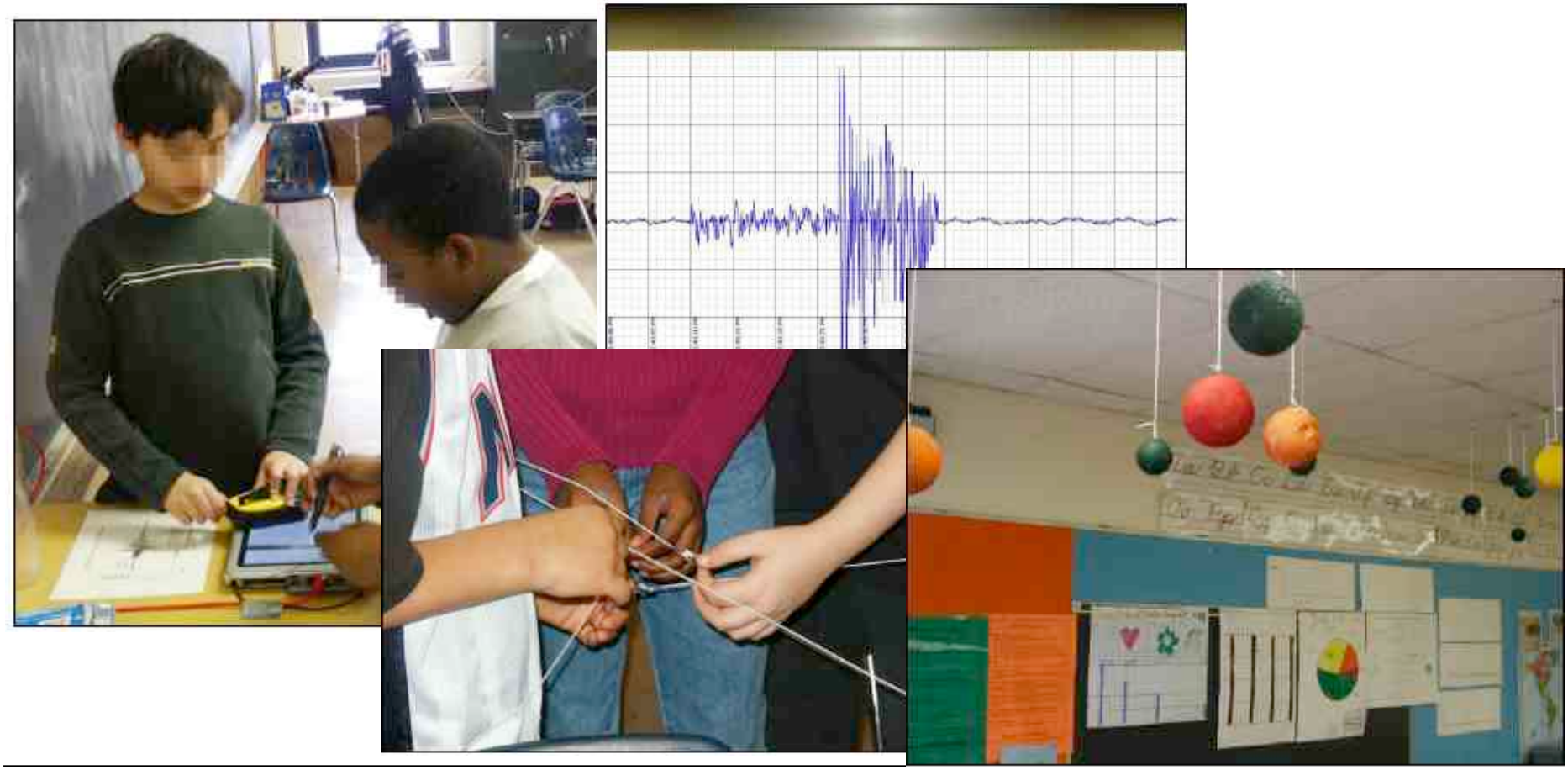
Classroom-Embedded Simulation (1)

- Moher (2006)
- HelioRoom: Simulation of Solar System integrated into classroom



Classroom-Embedded Simulation (2)

- Moher (2006)
- RoomQuake: Simulation of earthquake analysis integrated into classroom



8 Computer-Supported Cooperative Learning

Literatur:

F. Fischer, I. Kollar, H. Mandl, J. Haake (Eds.), Scripting computer-supported collaborative learning: cognitive, computational and educational perspectives. Springer, New York, pp. 101–115.

What is a Script?

- "*[…] a script is a story or scenario that the students and tutors have to play as actors play a movie script*" (Dillenbourg, 2002)
- Example: Restaurant Script
- Term comes from cognitive psychology (Schank, Abelson 1977)
  - Knowledge structure regarding a sequence of actions
  - E.g. restaurant script
- Scripting in E-Learning involves three perspectives
  1. Cognitive psychology
     - Internal: Script is a memory structure inside the user
  2. Education
     - External: script is imposed on the user
  3. Computer science
- Joining in cognitive processes: thinking, learning
- Joining in metacognitive processes: monitoring, regulating, evaluating, ...

(King, 2007) (Dillenbourg, 2002)

Example Script: Universanté

- Dillenbourg and Jerman 2006
- Students from different nations solve problem cases in mixed and changing teams. Each case is first read and discussed in teams of mixed nations. National teams then inform each other about the cases read and create a national fact sheet. These national fact sheets are then compared and completed by teams of students with thematically similar cases (mixed nations). These same teams present their compiled fact sheets to other teams of their same nationality and receive feedback. Finally, students return to their initial case group and work out a case solution.

  (Quoted from Kobbe 2007)

A Syntactical Analysis of Collaboration Scripts

Script = [phase 1, phase 2, ..., phase m]	Sequential: linear sequence of phases.
Phase = [Task, Group, Mode, Timing]	Phase specifies how students should collaborate and solve the problem. Attributes of a phase: • the task that students have to perform, • the composition of the group, • the distribution of task (see Task attribute) • the mode of interaction • the timing of the phase
Task = [input, activity, output]	• Each phase is clearly associated with one main activity. • Input is usually teaching material (e.g. text) • Output is the result of the activity.
Task(n+1) = [output(n), activity(n+1), output(n+1)]	The output of a phase generally becomes the input of a later phase (often the next phase).

(Dillenbourg, 2002)

Specifying CSCL scripts

Components:

1. Participants (number, demographics, ...)
2. Activities (summarizing, explaining, reviewing, ...)
3. Roles (listener, summarizer, ...)
4. Resources (e.g. teaching material)
5. Groups (how to divide the participants into groups)

Mechanisms:

1. Task distribution (e.g. distribute material/information)
2. Group formation (by some principle vs. natural groups, e.g. gender)
3. Sequencing (order of events and activities)

(Kobbe, 2007)

Example: Specifying Universanté

- Participants: Participants from at least two nations with at least as many participants per nation as there are case descriptions.
- Groups: Case groups, national groups, theme groups
- Task distribution: Each case group receives one case description
- Group formation: For each case description, one case group with at least one participant per nation. For each theme, a theme group composed of all case groups related to the theme.
- Sequencing:
  - Discussion of case within each case group
  - Synthesis of case experience presented by theme group members in the national groups.
  - Fact sheets elaborated within the subgroups of a certain nationality in theme groups.
  - Each theme group discusses similarities and differences of national fact sheets
  - Within each nation group: members of each theme group present fact sheet

(Kobbe, 2007) …

Effective Learning Activities

- Thinking aloud
- Explaining content
- Asking critical questions
- Elaboration of content
- Argumentation
- Reconciling cognitive discrepancies

(King, 2007)

Example of Face-to-Face Scripted Collaboration

- Pair Summarizing
  - 2 roles: recaller and listener
  - Activities: summarize, give feedback, joint elaboration
- Reciprocal teaching
  - Roles: questioner, summarizer, clarifier, predictor
- Guided strategic problem solving
  - Question based / no roles
  - Guide students to be strategic
- “Ask to think - tel why”
  - Roles: teacher, learner

The more detailed the script, the harder it is to internalize it
→ CSCL required

(King, 2007)

Taxonomy of Scripts

- Macro scripts vs. micro scripts

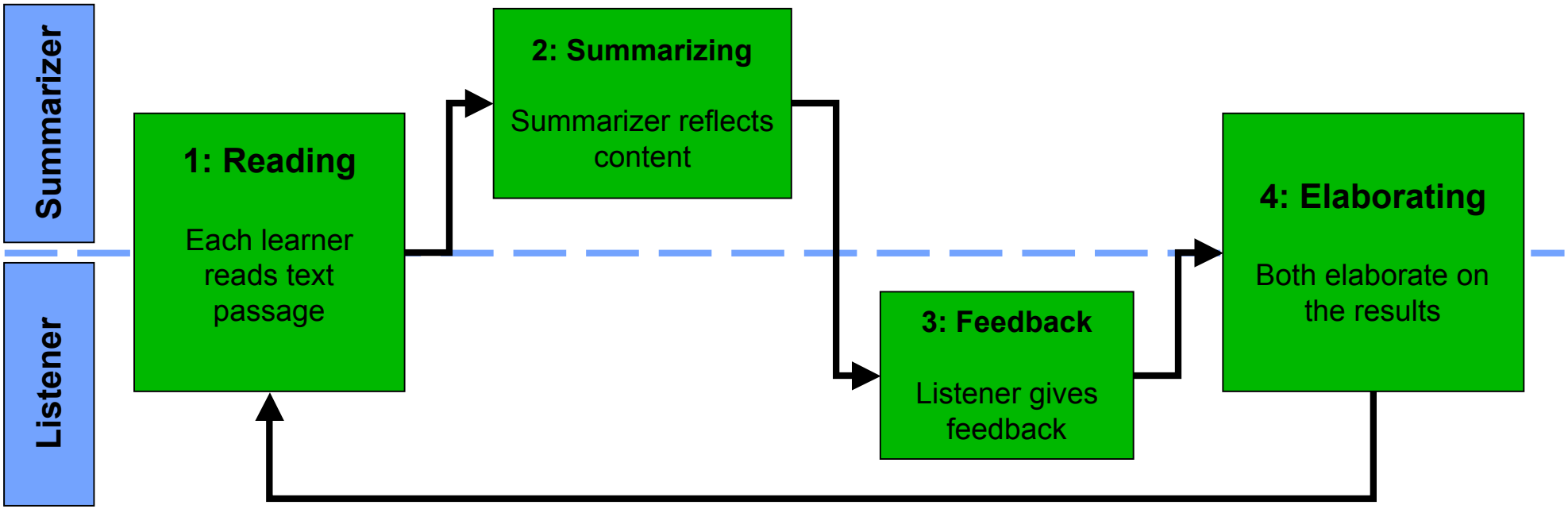
	Macro Script	Micro Script
Approach	Top-down	Bottom-up
Perspective	Pedagogical	Psychological
Level	Processes	Dialogues
Example	Structure of the collaboration process (e.g. presentation, discussion, ...)	Coordination of the collaboration (e.g. argument, counter argument, ...)

- Imposed vs. induced
  - Imposed means the script is explicitly shown to the user
  - Induced means it is embedded in the learning environment → higher freedom

(Kobbe, 2007), (Dillenbourg & Jermann, 2007), (Ayala, 2007)

Example Macro Script 1: M.U.R.D.E.R.

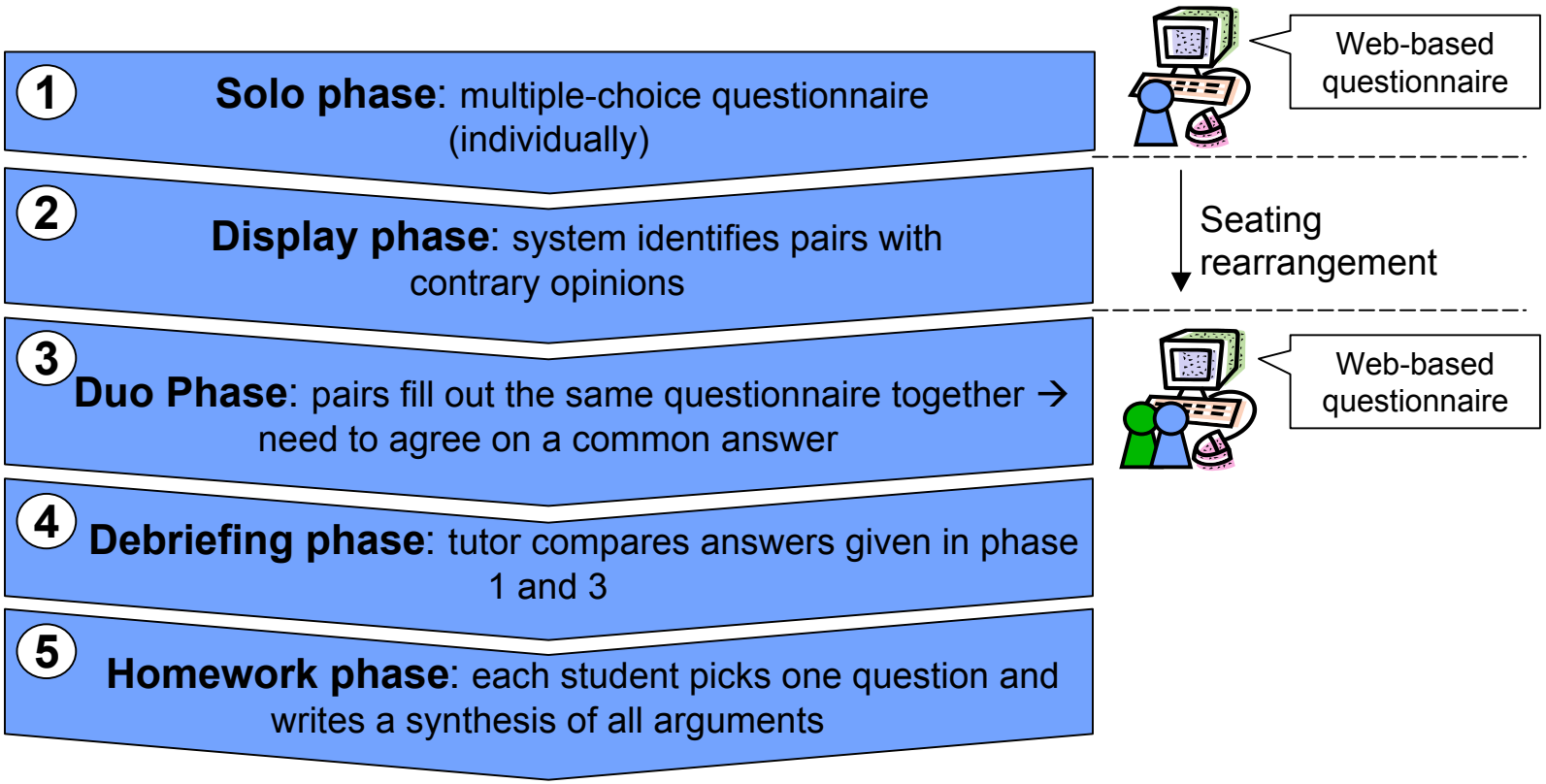
- Mood, Understanding, Recall, Detection, Elaboration, Review
- Supports collaborative sessions aiming at text understanding
- 2 Roles:
  - Summarizer
  - Listener



(Kobbe, 2007), (Kollar, 2006)

Example Macro Script 2: ArgueGraph

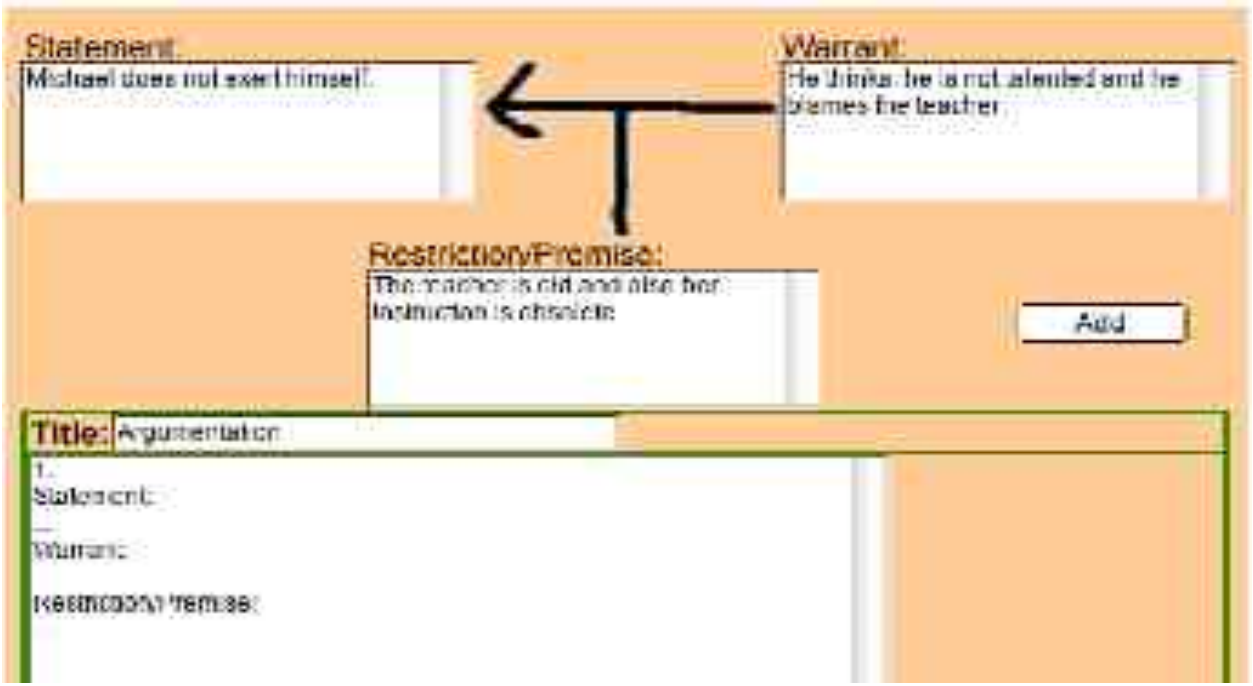
- Goal: trigger argumentation between learners (Dillenbourg, 2002)
- Phases:



(Jermann, 2003)

Example Micro Script

- Support the construction of
  1. Arguments (argument = statement + justification (“warrant”) + restriction)
  2. Argumentation sequences: (argument - counterargument - integration)



The interface of the script for argument construction (Stegmann, 2004)

(Stegmann, 2004)

Current Research Issues

- Construction of prototypes supporting collaborative scripted learning
- Comparison of different realisations of the same script
  - E.g. without technical support vs. with technical support
  - E.g. with traditional devices (laptops) vs. with advanced devices (tabletop)

- Open opportunities for personal involvement in project work
  - Projekt- und Diplomarbeitsthemen
  - Kotakt: Sara Streng

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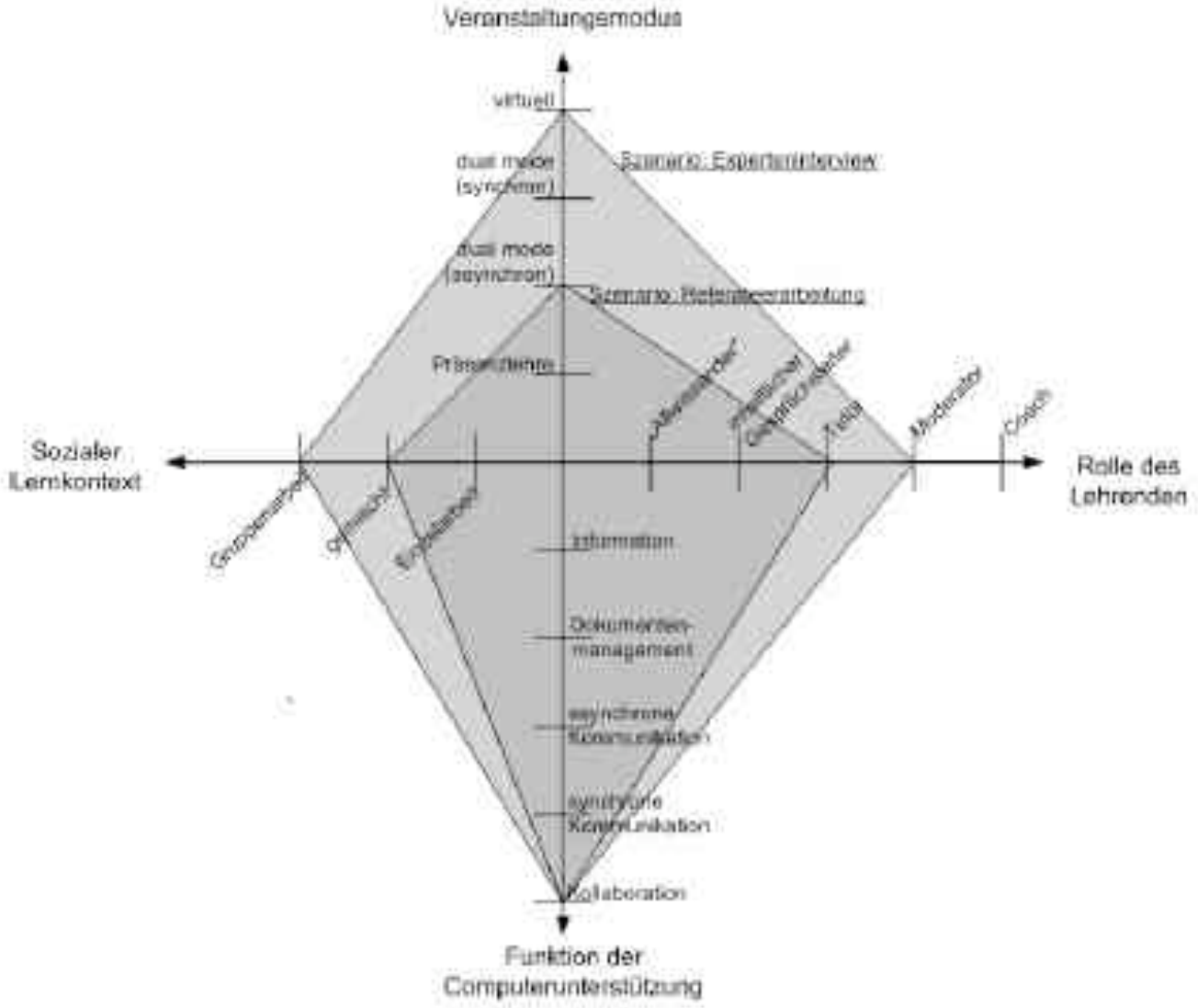
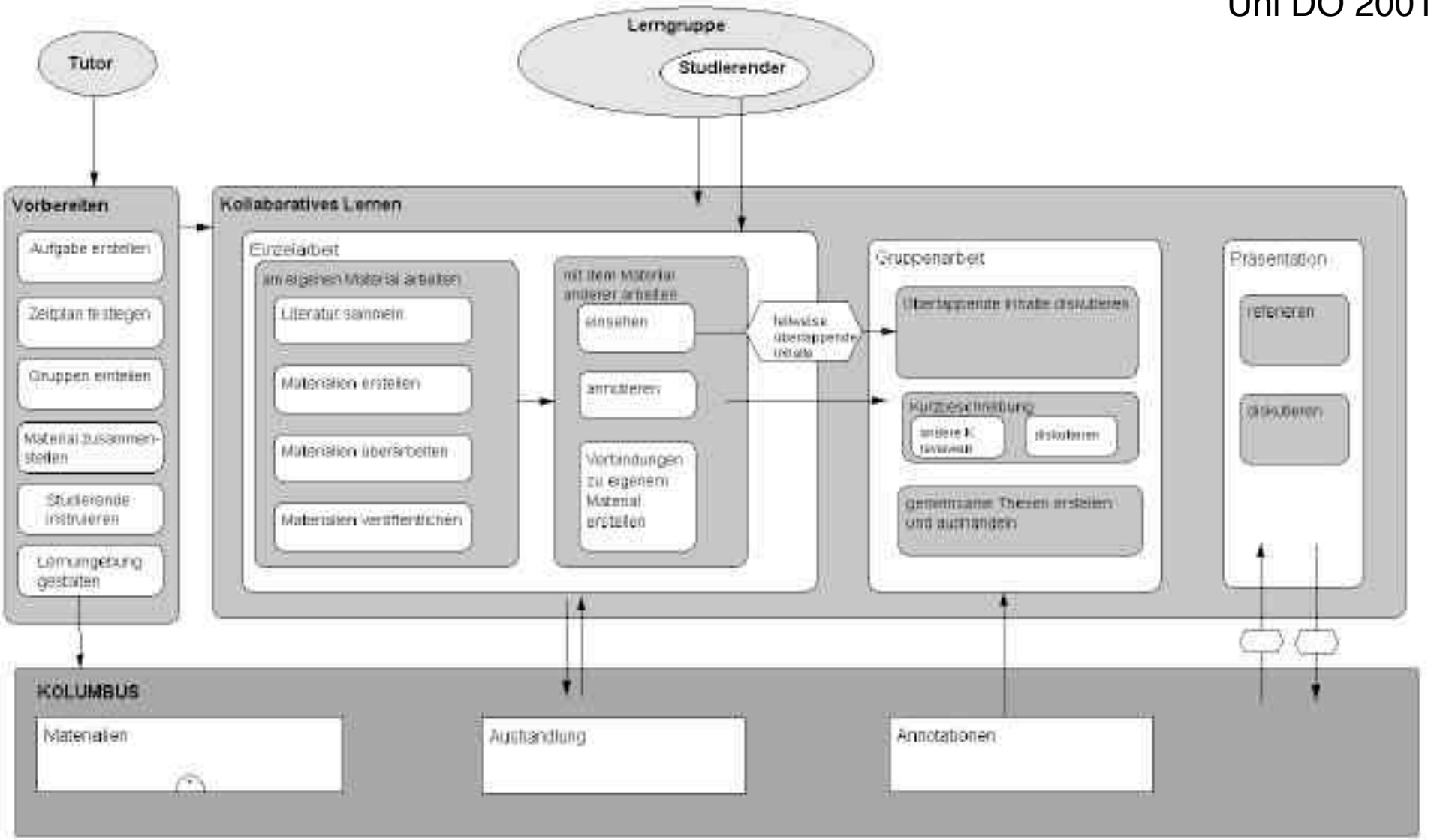
Bandbreite möglicher Szenarien



Beispielszenario "Referateerarbeitung"

Uni DO 2001

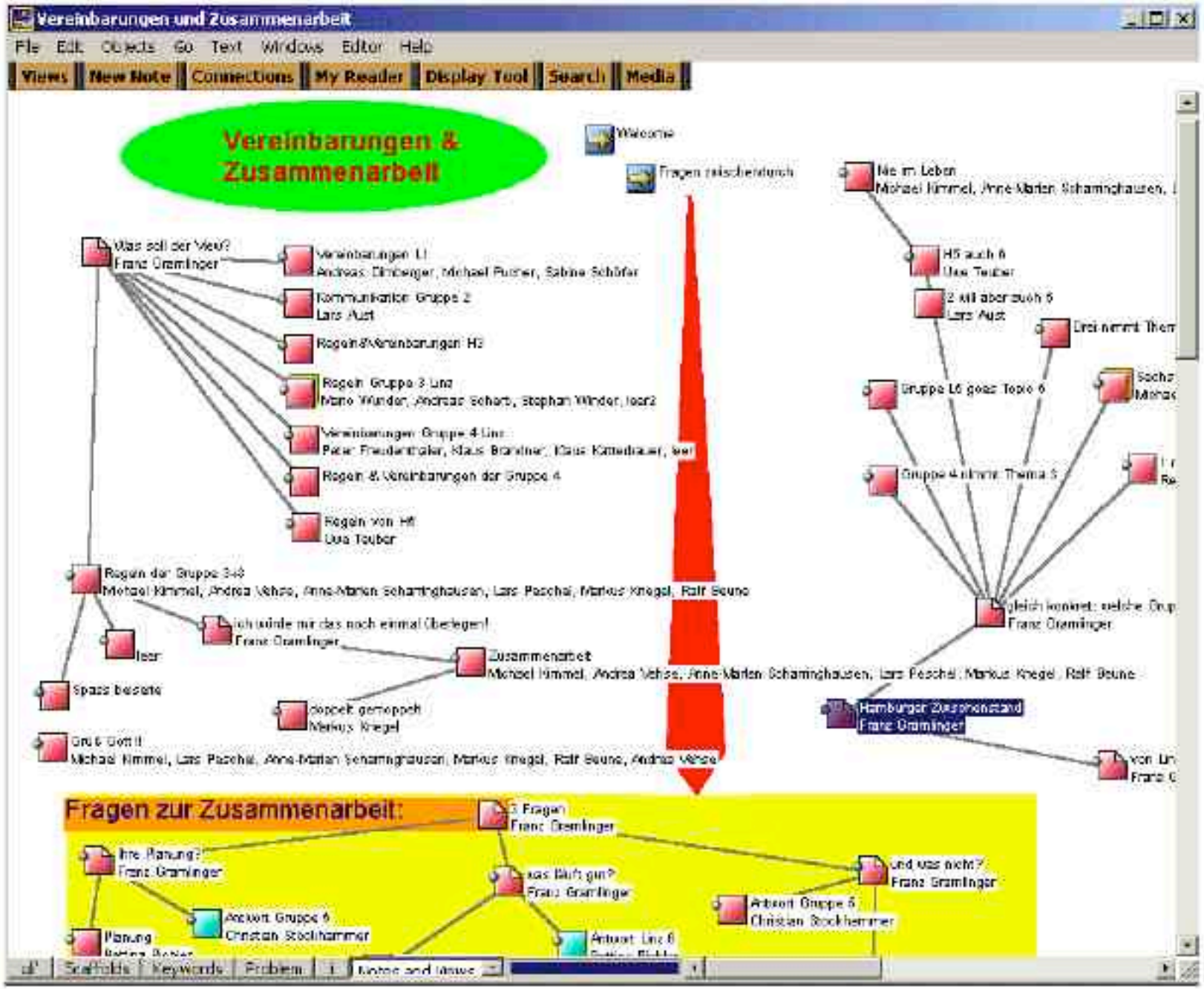


Erfahrungen aus CSCL-Seminaren

- (Uni Dortmund 2001)
- Vorbereitungsaufwand ist *wesentlich höher* als in traditionellen *face-to-face*-Seminaren
- Strukturgeben (scaffolding)
  - Inhaltlich: Zusammenarbeit darf kein künstlich aufgesetztes Ziel sein
  - Organisatorisch: Intensive Einführung der Lernenden
    - » Bsp. *Peer review* gemeinsam erstellter Ergebnisse
    - » Bsp. Erarbeiten gemeinsamer Thesen
  - Prozessebene:
    - » Strukturierter Ablauf, Orientierungsprobleme
- Technik-Schulung
  - Extrem hohe Anforderungen
  - Nicht alle Funktionalitäten von Anfang an genutzt – steigende Unsicherheit
  - Nutzungsgewohnheiten vs. Kontinuierliche Schulung

Experimentelles Seminar Hamburg/LInz

- Uni Hamburg 2002/03
  - Plattform "Knowledge Forum" (basiert auf CSILE)
  - Verteiltes Seminar Hamburg/Linz
- Ablauf:
  - Zwei Wochen: Orientierung in Technik und Gruppe
  - Vier Wochen: Erste lokale Aufgaben
  - Zwei Wochen: Kontaktaufnahme mit anderem Studienort
  - Sechs Wochen: Arbeiten an gemeinsamer Aufgabe in gemischten Gruppen



Knowledge Forum Screenshot

Evaluationsergebnisse

- Einstellung zum kollaborativen Lernen verhalten:
  - Alleine zu lernen wird im Zweifel vorgezogen
  - Zeitaufwändigkeit von Meta-Lernaufwand und Gruppenarbeit wird kritisiert
- Werkzeug:
  - Wird nur für standortübergreifende Kooperation geschätzt
- Lernvorgänge:
  - Arbeitsteiliges, kooperatives Lernen findet häufig statt
  - Kollaboratives Lernen eher selten
- Gesamteindruck:
  - Noch weit entfernt von einer Kultur kollaborativen Lernens!
  - "Overhead" macht praktischen Einsatz ökonomisch fraglich

Working Alone and Together

- Many studies show positive effects of group learning
- Example (Fantuzzo et al. 1989):

	High structure in assignments (multiple choice)	Low structure in assignments (discuss topics)
Group work	84,8	70,2
Individual work	69,0	66,3