Orchestration Signals in the Classroom: Managing the Jigsaw Collaborative Learning Flow


Davinia Hernandez-Leo,
Raul Nieves,
Ernesto Arroyo,
Andrea Rosales,
Javier Melero,
Pau Moreno,
Josep Blat

Interactive Technologies Group GTI
http://gti.upf.edu
Universitat Pompeu Fabra
Barcelona, Spain

davinia.hernandez@upf.edu

ec-tel 2011
22 Sep. 2011 Palermo
Content

• Context - Problem
• Signal Orchestration System prototype
• Jigsaw CLFP Activity
• Evaluation
• Conclusion / future work
MANAGING COLLABORATIVE LEARNING PROCESSES IN PHYSICAL SETTINGS

CONTEXT- PROBLEM
Context

• Physical spaces (classroom, playground, city, museum...)
  • Encourage experimentation, exploration, collaboration and discussion

• “Technology-augmented physical spaces”
  -enhanced learning
  • Tangible user interfaces
  • Ubiquitous computing
  • Augmented reality

(Arroyo et al., 2011)

(Alavi et al., 2009)

(Santos et al., 2011)
Problem

• Orchestration of collaborative learning processes in f2f physical settings:
  • Who **belong to each group**
  • Which **collaboration areas** are assigned to each group
  • How to **distribute the resources or roles** within the group
Problem

• Some solutions proposed when using computer-support (LMS/VLE in PC, laptops...)

• Using mobile phones would be a more portable option

• But, what if ?
  • Not available (for all the students), cost limitations
  • Mobile phones not allowed
  • Agile dynamics
  • Avoidance of attention distraction / cognitive load
  • Orchestration indicators need to be perceived by all participants (because of awareness, ...)
PROPOSED SOLUTION
Signal Orchestration System

- Adding digital coordination information to physical spaces:
  - Signals indicating group formation
  - Signals indicating distribution of resources
  - Signals indicating assignment of work areas
  - ...

GTI
Group de tecnologies interactives http://gti.upf.edu
Signal Orchestration System
First prototype

Personal Signal
wearable devices

• Visualization +
  communication modules

Orchestration Signal
manager

• Graphical interface +
  processing module +
  communication module
Personal signal devices

- Color combination signals indicating coordination aspects as “remotely controlled by the manager (teacher)"
  - RF12B, up to 100 m.
  - JeeNodes, low-cost Arduino clone board
  - ATmega329 microcontroller (logic)

Casing unobtrusive
*to minimally disrupt users’ activity
*seen from above
*to share and match visual indicators with partners
Orchestration Signal Manager

- Where the teacher can configure the orchestration signals to be transmitted to the PS-devices
  - Interface + microcontroller + transceiver
  - Configuring color signals for each device (id or student name // drag&drop) in a sequence of activities
- Buttons for controlling batch message transfer and individual signal transfer (e.g., group membership readjustment)
JIGSAW CLFP ACTIVITY

EXPERIMENTING THE APPROACH - PROTOTYPE
Jigsaw CLFP scenario

• Individual phase
  • Read a case (out of three)
  Which case?

• Expert phase
  • Meet students that read same case (discuss)
  Who are they?
  Where?

• Jigsaw phase
  • Students that read different cases meet (identify differences between cases)
  Who exactly?
  Where?

27 Master students, with 12 different nationalities
6 men and 21 women
Jigsaw CLFP scenario – SOS

• Individual phase
  • Read a case (out of three)
  Which case?

• Expert phase
  • Meet students that read same case (discuss)
  Who are they?
  Where?

• Jigsaw phase
  • Students that read different cases meet (identify differences between cases)
  Who exactly?
  Where?
Jigsaw CLFP scenario – SOS

- Individual phase
  - Read a case (out of three)
  - Which case?

- Expert phase
  - Meet students that read same case (discuss)
  - Who are they?
  - Where?

- Jigsaw phase
  - Students that read different cases meet (identify differences between cases)
  - Who exactly?
  - Where?
Jigsaw CLFP scenario – SOS

• Individual phase
  • Read a case (out of three) → Which case?

• Expert phase
  • Meet students that read same case (discuss) → Who are they?

• Jigsaw phase
  • Students that read different cases meet (identify differences between cases) → Who exactly?

Research questions

• Does the orchestration signals enable/facilitate the coordination of the Jigsaw learning flow in the classroom?

• Are the orchestration signals flexible enough to deal with unexpected situations?

• Are the characteristics of the prototype usable for the purposes of the Jigsaw learning flow orchestration?

• What aspects need/can be improved?

Mixed method, triangulating data

Observations (timing, incidents, use of devices) + students + teachers’ questionnaires
Jigsaw CLFP scenario – initial plan

- **Individual phase**
  - Read a case (out of three)

- **Expert phase**
  - Meet students that read same case (discuss)

- **Jigsaw phase**
  - Students that read different cases meet (identify differences between cases)

<table>
<thead>
<tr>
<th>27 students, 3 different cases =&gt; 9 students read the same case</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Expert Groups on the same case, each of them with 4 or 5 students having read the same case</td>
</tr>
<tr>
<td>9 Jigsaw groups, each of them with 3 students having read different cases</td>
</tr>
</tbody>
</table>

Working areas assigned according to group sizes

- SOS + colour cardboards
Jigsaw CLFP scenario – actually happen

• Individual phase
  • Read a case (out of three)

• Expert phase
  • Meet students that read same case (discuss)

• Jigsaw phase
  • Students that read different cases meet (identify differences between cases)

Constant changes in the manager during the actual enactment

3 students did not attend + 1 PS-device did not work

Initial planned changed => 8 students read the same case

1 student took the wrong case + 1 student had to leave

Expert groups from 3 to 5 members, at the end only 6 students read case A

6 Jigsaw groups from 3 to 4 students
Results (I)

• CL flow followed as desired (according to Jigsaw intrinsic constraints)

• SOS not indispensable to achieve orchestration but can decrease teachers’ workload and students’ attention to orchestration issues

Flow and distribution of groups achieved
46% of the students rated the PS-devices as quite useful, 38% as very useful, 12% as somehow useful, 4% as not useful

• “I didn’t need to indicate students in every moment what case each of them should read. Students were autonomous identifying their groups and task to accomplish. The group distribution was easier and agile since I didn’t need to pay attention to where each student were going...” (T)

“I can pay more attention to the tasks themselves and not that much to the organization” (T)
Results (II)

• **Flexible re-configuration of signals** (unexpected incidents) transparently to the students. Appreciated by teachers

Flow and distribution of groups achieved (despite the changes!)

“The process for sending signals was easy; there was even a student that left the class during the second phase, and it didn’t imply a problem...” (T)

“The system is very helpful, because it allows me to **make changes during the activity** in the signals to send...” (T)
Results (III)

• When compared to previous experiences, system showed to facilitate a **more organized and dynamic collaboration and engaging experience**

77% of the students experienced similar collaboration situations in the past

“**The devices speed up the dynamic**” (S)
“**Very helpful using the devices because they enables a complete organization**” (S)
“**The movement in the classroom is motivating and favors collaboration and motivation**” (S)

“**The devices open our interest and raise expectations** of what will be the next signal” (S)
“**It’s funny** to see your color and then look for the place you need to go...” (S)
Results (IV)

• Signals were seen and understood fairly well and quickly

53% of the students said that they could see their signals in the PS-devices quite well, 35% very well, 12% not very well, 0% bad

62% of the students said that they could see the signals of their classmates quite well, 15% very well, 23% not very well, 0% bad

35% of the students said that they could see the “cardboard furniture signals” quite well, 42% very well, 19% not very well, 4% bad

The students get familiar with the device very quickly because it is very easy to use” (T)

“Students identify very quickly their colors” (O)

“All of the students saw the signals almost at the same time” (O)

“In the third phase students appeared to be used to the devices and understood very quickly what to do…” (O)
Results (V)

• More than a 70% of the students said that if they were to organize a similar activity, they would like to use SOS

• Positive aspects: **dynamism, visual indicators, engagement**

73% of the participants said that if they were to organize a similar activity, they would like to use the signal system, 8% said that they won’t like to use it and 5% indicates that it would depends on the situation.

“Facilitating a rapid group formation” (S)
“Fluid organization” (S)
“Fosters students mobility in the classroom” (S)
“New, motivating, funny…” (S)
“Raise expectations, curiosity, engagement…” (S)
“The organization of the dynamic is highly visible... you do not need to read continuously the description of the “logistics”…” (S)
Results (VI)

• To improve:
  • Revise the **design of devices** (size, weight, robustness)
  • Use always **combinations of colours** (not single colour for some, and combinations for others)
  • Being able to send signals also to **furniture or locations** in the classroom
  • Enabling students to send signals to the **teacher**
CONCLUSION
Conclusion – Current/Future Work

• Distribute signals to students indicating orchestration aspects in f2f settings

• SOS: Orchestration Signal manager + Personal Signal devices
  • + dynamic, agile, organized, engaging activity
  • - teachers’ workload regarding orchestration tasks
  • flexible support

• Current – future work
  • New experiments, also outside the classroom with several CLFPs
  • Lighter and more compact PS-devices / Easier-to-use OS-manager
  • Adding sound signals, shared artifacts/furniture signal devices, bidirectional communication
Thank you!

davinia.hernandez at upf.edu
http://gti.upf.edu