GSIC / EMIC Group and Towards My Doctoral Thesis:

A pattern-based design process for the creation of CSCL scripts computationally represented with IMS LD

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http://gsic.tel.uva.es
Contents

- **GSIC Introduction**
- GSIC main research topic: CSCL
- GSIC research lines and projects
- Towards my Ph.D.

- Conclusions and discussion

- **Creating CSCL scripts**
  - A pattern-based design process for
  - Computationally represented with IMS LD
GSIC Introduction

Who are we?
- Our context
- Members of the group
Our context

Valladolid

- Capital of the “Castilla y León” Region
  - One of the largest in EU
  - One of the least dense populated (4 mill.)
- Valladolid population: 400,000

University of Valladolid

- 700 years old
- Engineering, life sciences, social sciences, humanistic studies, etc.
- 30,000+ students, 2000+ teaching staff
- http://www.uva.es
What is GSIC?

**GSIC** (Intelligent and Cooperative Systems Group)

- The technological component of a more general interdisciplinary group called **EMIC** (Education, Media, Informatics and Culture)
- University of Valladolid

**Active life since 1994**

**Teachers and researchers from:**
- School of Telecommunications Engineering
- School of Computer Engineering
- Faculty of Education
Members of the group (I)

Telecommunications Engineering:

- Associate lecturers (Dr)
  
  Yannis Dimitriadis, Juan I. Asensio,
  Eduardo Gómez, Miguel Bote

- Assistant lecturers (non-Dr)
  
  Guillermo Vega, Davinia Hernández,
  Miguel Ángel Gómez, Federico Simmross

- Graduate research assistants
  
  Luis Palomino, Eloy Villasclaras, Guillermo Yagüez,
  Sergio Guíñez, Marco Rodríguez
Members of the group (II)

Faculty of Education

- Associate lecturers (Dr)
  - Bartolomé Rubia, Rocio Anguita
- Assistant lecturers (non-Dr)
  - Iván Jorrín, Inés Ruíz

Computer Engineering

- Associate lecturer (Dr)
  - Alejandra Martínez
- Assistant lecturer (non-Dr)
  - José Antonio Marcos
Contents

- GSIC Introduction
- **GSIC main research topic: CSCL**
- GSIC research lines and projects
- Towards my Ph.D.
- Conclusions and discussion
CSCL (I)

Information and Communication Technologies in Education

Evolution:

- Computer Aided Instruction (CAI)
- Intelligent Tutoring Systems (ITS)
- Computer-Supported Collaborative Learning (CSCL) (Koshmann, 1996), (Dillenbourg, 1999)
CSCL (II)

- CSCL as evolution of CSCW (learning vs. work)
- CL (Collaborative Learning)
  - Social interactions as key element for learning
- CS (Computer Support)
  - Computer (and networks) as mediation technologies
- New requirements
  - Technological + Pedagogical
    - (Support for communication, collaboration, coordination, adaptation, reuse, participatory design, evaluation...)

10
Contents

- GSIC Introduction
- GSIC main research topic: CSCL
- **GSIC research lines and projects**
- Towards my Ph.D.
- Conclusions and discussion
Research lines (I)

Design in CSCL: IMS LD, patterns, collaboration scripts, authoring tools

- LD for CSCL?
- How teachers can create collaborative LDs / scripts?

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http://gsic.tel.uva.es/collage
Research lines (II)

Collaborative learning designs enactment / tailorable systems

- Grid Services for e-learning
- Script-driven addition/removal of tools

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- Coordination and shared workspace awareness

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Gridcole, a tailorable system for collaborative learning

AORTA framework
http://gsic.tel.uva.es/aorta
Research lines (III)

Semantic search of CSCL tools

- How to discover appropriated learning services?
- Use of ontological techniques

Ontoolcole,
an ontology for the search of CSCL Services

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Formative evaluation in CSCL

- How to evaluate CSCL experiences?
- Combining quantitative and qualitative techniques
- The role of roles in the analysis of interactions

Mixed methodology for evaluating CSCL experiences

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The big picture

Teacher

Design process

Authoring tool: Collage

Computer-interpretable design

Groups/roles administration tool

(Collaborative) Learning Management System (LMS)

IMS LD

Gridcole

Tool searcher

Ontoolcole

Process awareness tool

Students

Evaluation

SAMSA
Quest
ILOCA
Projects

- **TELL** (Towards effective networked supported collaborative learning). EU e-learning programme (1/04 – 12/05).
- **CRAC**, Grid and Peer-to-Peer Middleware for Cooperative Learning Environments. Spanish Ministry of Science and Technology (12/02 – 11/05)

KALEIDOSCOPE Network of Excellence (Share Virtual Laboratory backbone activity, CAViCoLA ERT, Computer-based Analysis and Visualization of Collaborative Learning Activities, and Interaction and Collaboration Analysis joint research project). EU IST FP6 programme (1/05-12/07)

- **GridCyL**, System based on grid services for the design and flexible integration of collaborative learning applications. Castilla y León Regional Government (1/05 – 12/07).
- **Grid4All**, Grid: Dynamic Virtual Organizations for schools, families, and all. EU IST F6 programme (6/06-12/08)
Contents

- GSIC Introduction
- GSIC main research topic: CSCL
- GSIC research lines and projects
- Towards my Ph.D.
- Conclusions and discussion
Towards my Doctoral Thesis

Context: keywords

Patterns

CSCL scripts

design process

IMS LD
Design of CSCL situations

- Productive **interactions** among participants
- Structuring CL, **collaboration scripts**
  
  (Dillenbourg, 2002)

- Computational representations of collaborations scripts (**CSCL scripts**) interpretable by LMSs:
  
  Practitioners can influence in the behavior and functionality of a CSCL system
Creating CSCL Scripts

How can teachers create “potentially effective” “computer-interpretable” collaboration scripts according to the necessities of their situation?

Challenges

1. Not easy to find appropriate trade-off between coercion and free collaboration

2. Modelling CL processes (technically) difficult

3. Computer interpretable notations (XML) are not familiar to educators
Creating “potentially effective” collaboration scripts:

Challenge 1: Not easy to find appropriate trade-off between coercion and free collaboration

A pattern-based approach to creating CSCL scripts
Best (good) Practices

Reusing the principles of commonly used CSCL scripts

- Capturing their essence (best /good practices)
- as patterns for the design of (potentially effective) CSCL scripts

so that they can be reused in different situations / content / disciplines (particularized according to their concrete necessities)
".... Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice“

A collection of interconnected patterns which enables the generation of a coherent whole (e.g. a town) is a Pattern Language

(Alexander et al., 1977)
Use of patterns in different domains: software engineering (Gamma et al., 1995), CSCW (Schümmer, 2003), also e-learning: technological / pedagogical design (PPP, E-LEN, TELL projects)...

Patterns for the design of CSCL scripts

- Hierarchical structure
- Patterns connecting rules
- Not complete, some examples for illustration
Hierarchical structure (I)

Pedagogical approaches

Collaborative Learning

Scripted Collaboration (11 de E-LEN report)

Roles and common CL mechanisms level

Facilitator

Jigsaw

CLFPs

Structured discussion

Asynchronous

Resource level

Activity level

Collaborative Learning flow level

CSCL scripting patterns

Debate PL (Goodyear, 2005)

Didactics of subject matters

A pattern-based

creating CSCL scripts

Pedagogical approaches
Connecting rules / relationships between patterns:

- “PatternX specializes patternY”
- “PatternX is alternative to patternY”
- ...

Example: CLFPs hierarchies

CLFPs can be combined

(a phase of a CLFP is structured using another CLFP)
This pattern gives the collaborative learning flow for a context in which several small groups are facing the study of a lot of information for the resolution of the same problem.

***

The collaborative learning flow must enable the resolution of a complex problem/task that can be easily divided into sections or independent sub-problems.
(educational objectives) (E.g.) To promote the feeling team members need each other to succeed (positive interdependence)

(complexity) High-risk: more appropriate for collaborative learning experienced individuals

**SOLUTION** Each participant in a group (“Jigsaw Group”) studies a particular sub-problem. The participants of different groups that study the same problem meet in an “Expert Group” for exchanging ideas. These temporary groups become experts in the section of the problem given to them. At last, participants of each “Jigsaw group” meet to contribute with their “expertise” in order to solve the whole problem.
Collaborative Learning
Flow Patterns (III)

**Jigsaw CLFP (3)**

*Diagram representing the solution*
Jigsaw CLFP (4)

(E.g.) The expert-group phase can be structured according to Pyramid CLFP or Brainstorming CLFP.

Particularization into a script:

(E.g.) Provide experts with a tool so that they can take notes during the expert group that provide support when the original group re-assembles...

Instantiation of the Jigsaw CLFP-based script:

(E.g.) Being the only expert in a sub-problem in the “Jigsaw Group” can be a demanding experience. This can be mitigated if two group members share the same section of the problem.
Creating “computer-interpretable” collaboration scripts:

Challenge 2: Modelling CL processes (technically) difficult
IMS Learning Design, language for describing learning processes

Also collaborative learning processes (CLFPs)?

- Several roles played by several individuals (a group)
- Collaborative learning activity (multiple individuals with the same role or multiple roles)
- Specification of activities in coordinated learning flows (method)
Analyzing possibilities and limitations to support:

- Group composition
  - Hierarchy of groups
  - Group size / amount of groups
  - Group formation policies / at runtime

- Roles / resources distribution

- Coordination
  - Flow of CL activities
  - Floor control
  - Flow of artefacts

- Flexibility
  - Flexible group formation

Creating CSCL scripts computationally represented with IMS LD

Research stay at OTEC
“Facilitating” the creation of CSCL scripts:

Challenge 3: **Computer interpretable notations (XML) are not familiar to educators**
Diverse approaches of LD editors:
- **RELOAD, CopperAuthor, COSMOS**: general purpose editors close to the specification (for LD experts)
- **MOT+ Editor, ASK-LDT**: graphical representations facilitates the authoring, but still LD knowledge is needed…

Our approach:
- A high-level **collaborative-learning** specialized editor that allows teachers to create their own collaborative LD by reusing CLFPs as LD templates

**COLLAGE** (COLaborative LeArning desiGn Editor)
Collage (I)

A pattern-based design process for creating CSCL scripts computationally represented with IMS LD

Collage (COLlaborative LeArning desiGn Editor)

http://gsic.tel.uva.es/collage

(Graphic-based high-level specialized authoring tool for collaborative learning. Based on Reload. IMS-LD level A compliant)
Design process (1)

Particularization of the ideas proposed in (Strijbos et al., 2002)

- Selecting a CLFP
  - Choose a CLFP depending on the promoted objectives, the type of problem or task the CLFP is more suited and the complexity...
  - Read the “help” about the chosen CLFP:
    Understand the learning flow structure on which the LD will be based
Collage (III)

A pattern-based design process for creating CSCL scripts computationally represented with IMS LD

Educational benefits

Type of problems / tasks

Complexity (CL experience)
Overview

This pattern gives the collaborative-learning flow for a context in which several small groups are facing the study of a lot of information for the resolution of the same problem.

Problem

Complex problem/task that can be easily divided into sections or independent sub-problems.

Educational benefits

- To promote the feeling that team members need each other to succeed (positive interdependence).
- To foster discussion in order to construct students' knowledge.
- To ensure that students must contribute their face share (individual accountability).

Complexity

High-risk: more appropriate for collaborative learning experienced individuals.

Solution

Each participant (individual or initial group) in a group (Jigsaw Group) studies or works around a particular sub-problem. The participants of different groups that study the same problem meet in an Expert Group for exchanging ideas. Those temporary focus groups become experts in the section of the problem given to them. At last, participants of each Jigsaw group meet to contribute with its expertise in order to solve the whole problem.
c. Determine the title, objectives and prerequisites of the LD

d. Specify the collaborative learning flow: The learning flow of the selected CLFP can be enriched replacing one or several of its phases with another CLFP. Depending on the CLFP some aspects should be decided.

e. Define the description activities, activity completion, the information about roles (including groups), group-size limits.

f. Create or select resources (content and tools)

g. Determine and configure the resources needed to support the activities

h. Associate resources to activities

i. Package the LD into a Unit of Learning
Collage (VI) design process for creating CSCL scripts. A pattern-based computational representation with IMS LD.
A pattern-based design process for creating CSCL scripts computationally represented with IMS LD.

Creating CSCL scripts based on CLFPs using Collage (four workshops, slightly different audiences).

Using LD-based CSCL Script structured according to CLFPs in real-world scenarios (case study: blended learning scenario, part of an engineering course).
Description of the case study

- Engineering course, students ~12
- 1 week **blended scenario:**
  - two F2F synchronous sessions and a virtual asynchronous session in between
    - *(previous courses without computer support)*
- LD-based CSCL script structured according to a combination of 3 CLFPs Pyramid, Jigsaw and TPS *(Think-Pair-Share)*
- **Collaborative reading** of a complex long technical paper about “administration of communication networks”
Implementation: Collage + Gridcole

(Coppercore)
Preliminary results

Qualitative and quantitative approaches
- Questionnaires (also for the teacher), direct observations, logfiles, focus group

Some preliminary results (not a complete analysis yet)
- Very positive (quantitative):
  - the system **adequately guides and supports** the realization of the activities, and the achieved **collaboration was satisfactory**
- Interesting comments
  - Some of the students thought that the “system” was **deliberately design for the “collaborative reading”**...
  - They miss a **“process awareness” tool**...
Contents

- GSIC Introduction
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- Towards my Ph.D.
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Conclusions

Creating LD-based CSCL scripts by reusing patterns = facilitating the authoring, facilitating the reuse of patterns, potentially effective scripts

Trade off between generality and unrestricted design options vs. good reuse and particularization of CLFPs (and hierarchies) and an easy edition of collaborative LDs

Reusing at different levels: learning flows vs. activities (LAMS), complementary!

Refinement process vs. assembling process (templates vs. building blocks / exemplars vs. chunks)