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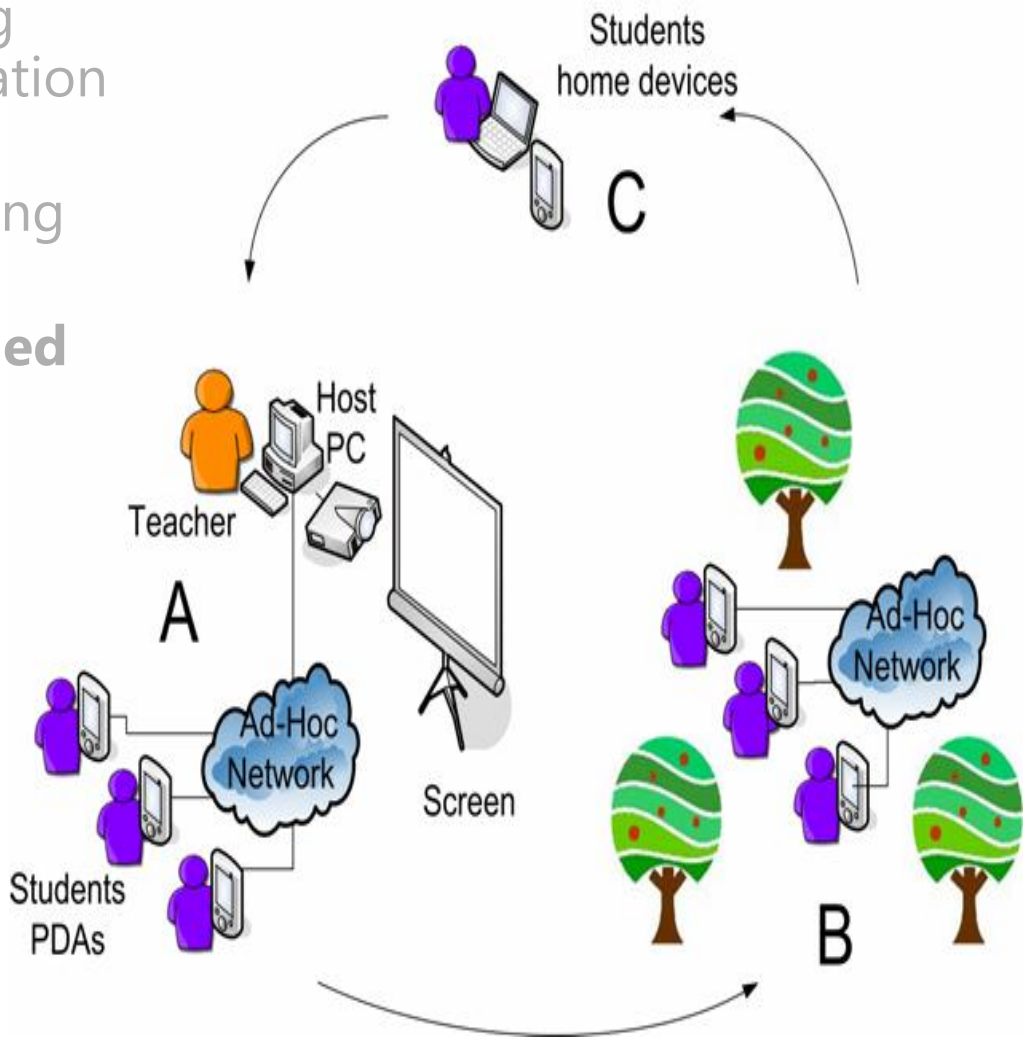
Nelson Baloian

Bridging the gap between formal and informal learning: the HCI perspective

Laccir Project: Research Goals

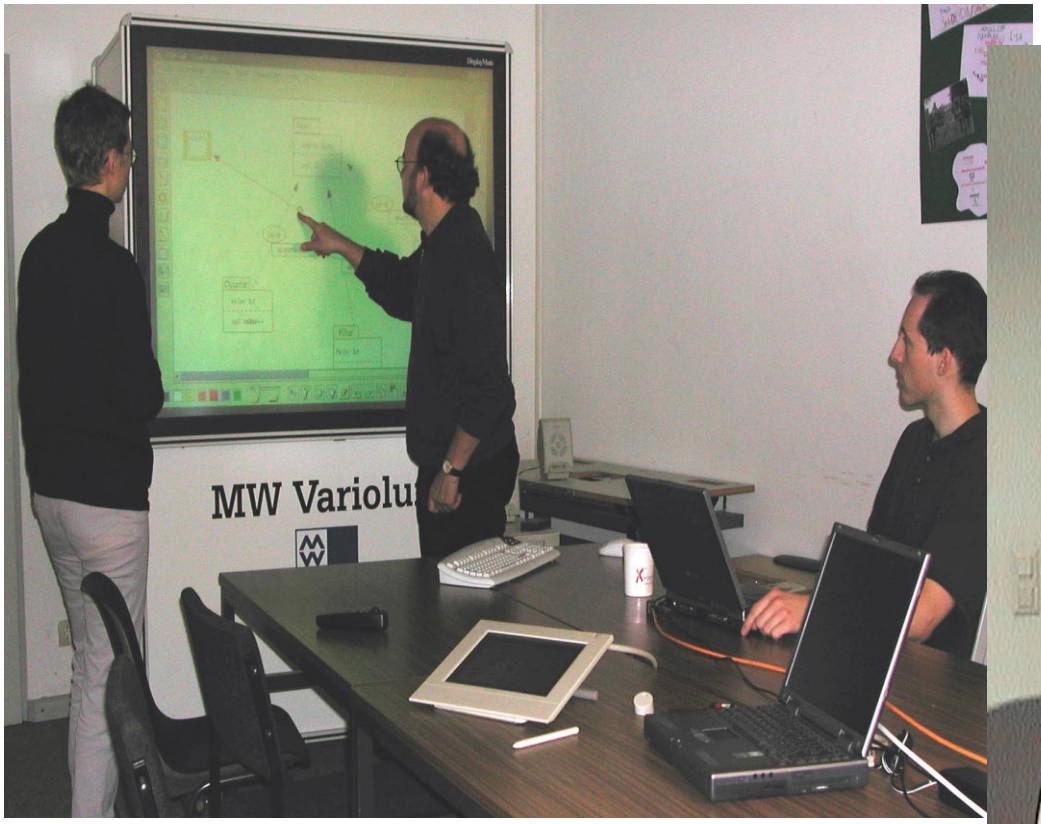
- Discover meaningful learning scenarios where the “information loop” applies
- Develop the necessary learning support tools
- Implement a **coherent**, **unified** HCI across various platforms/applications

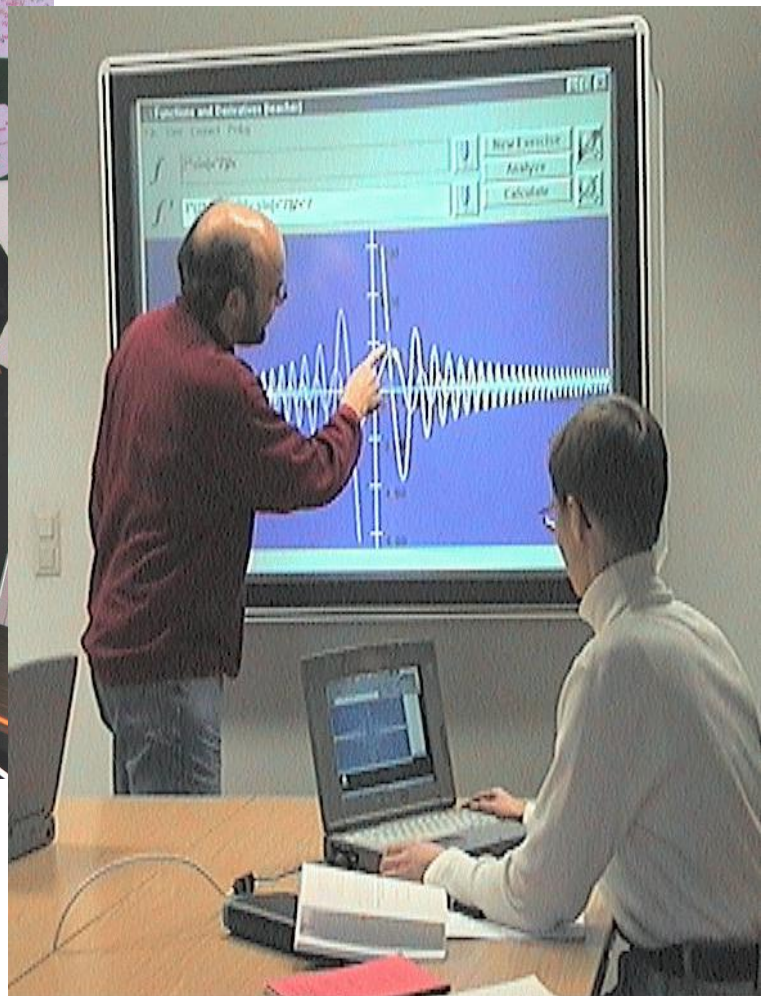


Some “very old” story

- 1993 IPSI-GMD Darmstadt, (.de) receives 2 electronic boards
- Streitz : DOLPHIN
  - Ambiente: the disappearing computer
- Hoppe : Cosoft
  - The Coputer-integrated Classroom
- 1995 : Duisburg, COLLIDE:
  - **Co**llaborative Learning in Intelligent Distributed Environments
- Bring the computer into the classroom

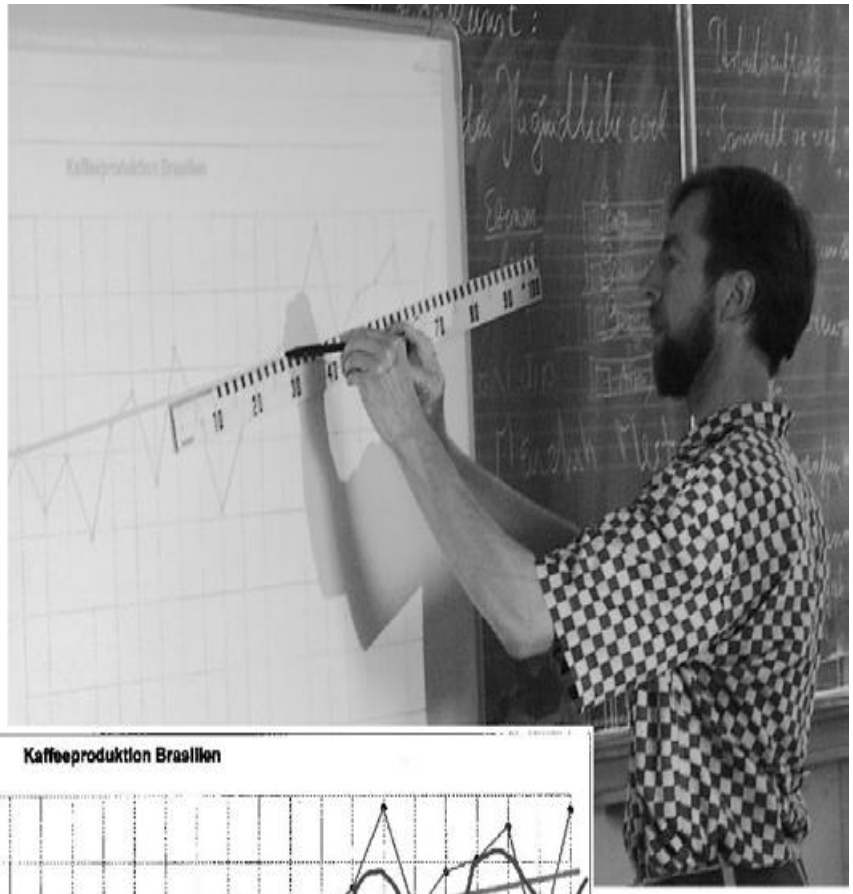
Rich teacher-student & student-student interaction

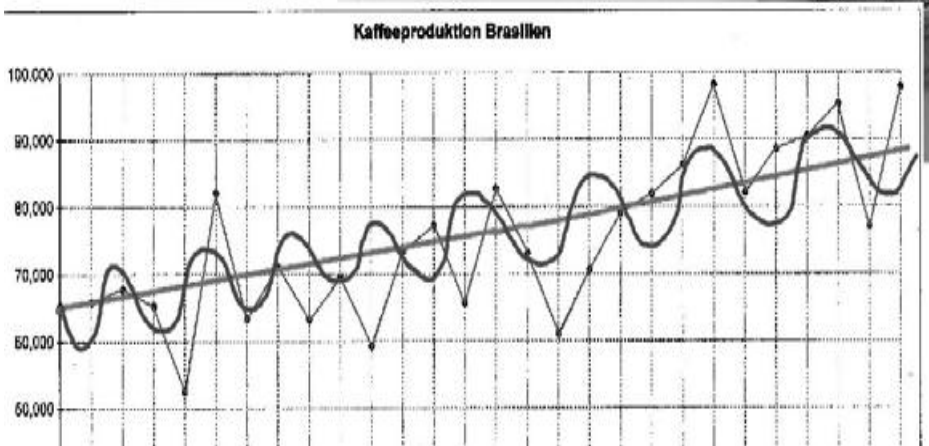




Hoppe, H.U.; Baloian, N.: Zhao, J.; Computer support for teacher-centered classroom interaction. Proceedings of the International Conference on Computers in Education. Taipei (Taiwan), Dec. 1993. pp. 211-217.

Merging of Various Media



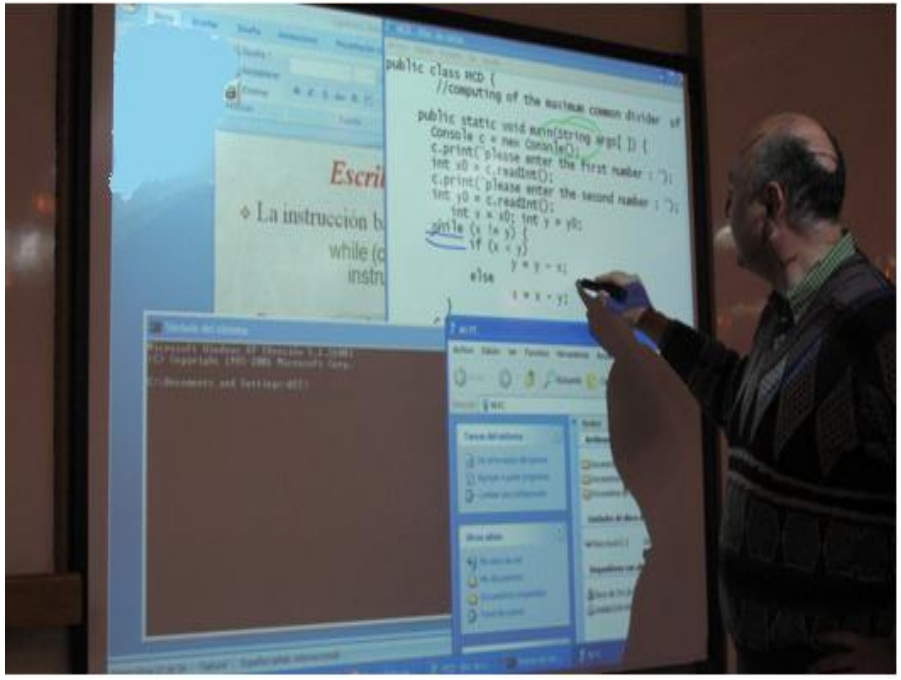


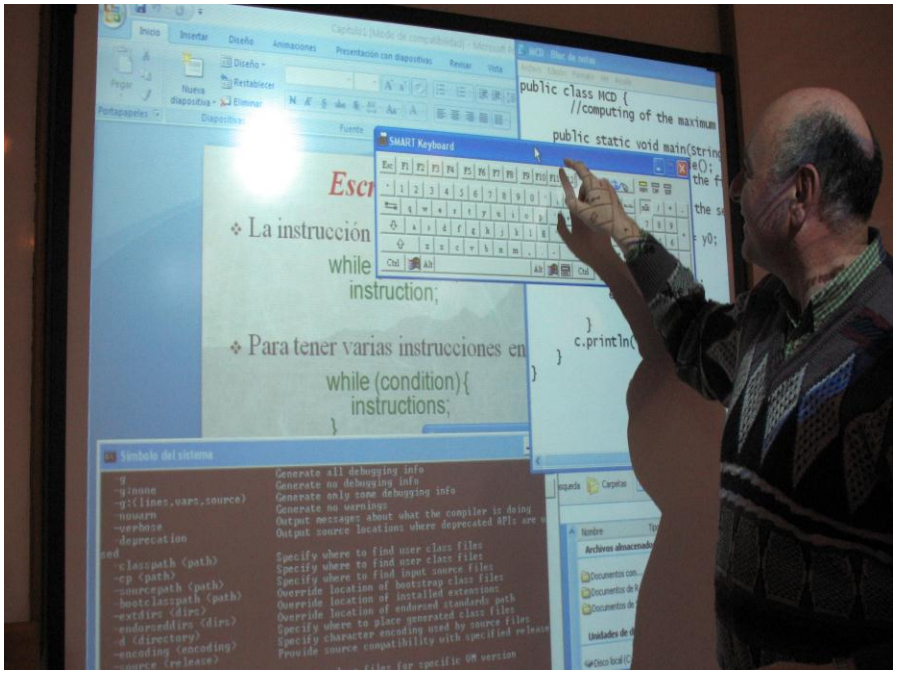
The Nimmis Classroom (1999-2002)

- Goals:
  - Computers supporting reading/writing learning in the classroom
  - Embeded technology
  - “Reading through writing” methodology
- Challenges:
  - File Manager ?
  - Login Procedure ?

Back in Chile

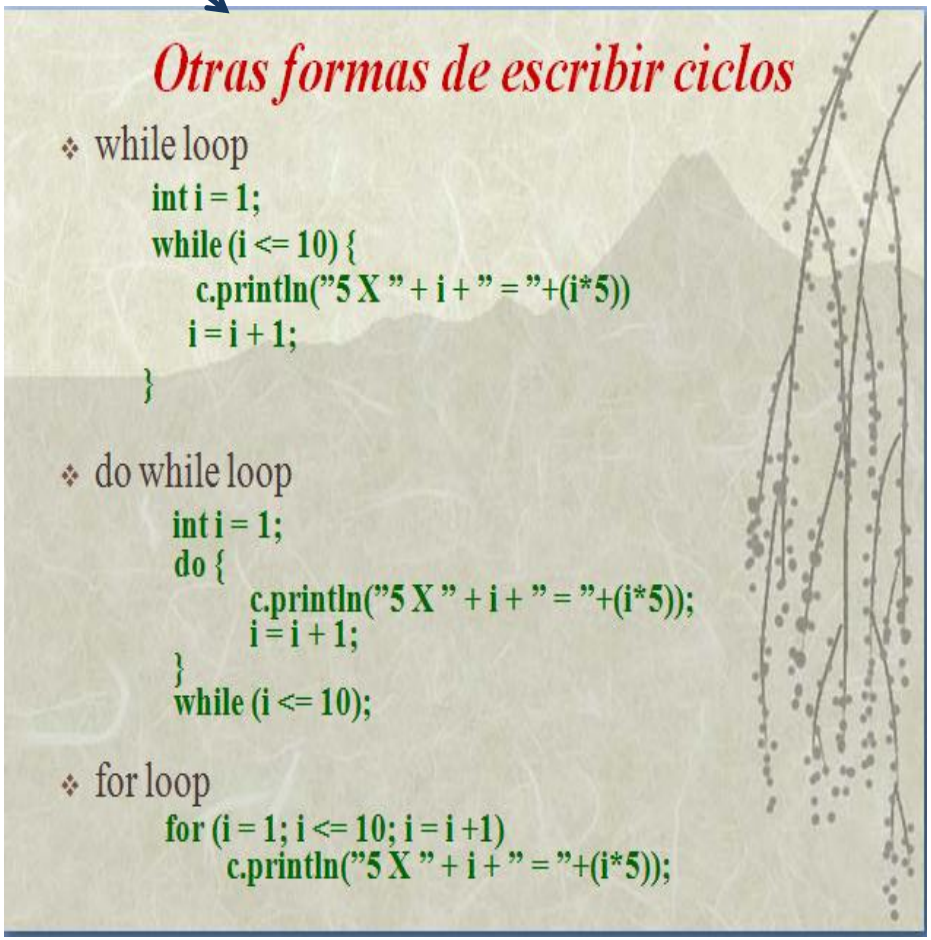
- 2003 Teaching Java with interactive board
- Using “Off-the-shelf” software





Teaching Java with"Off the shelf" software

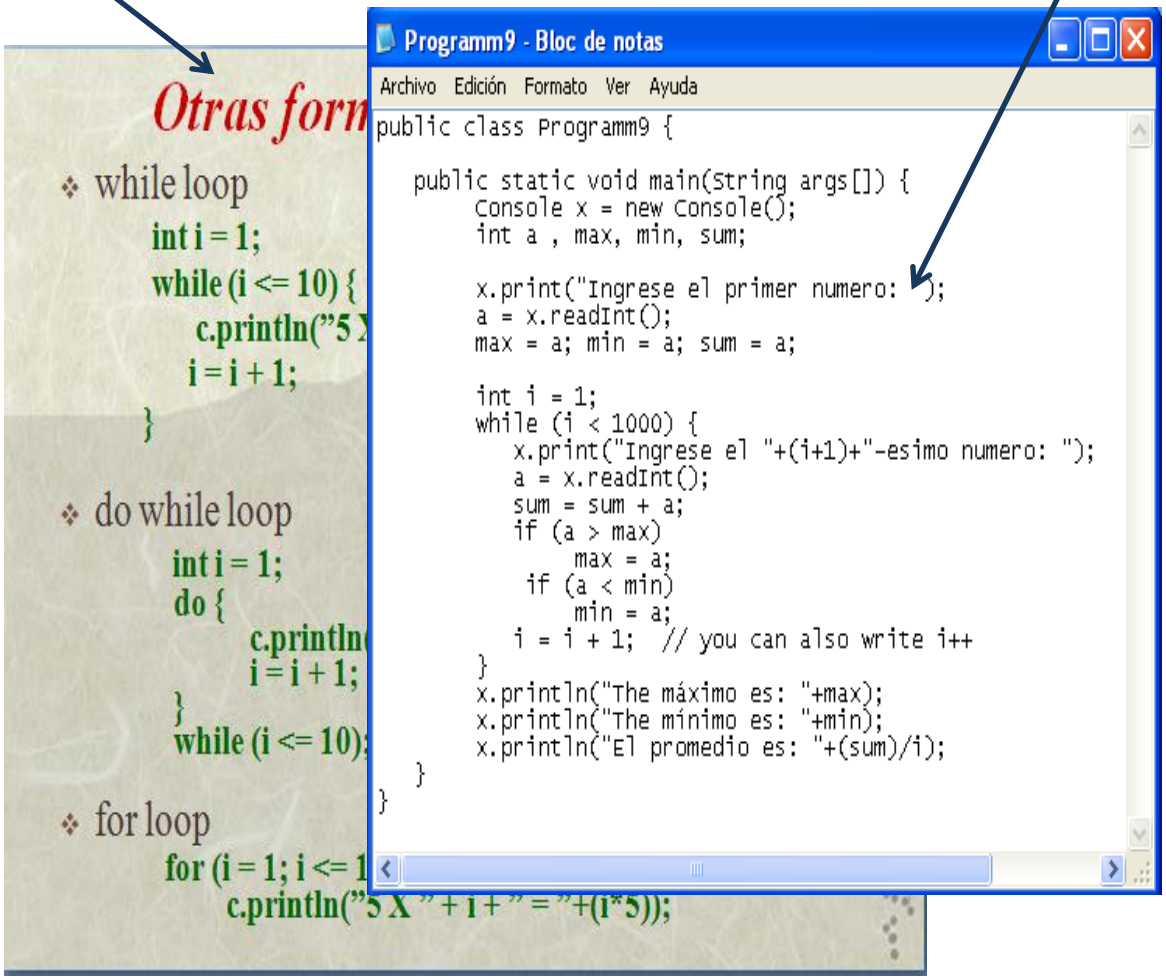
Power point presentation



Teaching Java with"Off the shelf" software

Power point presentation

Text editor

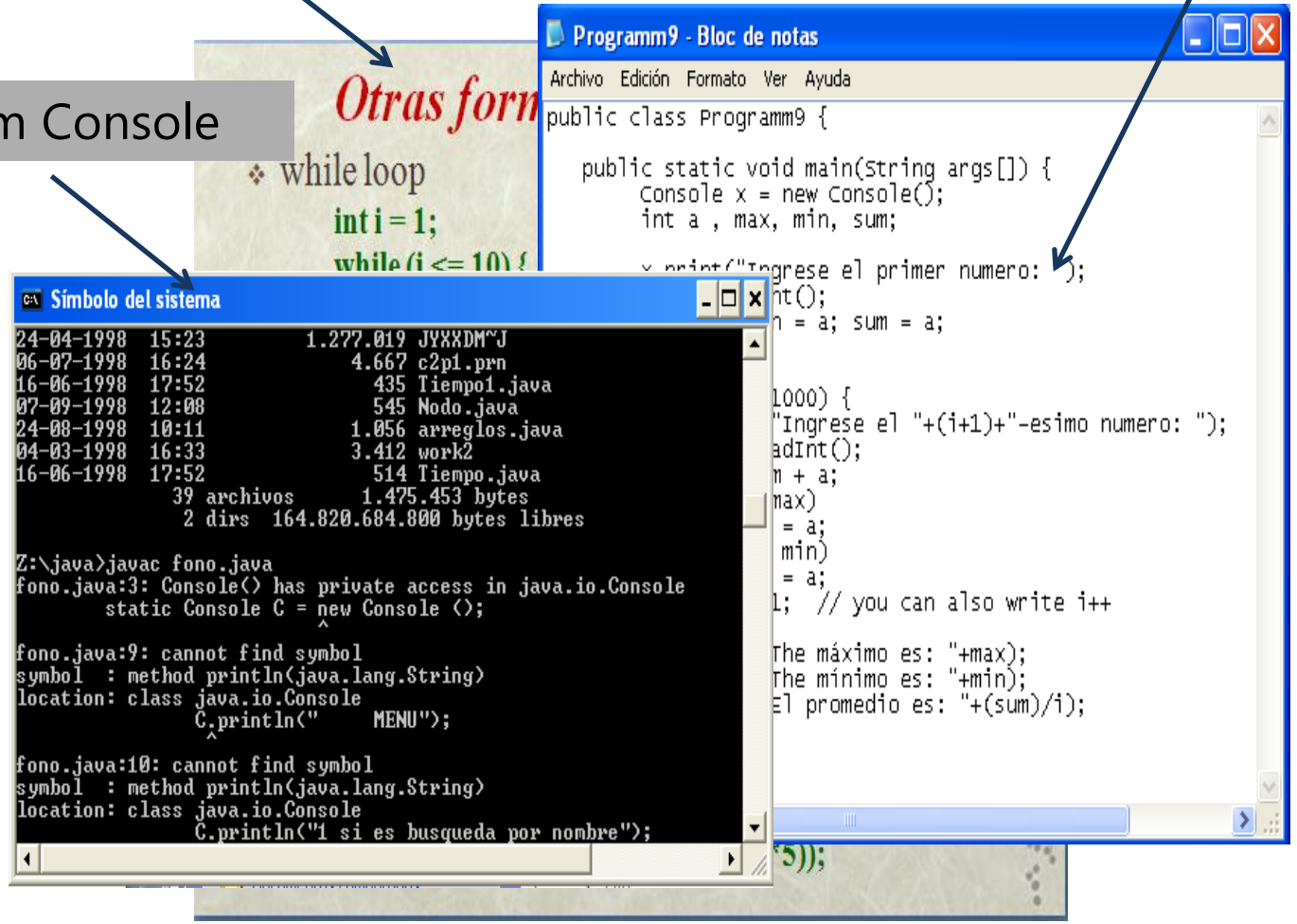


Teaching Java with"Off the shelf" software

Power point presentation

Text editor

System Console



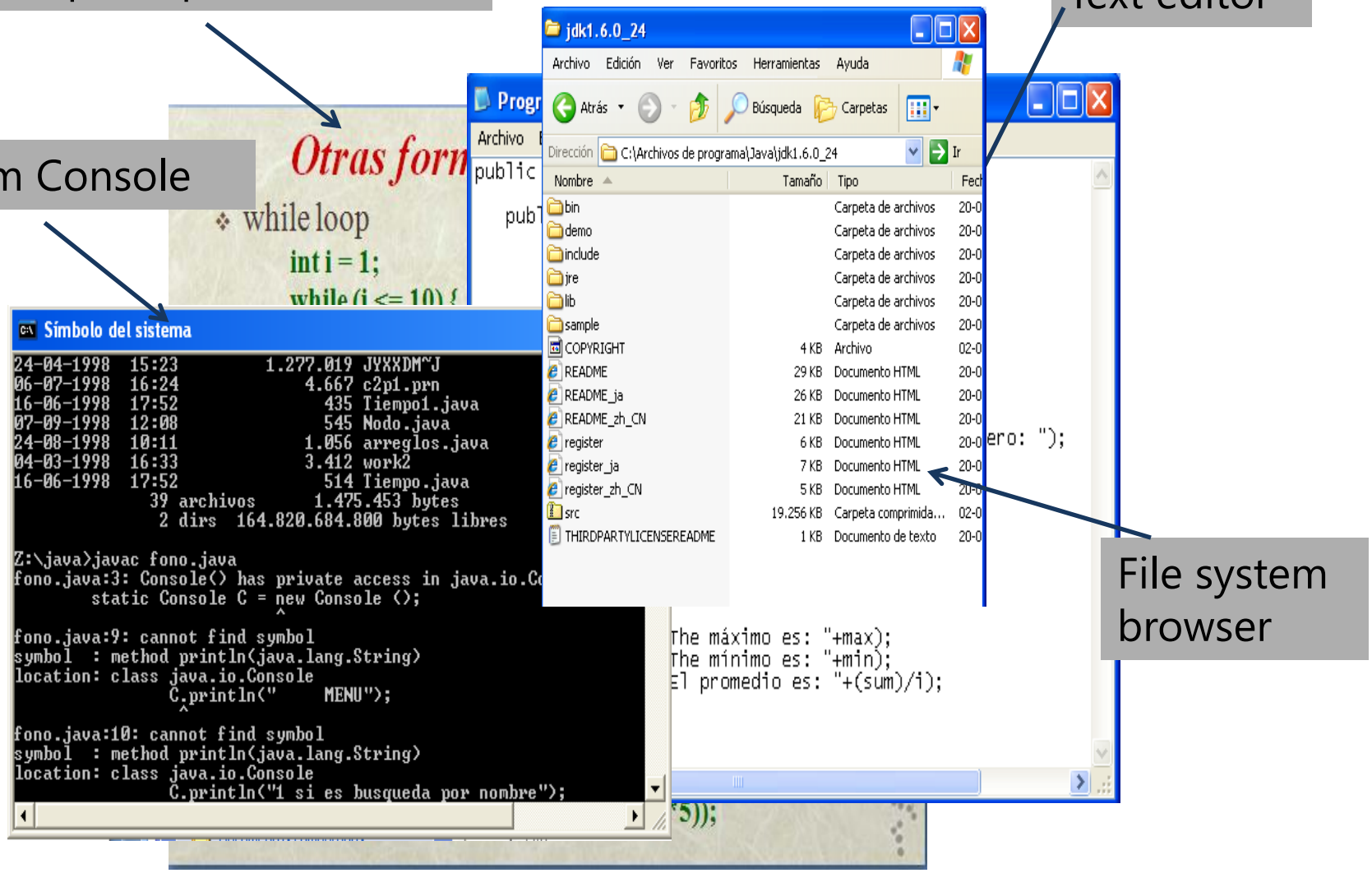
Teaching Java with"Off the shelf" software

Power point presentation

System Console

Text editor

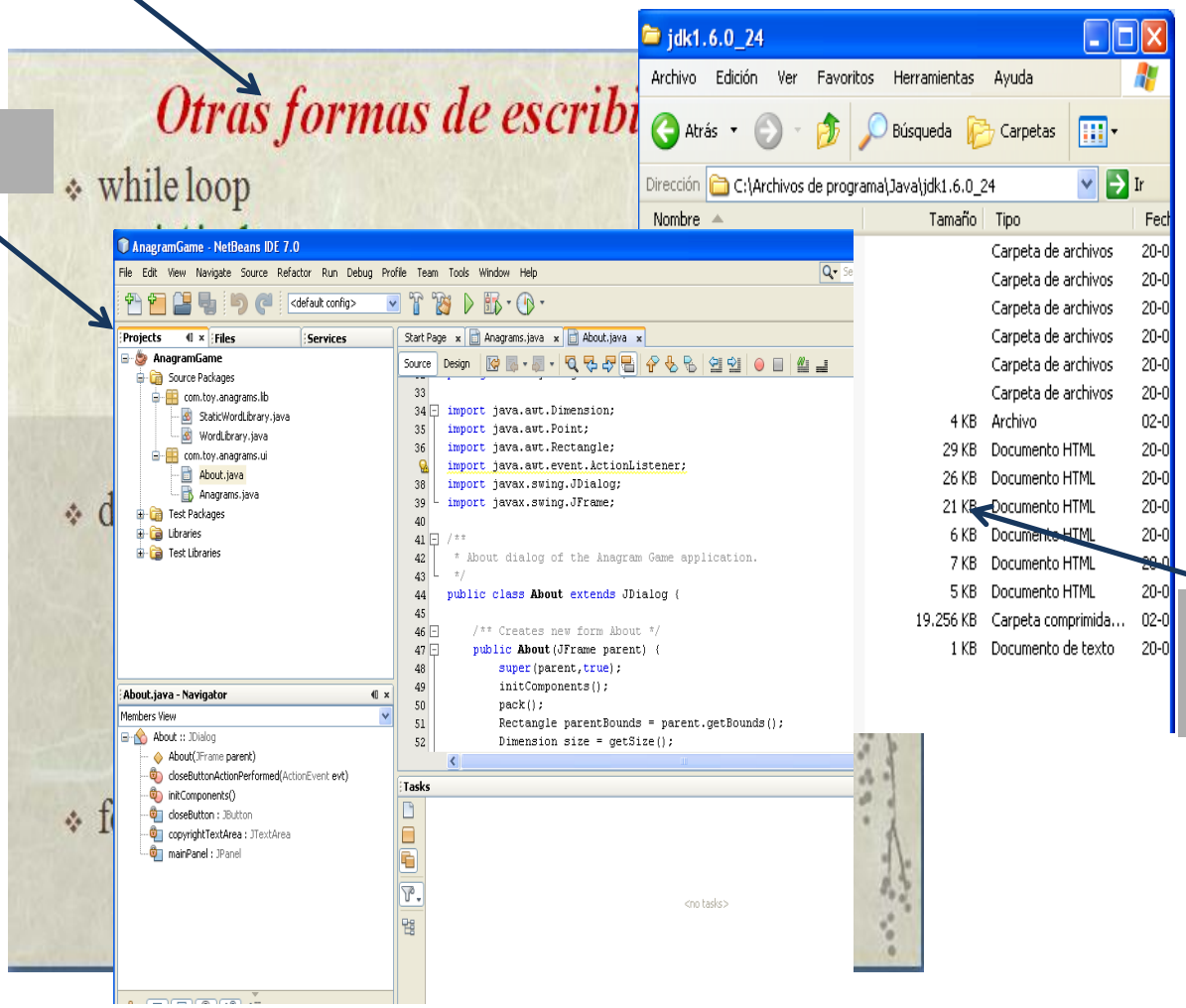
File system browser



In the best case:

Power point presentation

I.D.E



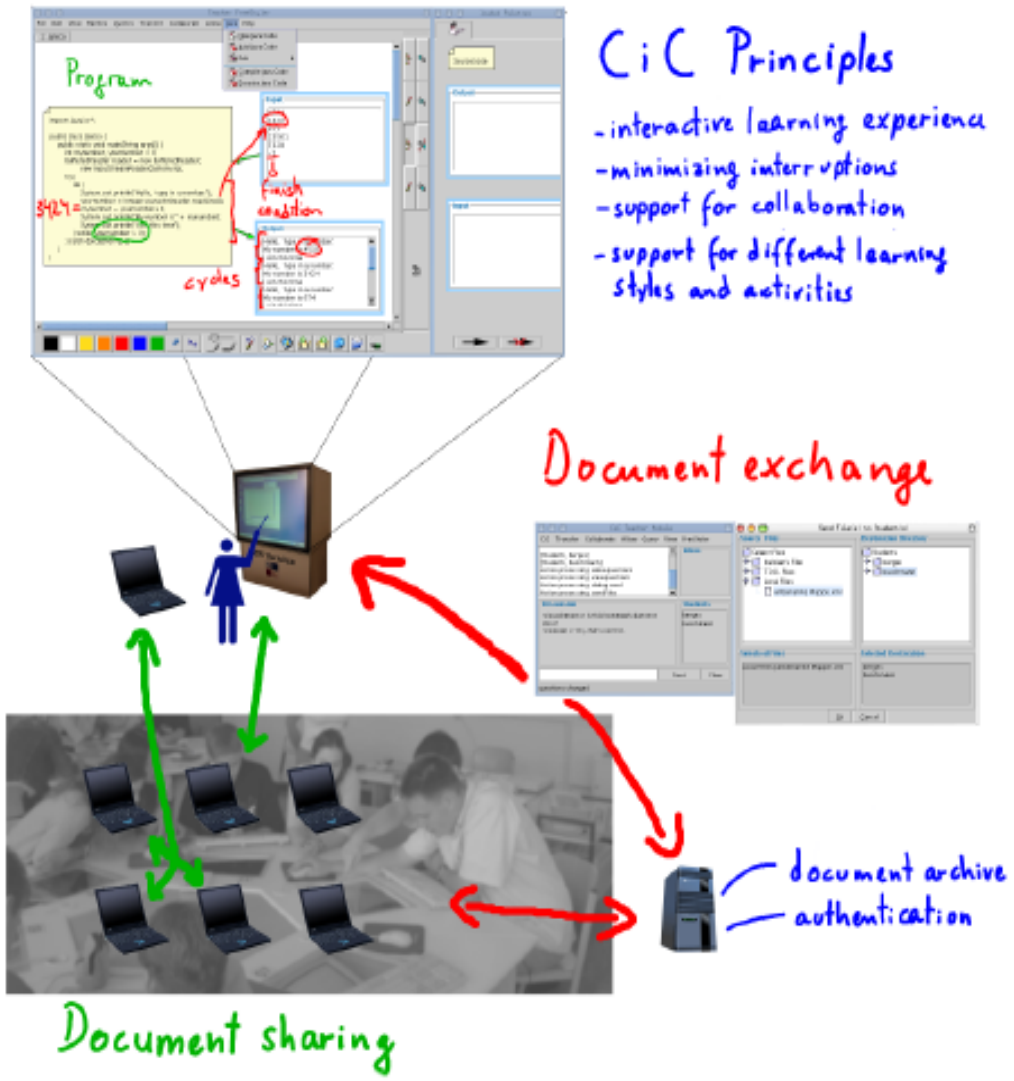
File system browser

Results of a survey

- "The teacher simply spends **too much time** trying to show us things"
- "We get **easily distracted** in class"
- "I started to take some books with me and began to read them there. Finally **I quit** attending classes",
- "Why does it take so **much time** to move from one program to another?"
- ***Focus of attention*** & ***Students' Distraction*** problems

Motivation for the CIC Project (2004)

- Integrates presentation, program editing/running and handwriting
- Synchronization
- Automatic distribution & collection of files **for most frequent tasks**



Baloian, N., Pino, J. A., & Hoppe, H. U. (2008). Dealing with the Students' Attention Problem in Computer Supported Face-to-Face Lecturing. Educational Technology & Society, 11 (2), 192-205.

Testing in a real scenario (U. of Waseda 2005)

Category	Standard scenario	CiC scenario	Chi-square	Significance
Preparation	2.21	1.81	2.655	0.265
Presentation	1.67	2.33	6.644	0.036
Flexibility	1.67	2.60	14.952	0.001
Highlighting	2.31	2.43	4.079	0.453
Absence of Disruption	1.57	2.24	12.868	0.002
Follow-Up	1,71	2.26	9.172	0.10

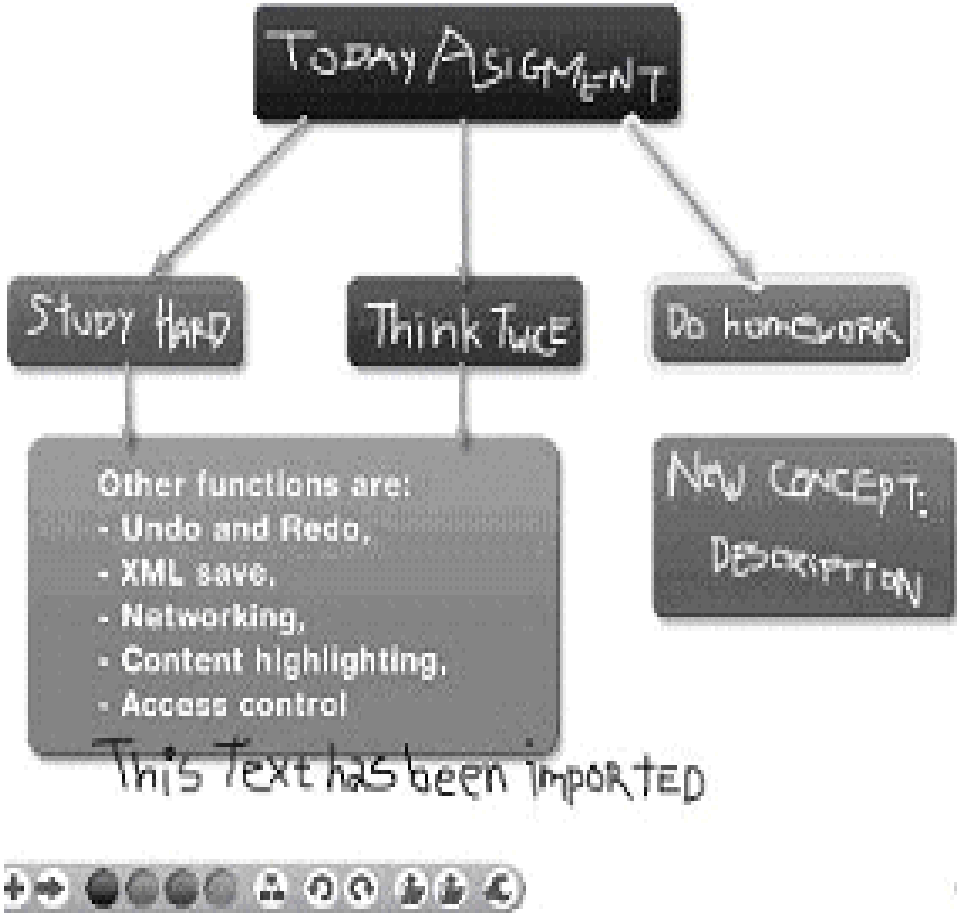
Lessons Learned

- HCI matters in learning scenarios
- Minimize interaction time
- Unexpected collaborative learning situations

- Good for a particular situation -> students' efforts might not be rewarding
- "Set-up" time too long

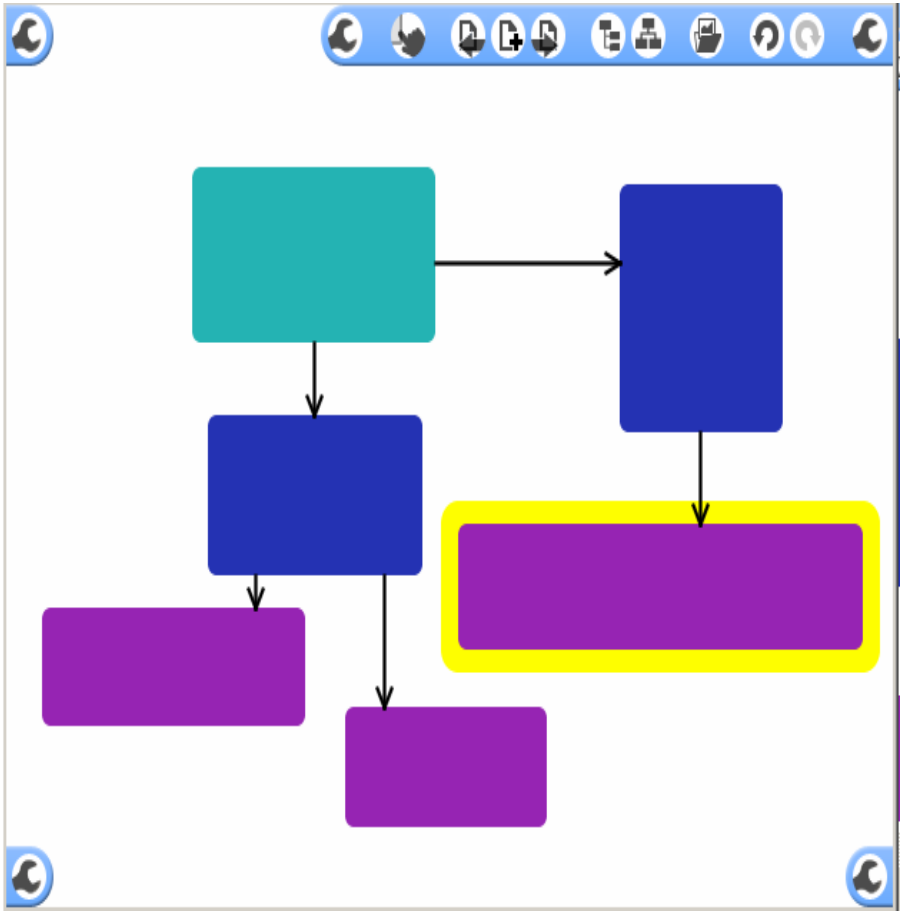
Deep Board: exploring gesture-based interaction

- **Goals:**
  - **Minimize** preparation **time**
  - Keep it **easy** to use, easy to remember
  - Allow **Flexible** creation, structuring & presentation of learning content
- **How:**
  - **Gesture**-based commands
  - Implementing "**depth**" with interactive whiteboards
  - **Web**-based, collaborative



Lessons Learned

- Keep it **simple**
  - Simple structure of material
  - Simple HCI, easy to remember
- Pages are not the only simple, easy to remember information **structure:**
  - **3D** information graphs: **easy** to manage
- Supporting **remote** lectures between two campuses at Waseda Univ. in Japan
- Still **being used** !!



H. Breuer, N. Baloian: Augmenting Whiteboard Interaction in the Classroom. ED-Media, Montréal, Canada, AACE press, June 2005 pp. 1214-1221.

Mobile Collaborative Learning

- 2005: Mobile technology is **mature** enough to support learning

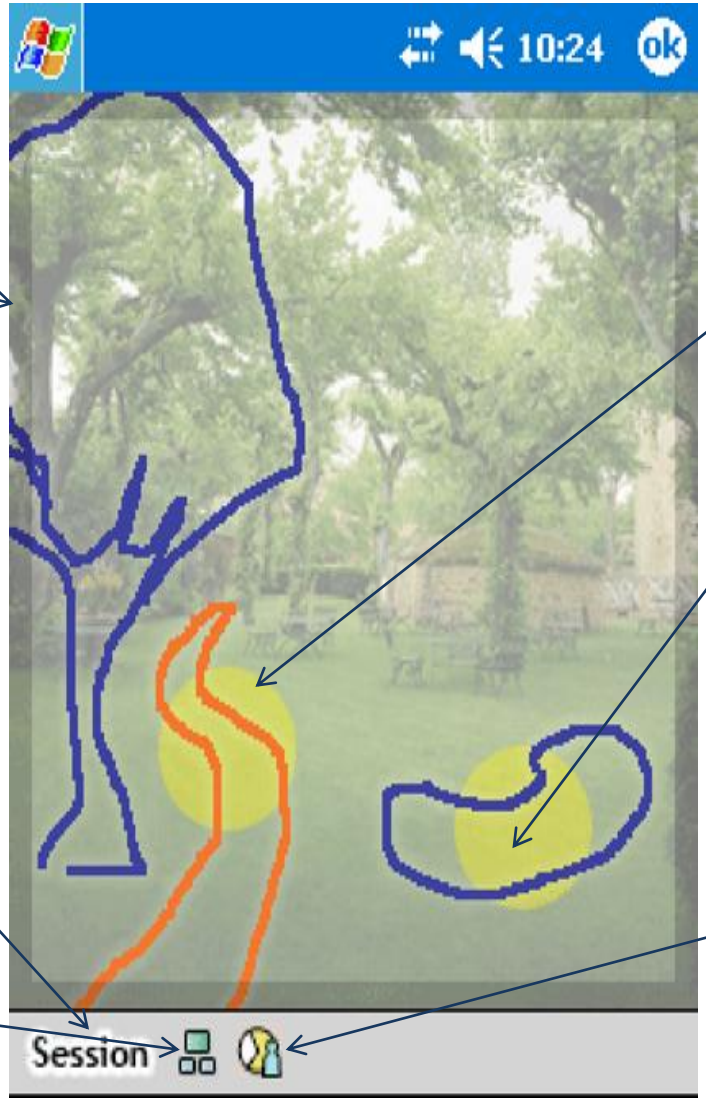
- Idea: use **gesture**-based interaction for mobile devices
  - Natural way to interact with a PDA
  - "Expand" screen capabilities (deep board)
- Other opportunities:
  - Keep **rich** face-to-face **interaction** while using computers
  - **Dynamic group** formation/reconfiguration

http://alana6705.blogspot.com/2010/04/what-is-mobile-learning.html

First Development: Mobile Collaborative Sketching

- Supporting **collaborative** design in learning scenarios
- Take a picture and start **generating ideas** by sketching
- Full Synchronized **P2P** application
- Interaction based almost exclusively on **gestures**
  - Maximizing available workspace.
- Content organized as hierarchical **concept maps**
- **No switching** between sketching and gesturing

MCSketcher Screenshot



Dark margin means working in an inner sub-node

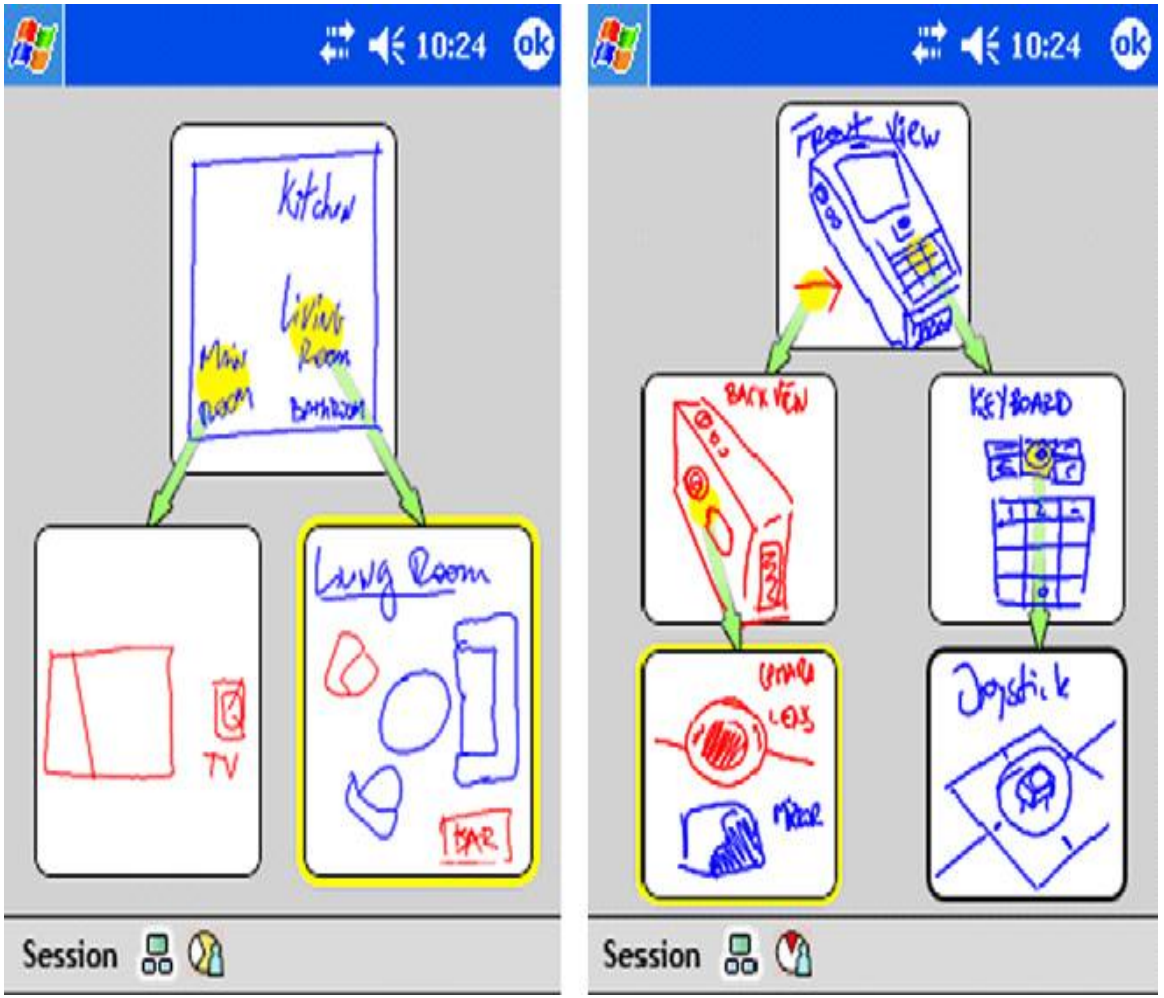
Design spots are anchors to other sketching pages

Highlighted "Session" Text means work needs to be saved

The "group" icon shows % of users working in this node

"Document three" icon

MCSketcher's Tree view: 2 Examples



G. Zurita, N. Baloian, F. Baytelman, 2008, A Collaborative face-to-Face Design SupportSystem based on Sketching and Gesturing. Advanced Engineering Informatics. 22 (3). (2008), pp. 340-349.

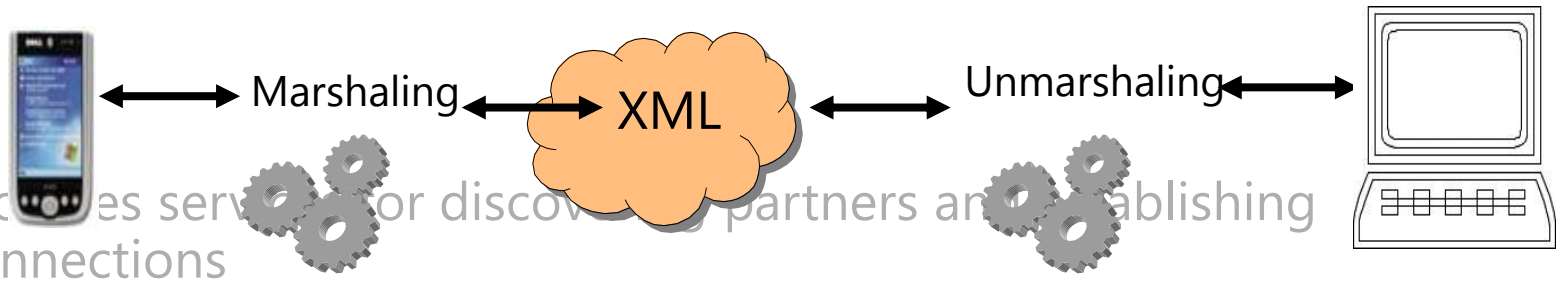
A Framework for developing mobile applications

Many mobile collaborative learning/working scenarios share common characteristics & have similar requirements

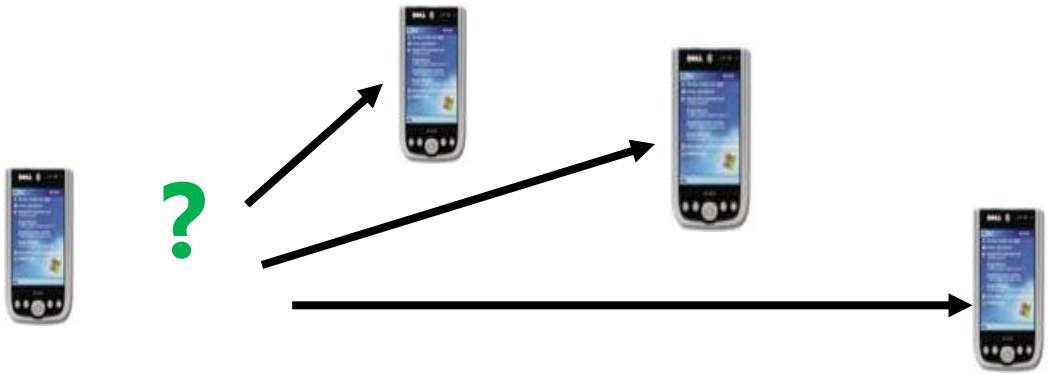
- Gestures recognition module
  - Recognizes some gestures
  - Extendable to add more gestures
- A flexible, lightweight communication platform for peer-to-peer applications

The Middleware

- API for developing distributed P2P applications easily.
- Available in Java and C#
- Implements object conversion:

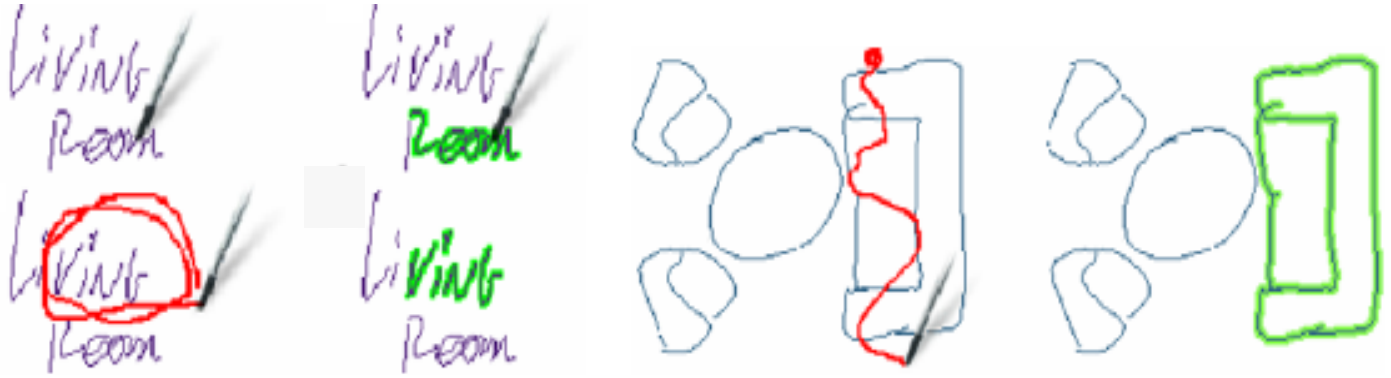


- Provides services for discovering partners and establishing connections



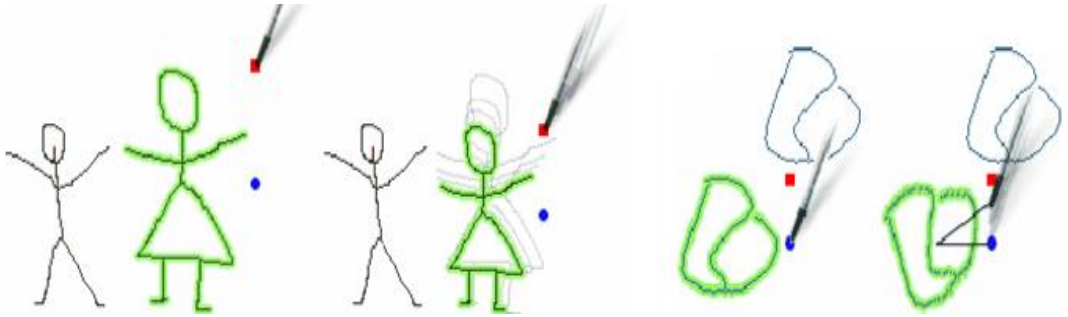
Gesture support (examples)

Selecting



Deleting

Resizing, rotating

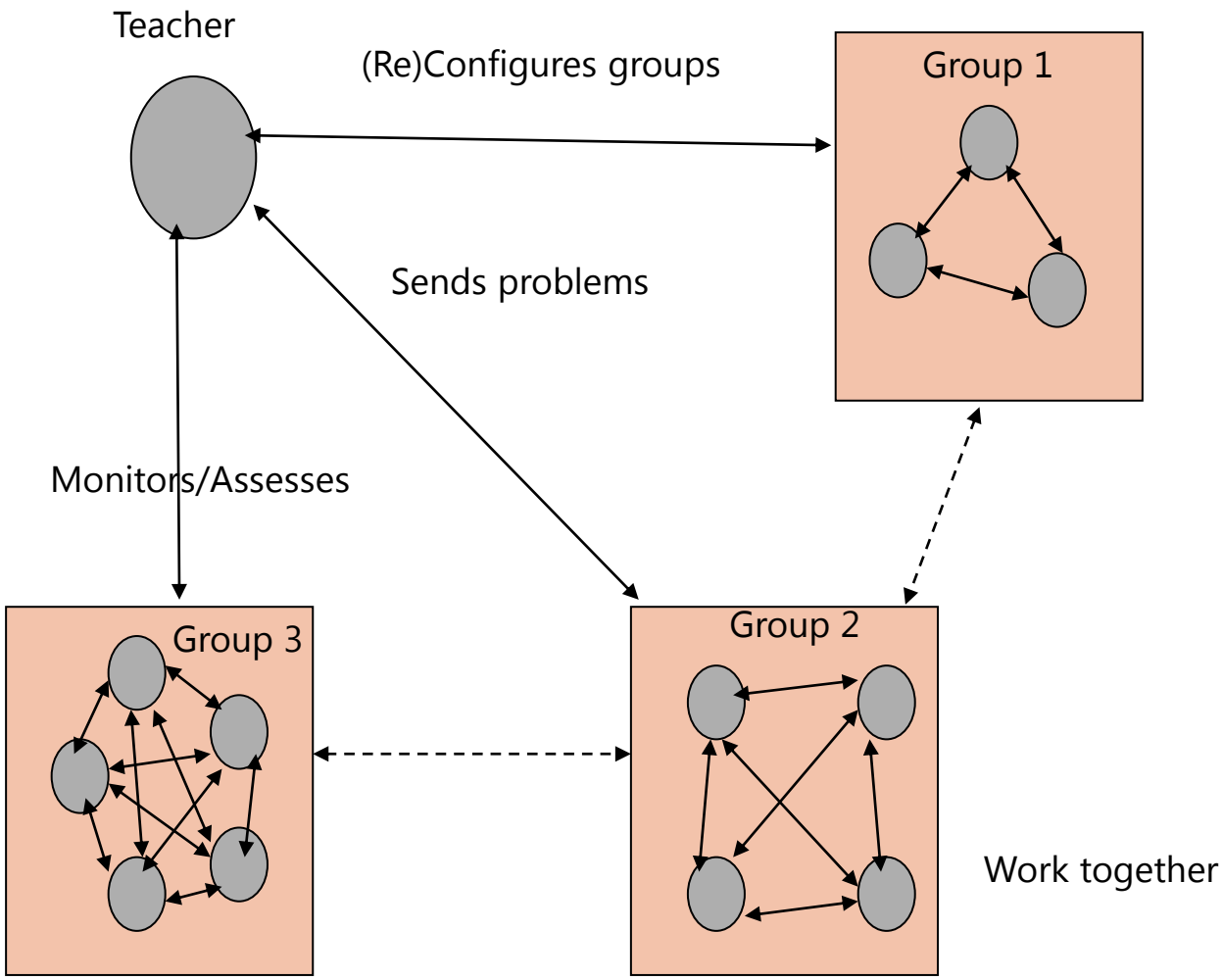


Example 1: MCPresenter

Supports:

- Configuring various working groups
- Creating/modifying & sending problems to the groups
- Open answers or options
- Students collaboratively solve problems & send answers back
- Real time monitoring and assessment

System Architecture

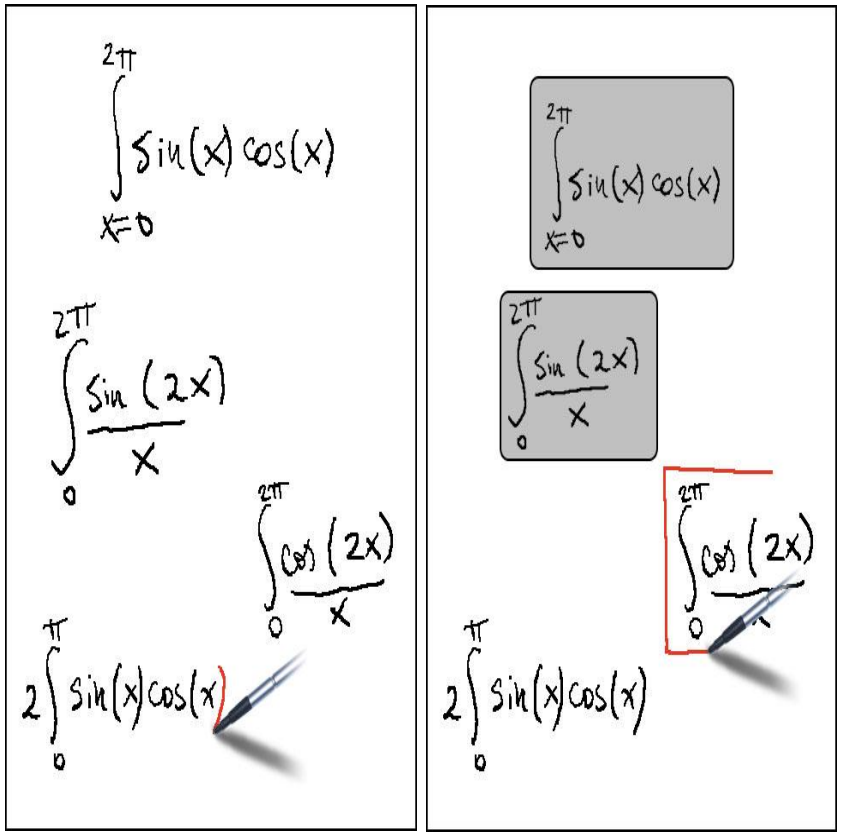


Group Configuration

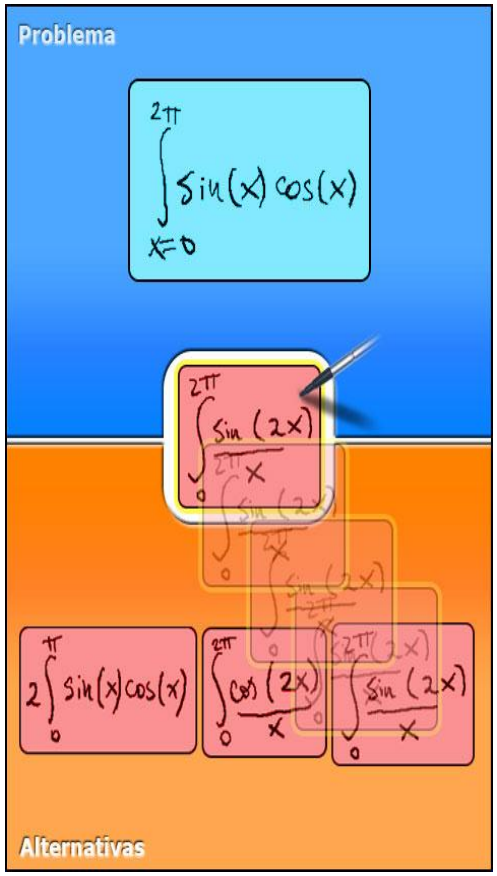
- Dragging user Nelson to group 2
- Users are displayed automatically when discovered
- Groups are defined by teacher
- The group icon shows updated content of the group's shared workspace

Problem creation

Freehand writing/sketching & delimiting elements by a rectangle gesture



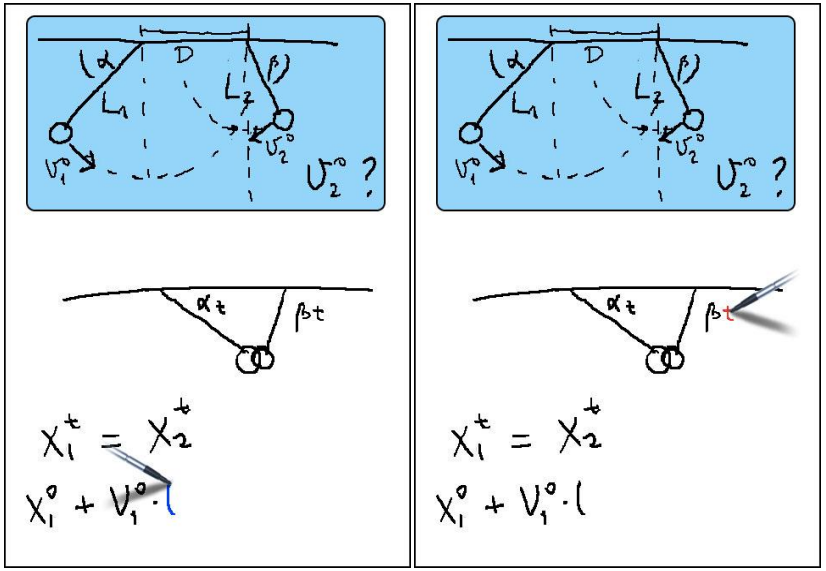
Dragging elements to corresponding areas: problem, solution, wrong options



Synchronized work

- Students work synchronously preparing open answers
- Teacher may join a group to help or propose new problems

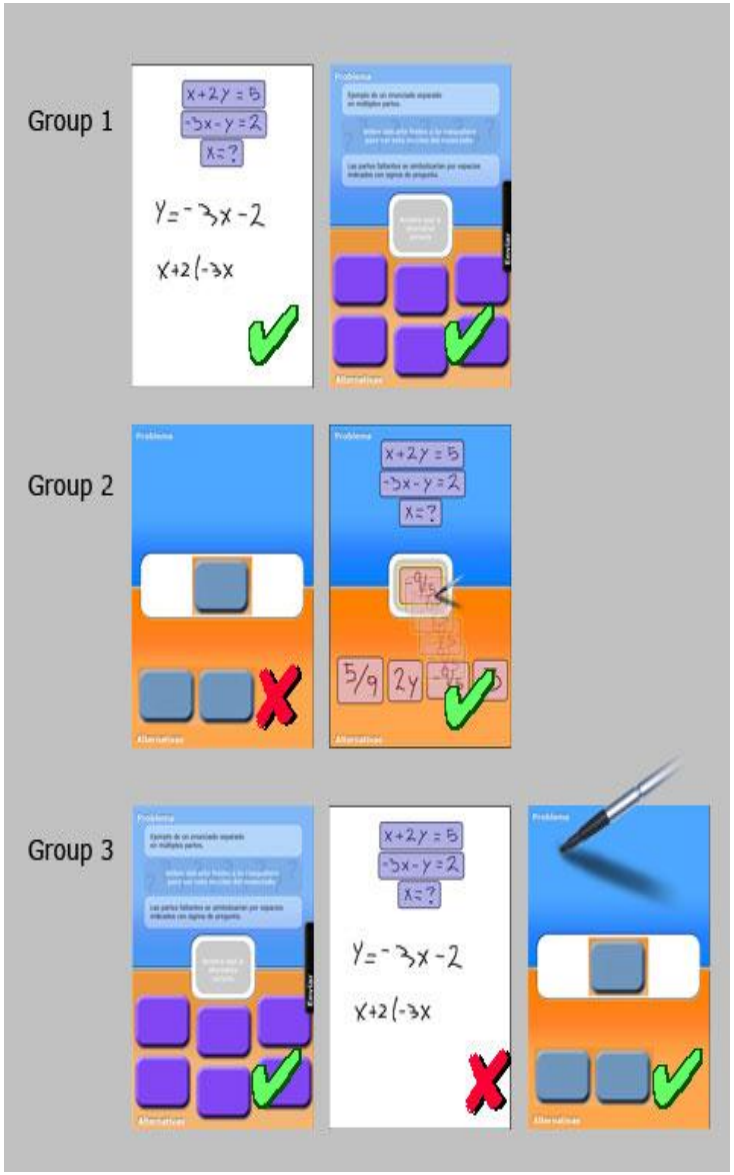
- Students must agree on an option as the correct answer before sending it



Assessment

The teacher's view of results

- **Group 1:** 2 correct answers (1 open , 1 with options)
- **Group 2:** 1 wrong and 1 correct, both with options
- **Group 3:** 2 correct answers (with options) 1 wrong answer (open)



G. Zurita, N. Baloian, F. Baytelman, Supporting rich interaction in the classroom with mobile devices. Proceedings of the Fifth IEEE International Conference on Wireless, Mobile, and Ubiquitous Technology in Education, Beijing, China, March 2008, IEEE Press. pp. 115-122, 2008.

Example 2: Participatory simulations (3)

- **Role-playing** activity oriented towards learning complex & dynamic systems
  - Mapping real world problems to simulated context & behaviors
  - Knowledge & patterns emerge from local interactions
- Highly **effective** in large groups
  - Simple to set up & interact with
  - Analyze information, exchange information, make decisions, see outcomes
  - Allows to relate actions & their consequences
- Highly **motivating** even in large groups
  - Participation & collaboration increase the understanding
  - Whole classroom?

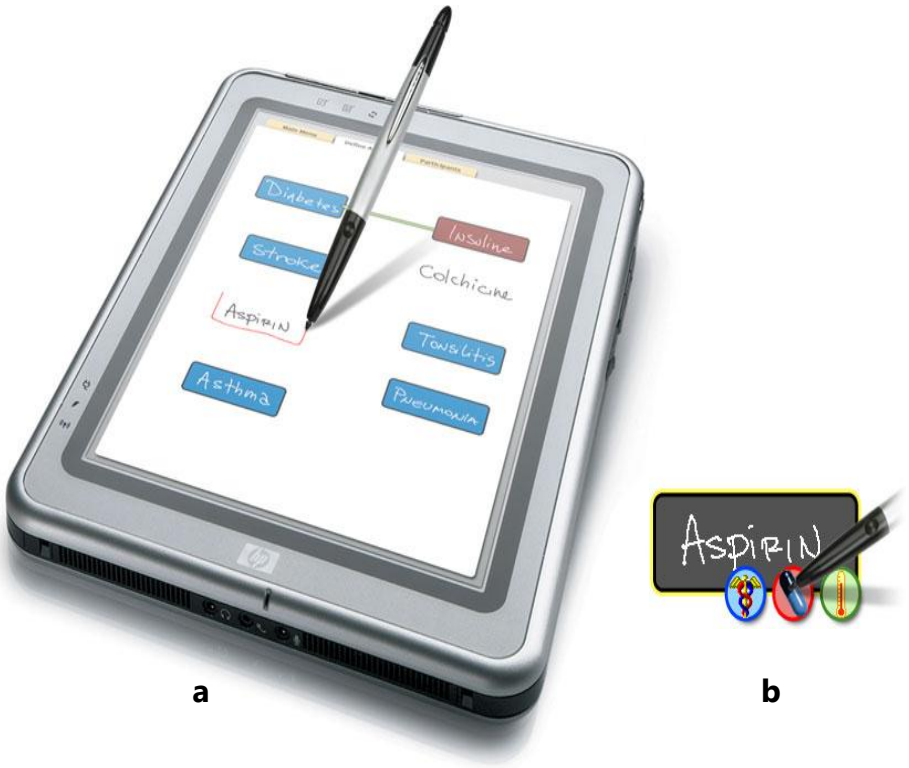
a) Trust building scenario

- Roles: Buyers and sellers
- Exchanging goods with random failures
- Vendor might decide its replacement (maximize revenues!)

Assigning roles & creating items

b) Medical scenario

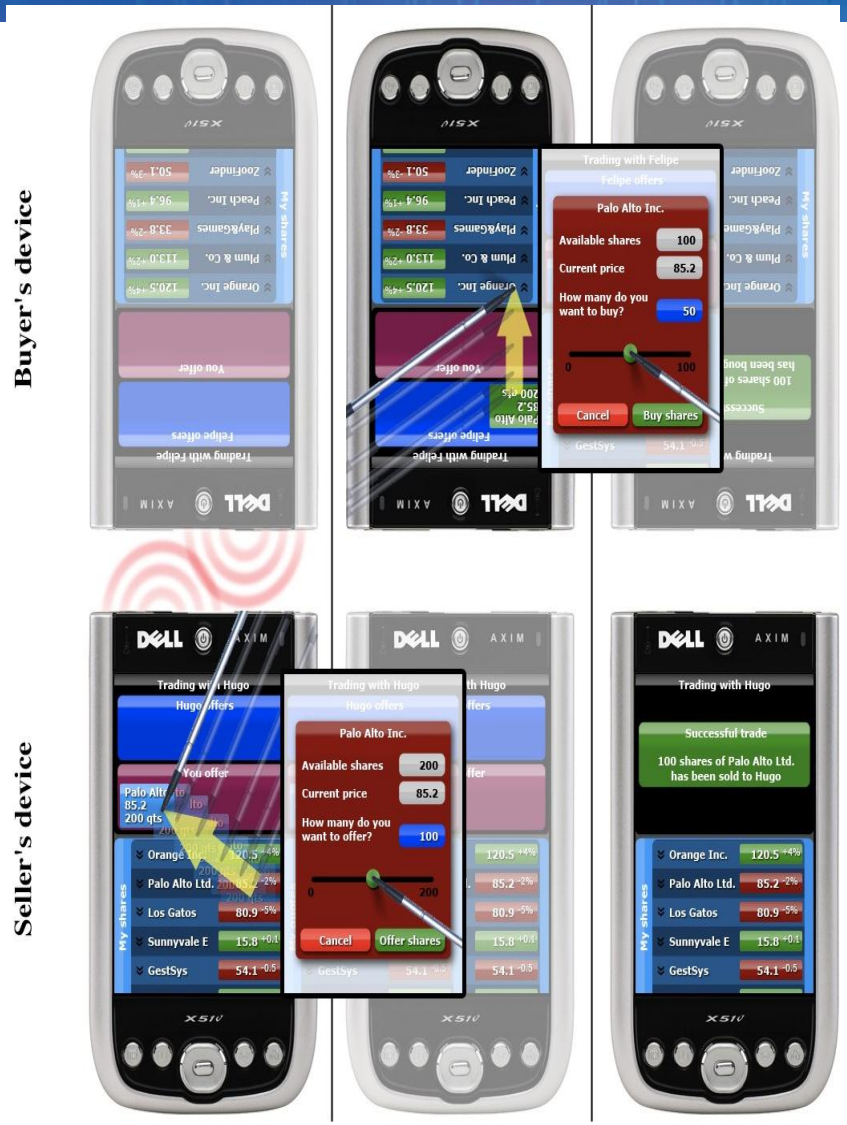
- Roles: doctors and patients
- Items: diseases, symptoms and treatments (medicines)



a b

Exchanging Items: Proximity + IrDA

c) Stock Market scenario



G. Zurita, N. Baloian, F. Baytelman and A. Farias: A Platform for Motivating Collaborative Learning Using Participatory Simulation Applications. 2nd Edutainment Conference, Hong Kong, China, July 2007

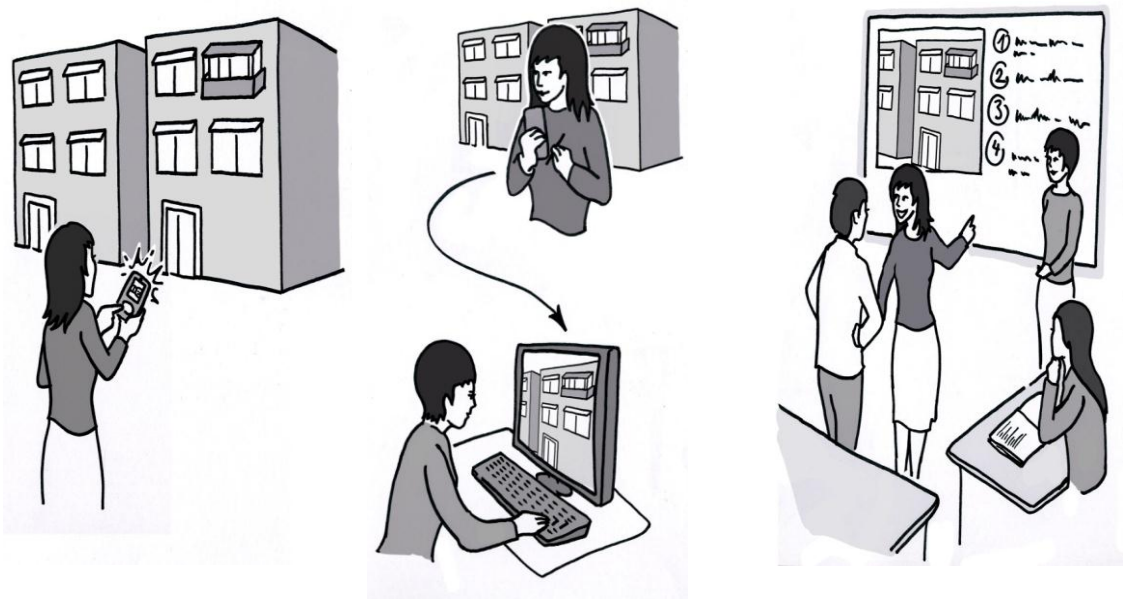
So far, so good ?

- Not quite:
  - Fragmentation of learning experiences with different tools in different contexts
  - Different interaction rules in each application
  - Briggs:
    - "potential users will adapt technology if its benefits outweigh its disadvantages (notably, the cost of learning how to use it), adjusted by the frequency of use"

- LACCIR Project proposal:
  - integration of classroom activities (structured, formal) & learning "in the wild" (unstructured, possibly informal and/or unexpected)

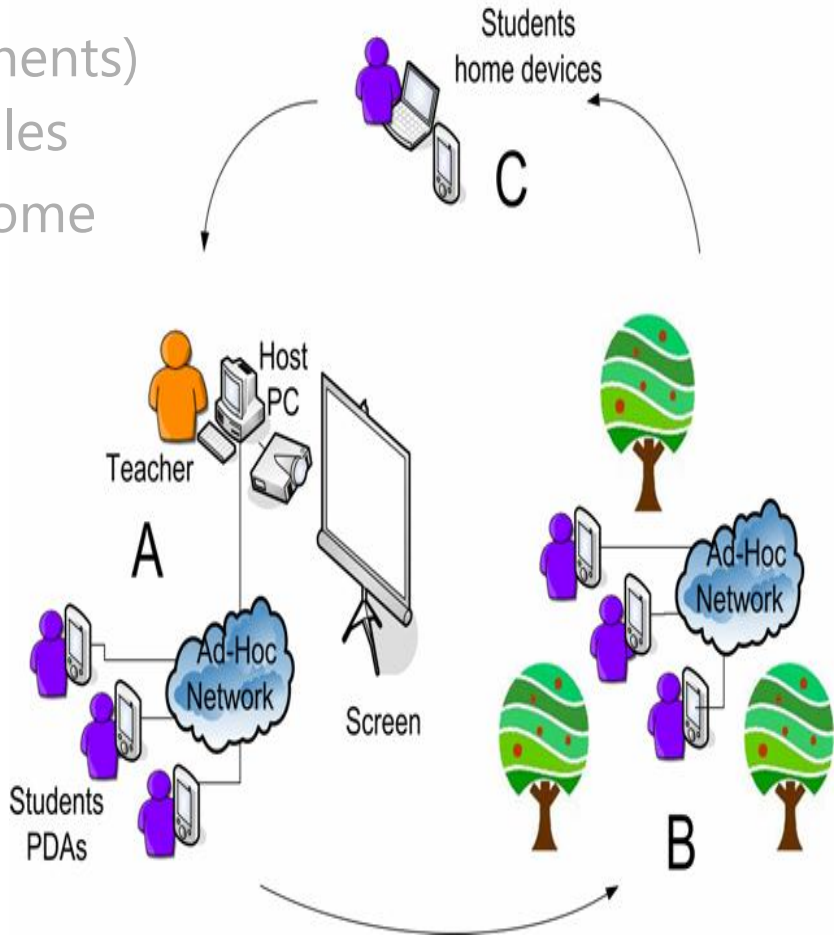
Research Questions

- Can we implement meaningful learning activities with this model ?
- Can we develop an integrated HCI model across platforms ?
- Can we (should we) use widgets ? gestures ? both ?
- Can we describe them with a pattern language ?



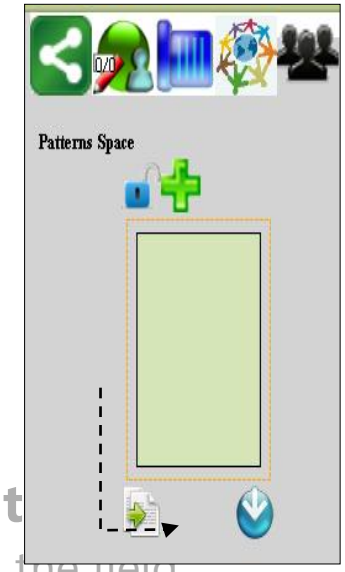
Example 3: Learning with Patterns

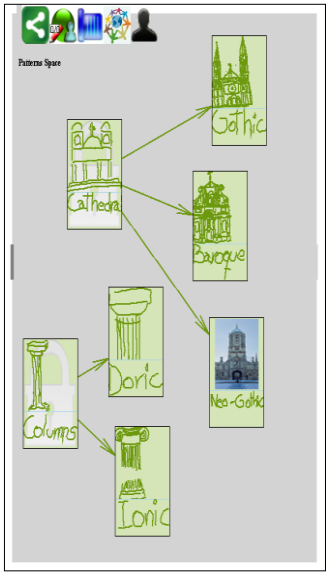
- Pattern: a typical solution for a recurrent problem
- Teacher explains a pattern (components)
- Students go „out“ to collect examples
- Process the gathered material at home
- Show, share their findings in the classroom.
- Motivates new “field trips”

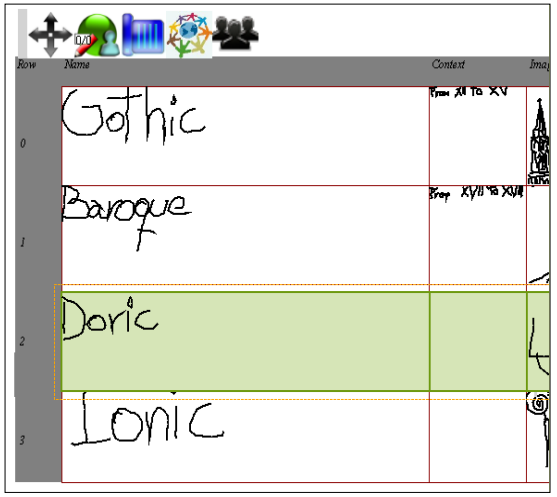


System Functionality

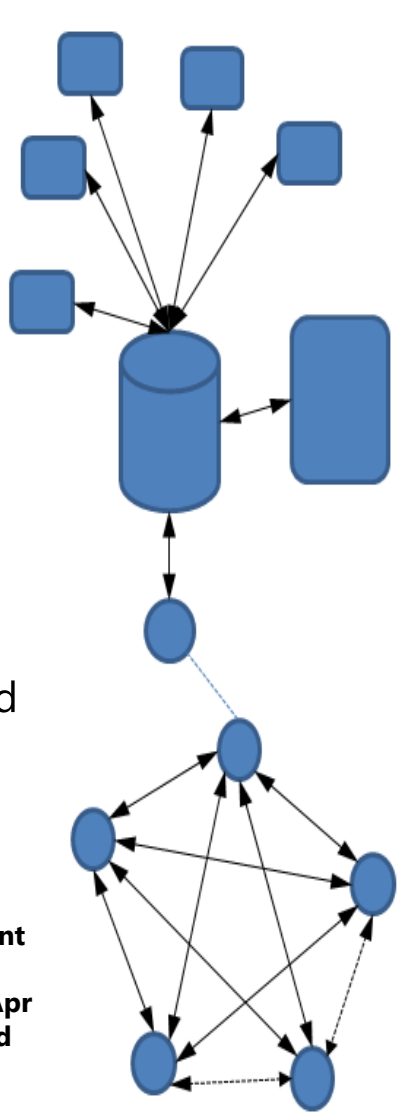
- **Creating Patterns:**
  - Teacher, classroom
- **Instantiating patterns:**
  - Students, outside
- **Linking patterns:**
  - Students, anywhere
- **Sharing patterns and instant**
  - Teacher, classroom, students on the field
- **Comparing patterns:**
  - Students, teacher anywhere







System Architecture: Synchronization



Students working in classroom: tuple spaces

Database implementing tuple-spaces

Teacher sharing patterns in classroom: tuple spaces

Student transferring session data to repository: tuple spaces

Platform implementing P2P network and Shared Objects

Students working on the field: Shared Objects

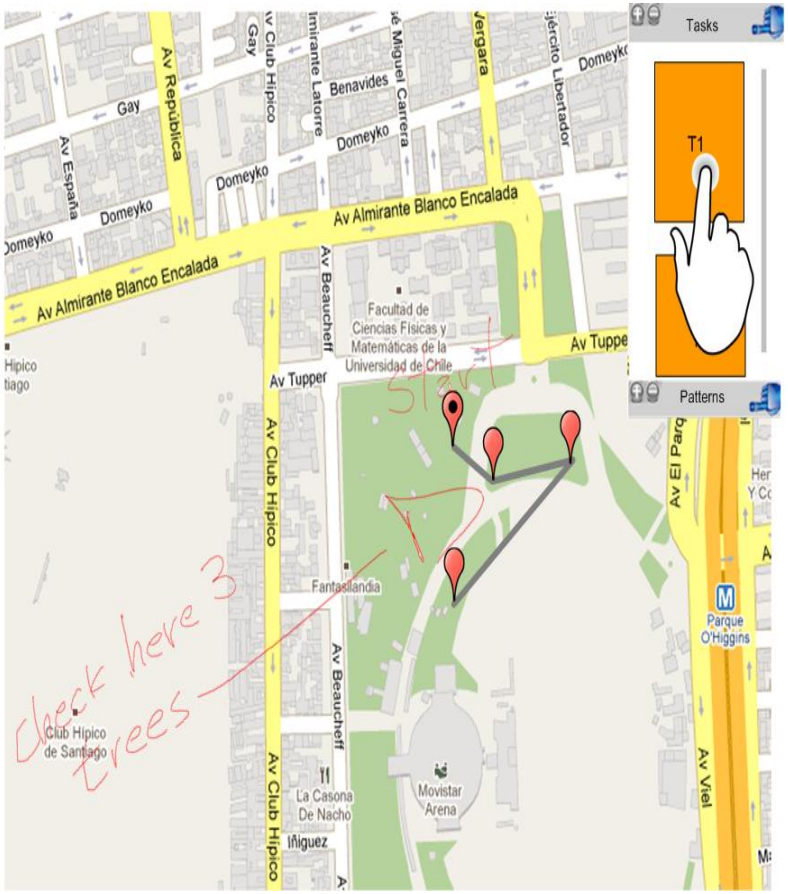
Nelson Baloian, José A. Pino, Gustavo Zurita, Gabriel Peña. Learning with Patterns: an Effective Way to Implement Computer Supported Pervasive Learning14th (CSCWD), pp. 677-682, Apr 2010. Shangai, China, Best Paper award

Including Geo-collaboration

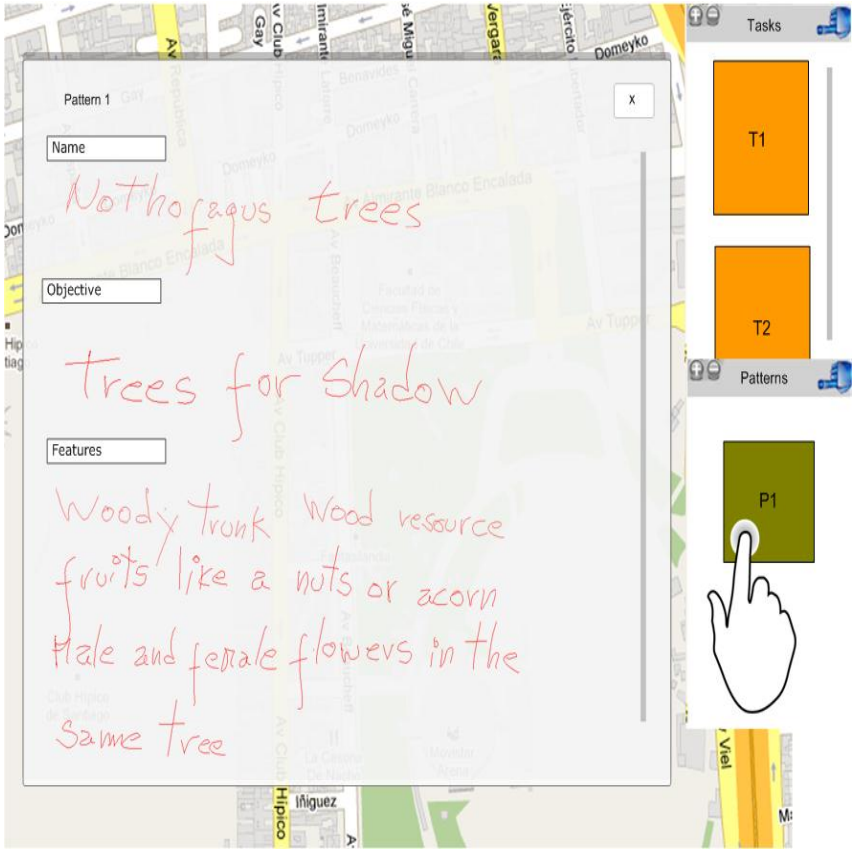
- Geo-referenced data plays an important role for completing the task:
- Learning Scenarios:
  - Geology
  - Botany
  - Architecture
  - Languages
  - Social sciences
  - etc.

Screenshots Geocollaboration (under construction)

Task Creation: follow a certain path

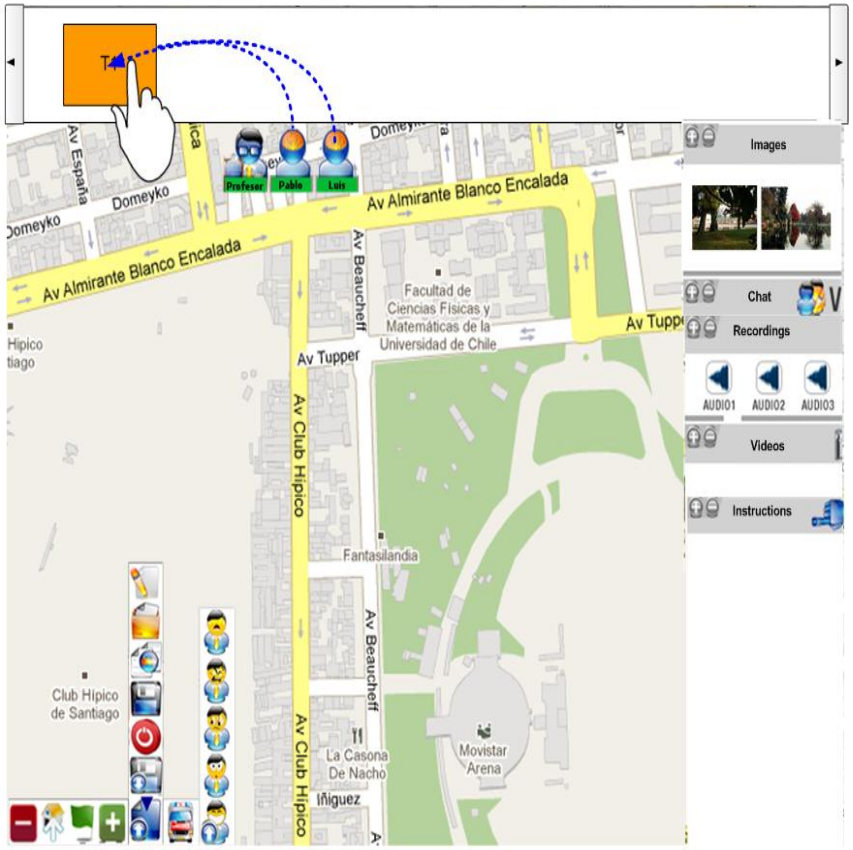


Pattern creation: define components

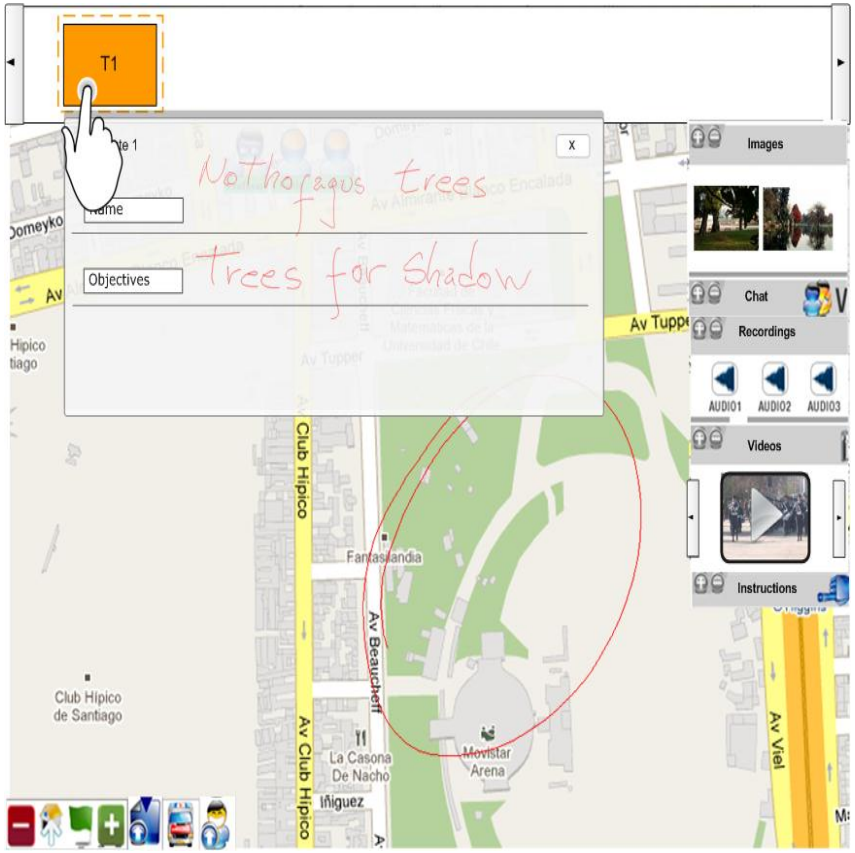


Screenshots Geocollaboration (cont.)

Assigning tasks to students



Student's view of the task

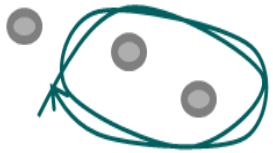
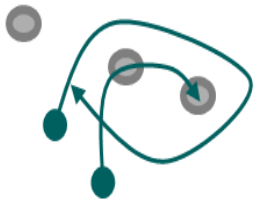
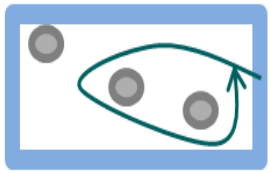
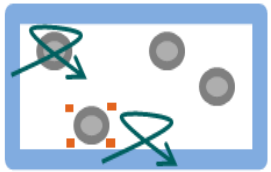
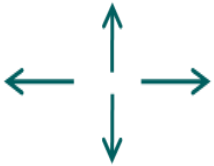
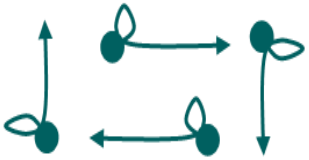
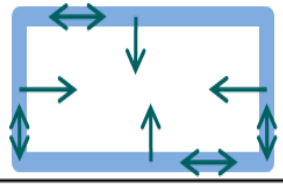
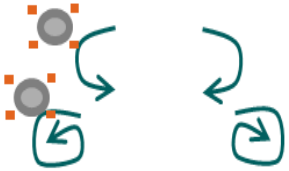


Pedro Antunes, Claudio Zapateiro, Gustavo Zurita, Nelson Baloian. Integrating Spatial Data and Decision Models in a E-Planning Tool. Proc. 16th CRIWG, Sep 2010. Maastricht, The Netherlands.

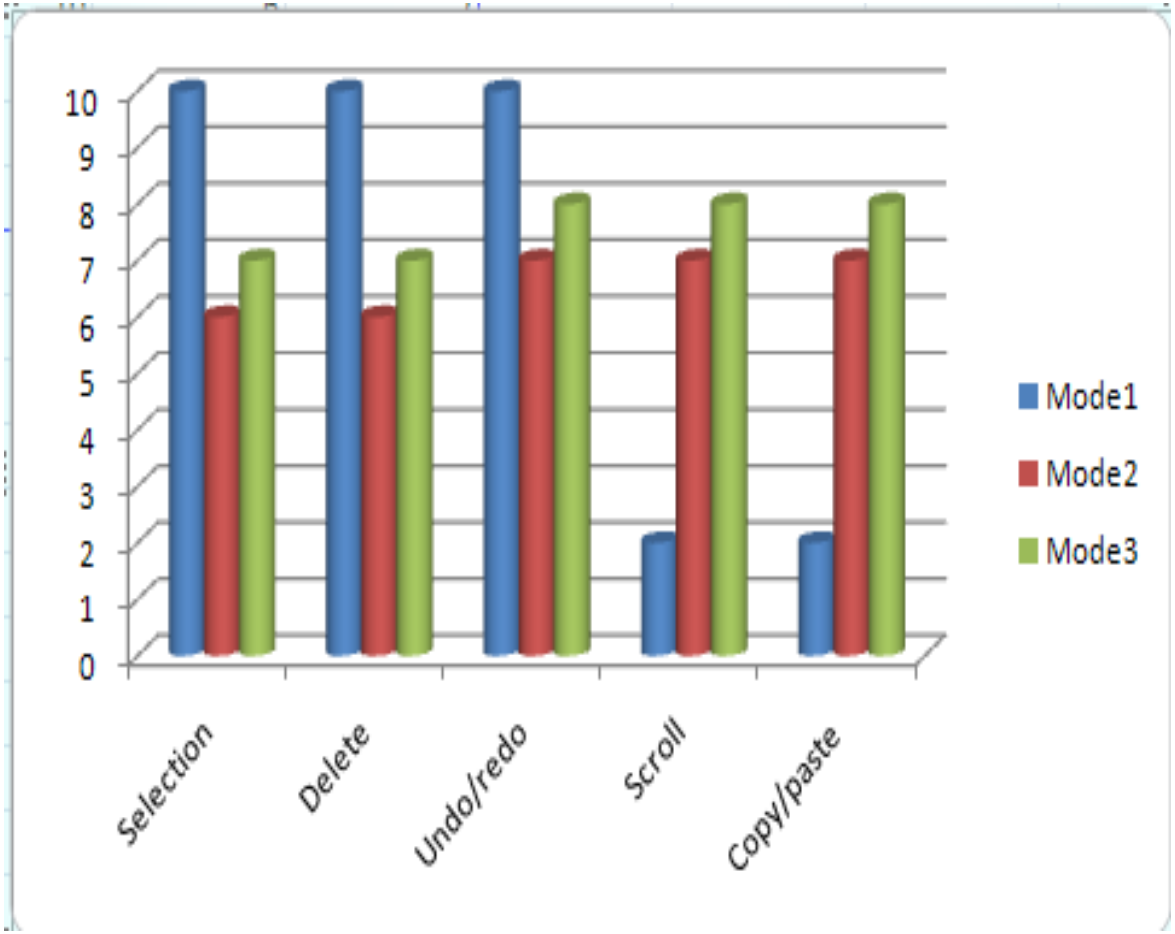
Towards a formal evaluation of gestures

- Which gesture is ***good*** on which platform ?
- **Diverse** Platforms: diverse screen sizes, interaction sensitivities
- What is ***good*** : easy to learn, easy to remember, robust

Various modes for gesture-based commands

	Mode 1: certain sketches are recognized as commands	Mode 2: using a pre-gesture (could be double-click)	Mode 3: Depend on starting absolute position
Multiple selection			
Delete			
Undo/Redo			
Scroll			
Copy/Paste			

Which type of result should we look for ?

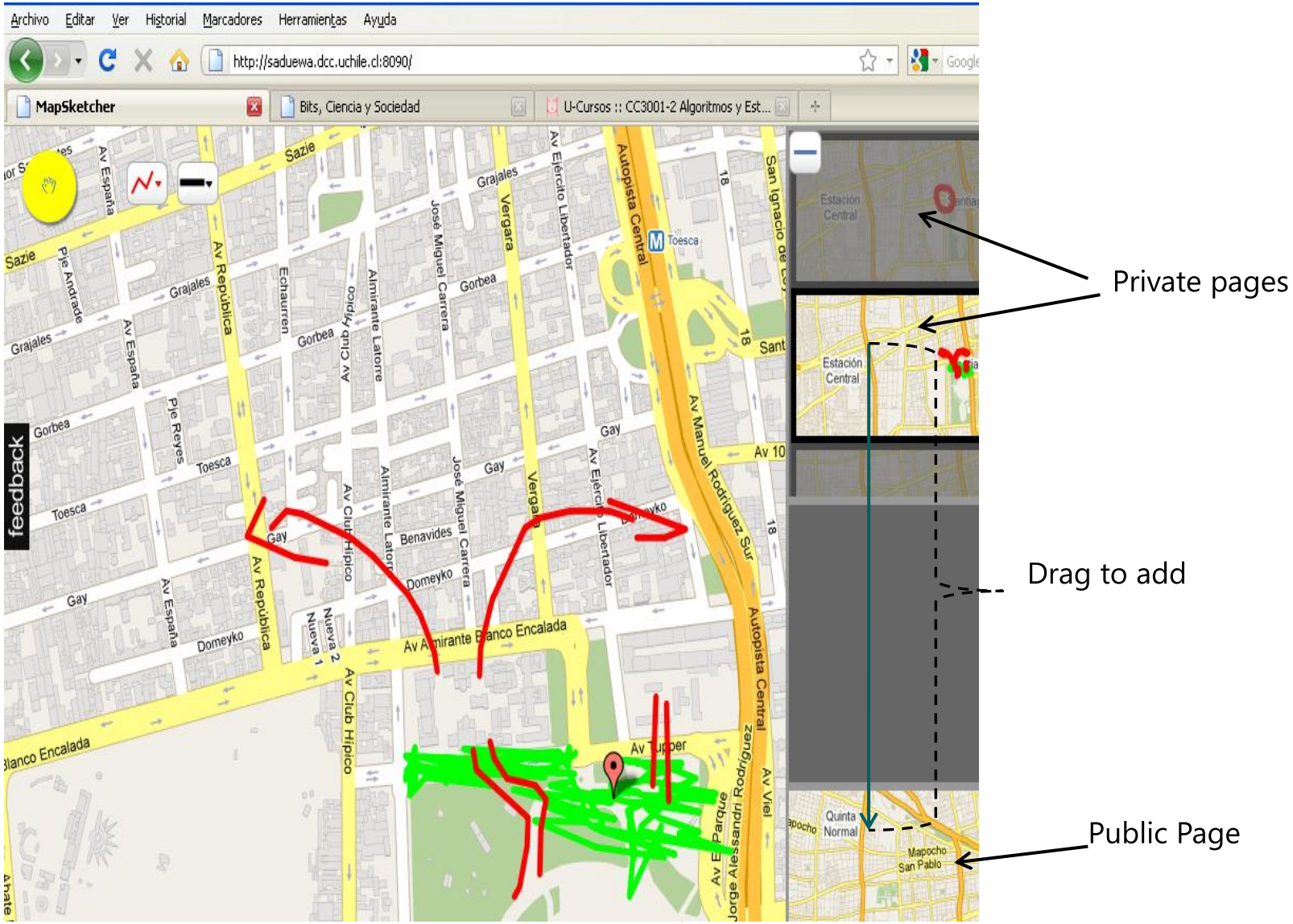


- This just for **one** touch sensitive device

Where do we go from now ?

- Even more diverse mobile and non-mobile devices appear every day in the market
  - They differ in shapes, sizes & OS
  - How to develop one platform for **all** ?
- Is 100% P2P really necessary nowadays ?
  - Internet is **everywhere**, and fast
- We are trying HTML5

Example 1: Web-based Geo-collaboration

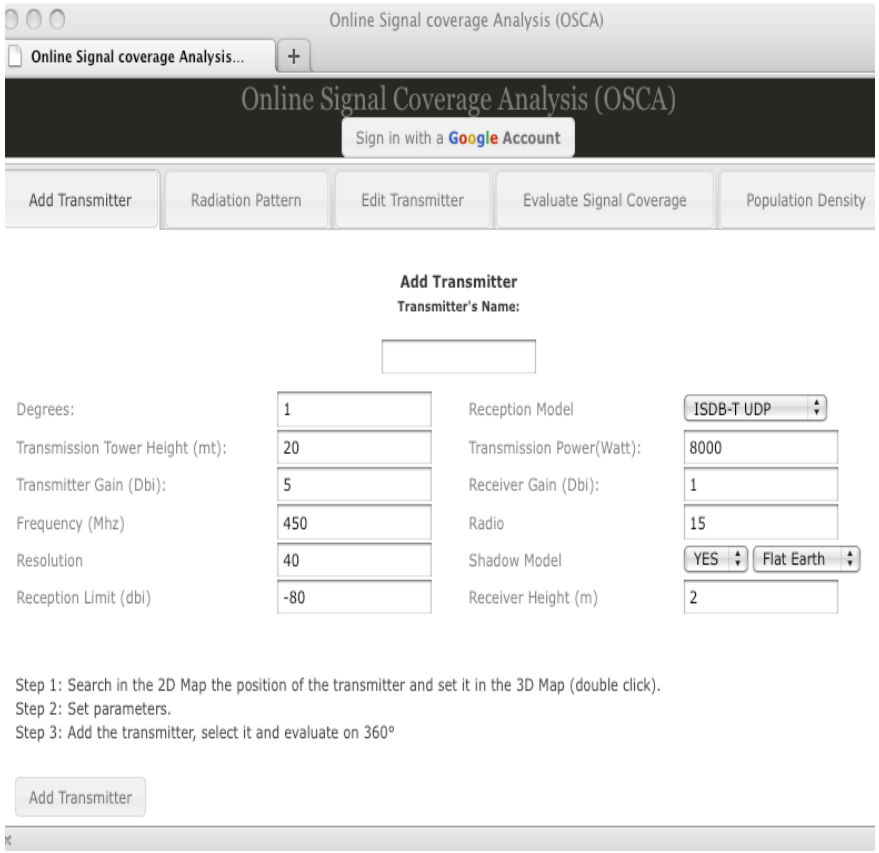


Example 2: Modeling TV signals propagation

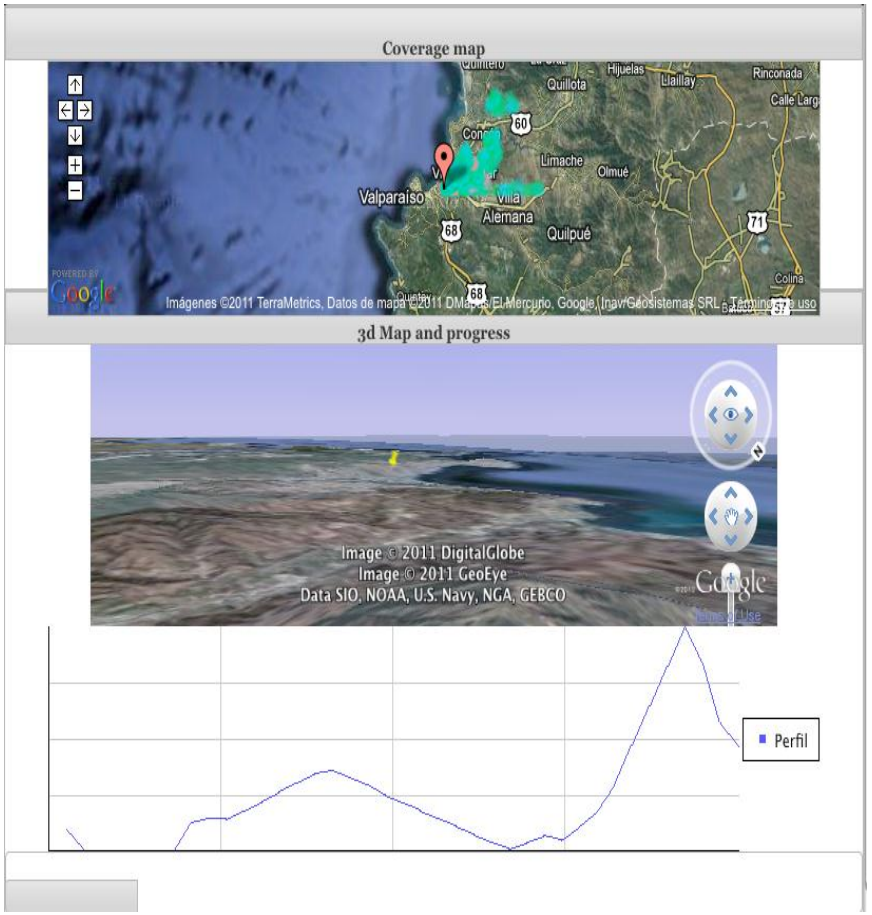
- Various models, various purposes
- Which model fits better to which situation ?
- Which arrangement of antennas covers more population ?

Classroom, home or laboratory work (Desktop)

Position of antennas, chose model

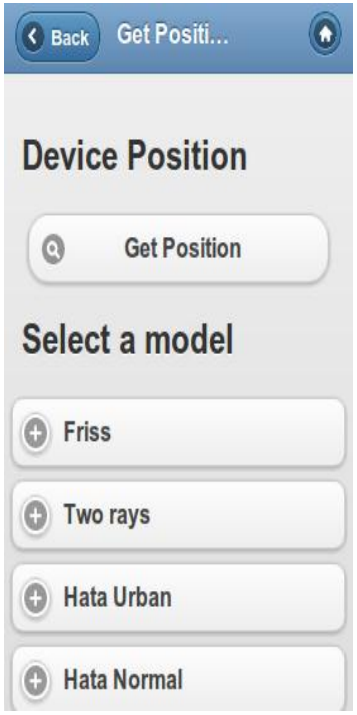


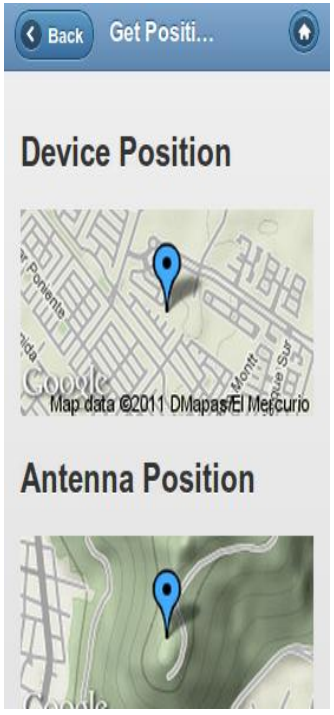
Simulation of covered area

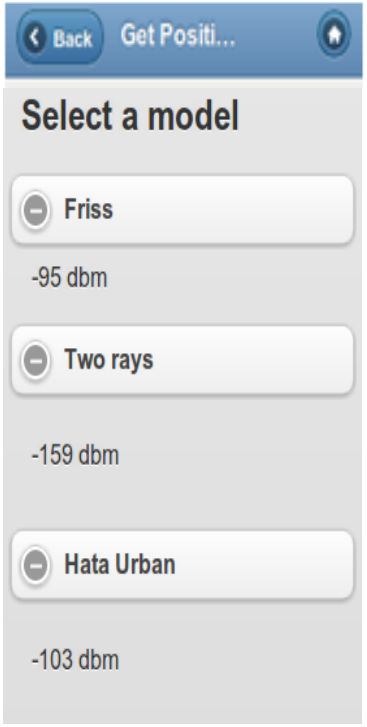


Working on the field

- HTML5-based web page allows :
  - Get device position (GPS)
  - Get the signal strength according to each selected model
  - Compare it with the actual length measured with ad-hoc equipment







Conclusions:

- Can we implement meaningful learning activities with this model ?
  - Yes, we can !
- Can we (should we) use widgets ? gestures ? both ?
  - Yes, we can !
- Can we develop an integrated interaction model across platforms ?
  - Yes, we can (it seems) !
- Can we describe them with a pattern language ?
  - Well, we still have to work on this

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Thank You

Briging the gap between formal and informal learning