Advancements in Intelligent Support for Collaborative Learning From Well-Thought-Out Group Formation to Effective Peer Interactions

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• Founder of the Computers in Education Lab  
  Laboratório de Computação Aplicada à Educação e Tecnologia Social Avançada (CAEd) created in 2012

• Main objective: investigate, develop and apply computational techniques to solve educational problems.

• We work in a multidisciplinary environment focusing on generating cutting-edge knowledge e technological products with potential to support the process of teaching and learning.

• 3 principal investigators, 3 pós-docs, 6 M.Sc. , 15 PhD, and collaborators from Brazil, EUA, Canada and Japan.
Group on Intelligent and Interactive technology

Seiji Isotani - PI
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Leonardo
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PhD Students
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Master Students
Wilmax
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Advancements in Intelligent Support for Collaborative Learning
From Well- Thought-Out Group Formation to Effective Peer Interactions

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Takeaway Message:

1. Take a **real world problem** that is hard to solve
2. **Organize the knowledge** from different sources
3. Build an **ontology**
4. **Hide the ontology** behind a model that people can understand
5. **Apply the model and the ontology to solve the problem**


The field of Computer-Supported Collaborative Learning - CSCL dedicates to study about how technology can be used to support collaborative learning and its processes (Stahl et al., 2006)
Context

The field of Computer-Supported Collaborative Learning - **CSCL** dedicates to study about how **technology** can be used to **support collaborative learning** and its processes (Stahl et al., 2006).

Despite of the potential benefits of Collaborative Learning, **this approach is only beneficial when there is an adequate design and orchestration of its scenarios** (Hernández-Leo et al., 2006, 2011; Dillenbourg, 2013).
The Problem

- These activities are too complex and time consuming
- They also require specific knowledge and skills
How to increase the chances of successful collaborative learning (CL)?
How to provide intelligent support to design and carry out collaboration?
Challenges
Knowledge to design effective collaboration is distributed across several learning theories and best practices.

They do not share the same terminology, assumptions and expectations and can be even contradictory!

In fact, Only 35% of the current CL technology rely on pedagogical knowledge.

Borgest et al. (submitted) Group Formation: The State of the art. Journal of CSCW.
Learning Theories and CL

Why should we use learning theories?

Although learning theories do not directly provide “recipes” for classroom teachers or curriculum designers. They do, however, provide essential information that can be used to develop learning situations and explain why these situations might lead to effective learning. (Swan, 2006)

The context in which learning activities should take place, the target knowledge or skill, the roles played by learners, learning objects that could or should be used, and so forth.

Why learning theories are not widely used in practice?

Hard to understand
Too complex & ambiguous
There is not a common vocabulary to describe them
Different point of views, levels of aggregation, perspective and emphasis (Reigeluth, 1999; Swan, 2006; Hayashi, 2009)
Can we organize this pedagogical knowledge and build an infrastructure to use it adequately?
Our Approach

Use ontological engineering to describe formally meaningful information contained in theories.

Pedagogical knowledge

Ontological structure

Use ontologies to support the development of ontology-aware systems.

Run experimental studies to:
- propose group formation;
- design group activities;
- estimate benefits, etc.

Theory aware intelligent systems

users

Teachers and students
Almost 20 Year History of the Research on CL

Group Formation


CL Design


Interaction Analysis
Formalizing CL

smaller group
part of the whole

interaction

Whole group

L_A

L_B

L_C
Formalizing CL

Sub-group goal

Strategy A

Strategy B

Whole group goal

Role

L_A

L_B

L_C

Individual goal
Formalizing CL

Knowledge Formalization

✓ Learning Strategies
✓ Learning Goals
✓ Group Goals
✓ Roles

Y <= I - goal(L_A <= L_B)

Y <= I - goal(L_B <= L_A)

W(L) - goal({L_A, L_B})

I - goal(L_A)

I - goal(L_B)

I - goal(L_C)

W(L) - goal({L_A, L_B, L_C})
Formalizing CL

Knowledge Formalization

✓ Learning Strategies
✓ Learning Goals
✓ Group Goals
✓ Roles

Knowledge Acquisition: (accretion, tuning, …)

Cognitive Skill Development (cognitive, associative, …)

Knowledge sharing

Learning by Guiding

Spread of a skill

Learning by Apprenticeship

Y <= I - goal (L_A <= L_B)

Y <= I - goal (L_B <= L_A)

W(L)-goal({L_A,L_B})

W(L)-goal({L_A,L_B,L_C})

Tutor

Tutee

Role

Role

Role

L_A

L_B

L_C
Development of cognitive skills (rough-cognitive stage)

Development of meta-cognitive skills (Associative stage)

Spreading of a skill

Learning by apprenticeship

Learning by guiding

Spreading of a skill

Learning by observation
Formalizing CL

Knowledge Formalization

Y <= I - goal(L_A <= L_B)
Y <= I - goal(L_B <= L_A)
W(L) - goal({L_A, L_B})
W(A) - goal({L_A, L_B})
I - goal(L_A)
I - goal(L_B)
I - goal(L_C)
W(L) - goal({L_A, L_B, L_C})
W(A) - goal({L_A, L_B, L_C})
An Theory-based Ontology for CL

CL Scenario

Learning Strategy

Y<=I-goal

I-role

Role Holder

Leaner

You-role

Role Holder

Learner

I-goal (I)

I-goal

CL process

W(A)-goal

Common goal

W(L)-goal

How to interact

Interaction Pattern

Necessary Interaction Activity

Influential I_L event

Complementary Interaction Activity

Influential I_L event

CL Role

Necessary Condition

Knowledge/cognitive state

Desired Condition

Knowledge/cognitive state

How to collaborate

Behavioral Role
### Knowledge Organization: Learning goal

<table>
<thead>
<tr>
<th>I-goal</th>
<th>Definition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acquisition of Content-Specific Knowledge</strong></td>
<td>To add new knowledge concerning the target domain to existing schemata, to understand it, and then to consider relationship among knowledge, and (re) construct knowledge structure.</td>
<td>[2, 3, 4, 6, 15, 16]</td>
</tr>
<tr>
<td>Accretion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restructuring</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Development of Cognitive Skill</strong></td>
<td>To get knowledge concerning cognitive skills such as diagnosing and monitoring, to practice them, and then to refine them.</td>
<td>[16, 18, 23]</td>
</tr>
<tr>
<td>Cognitive stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associative stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomous stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Development of Metacognitive Skill</strong></td>
<td>To get knowledge concerning metacognitive skills for observing self-thinking process, diagnosing it and regulating or controlling of self-activity, to practice them, and then to refine them.</td>
<td>[16, 19, 23]</td>
</tr>
<tr>
<td>Cognitive stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associative stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomous stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Development of Skill for Self-Expression</strong></td>
<td>To get knowledge concerning the skills for externalizing self-thinking process and presenting the learner's self-perspectives, to practice them, and then to refine them.</td>
<td>[3, 21]</td>
</tr>
<tr>
<td>Cognitive stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associative stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomous stage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Knowledge Organization: learning strategy

<table>
<thead>
<tr>
<th>Y&lt;=I-goal</th>
<th>Definition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning by Observation</td>
<td>Learning indirectly by observing other learners' learning processes</td>
<td>[2]</td>
</tr>
<tr>
<td>Learning by Self-Expression</td>
<td>Learning by externalizing self-thinking process, such as self-explanation and presentation.</td>
<td>[5]</td>
</tr>
<tr>
<td>Learning by Teaching</td>
<td>Learning by teaching something he/she already knows to other learners</td>
<td>[5,17]</td>
</tr>
<tr>
<td>Learning by being Taught</td>
<td>Learning directly by being taught by other learners</td>
<td>[17]</td>
</tr>
<tr>
<td>Learning by Apprenticeship</td>
<td>Learning by observing other learners' behavior and then imitating it</td>
<td>[7]</td>
</tr>
<tr>
<td>Learning by Practice</td>
<td>Learning by applying knowledge or skill to a specific problem</td>
<td>[23,24]</td>
</tr>
<tr>
<td>Learning by Diagnosing</td>
<td>Learning by diagnosing other learners' learning or thinking processes</td>
<td>[6,18]</td>
</tr>
<tr>
<td>Learning by Guiding</td>
<td>Learning by demonstrating knowledge or skill to other learners and guiding the learners</td>
<td>[7]</td>
</tr>
<tr>
<td>Learning by Reflection</td>
<td>Learning by rethinking and observing the learner's self-thinking process.</td>
<td>[33,34]</td>
</tr>
<tr>
<td>Learning by Discussion</td>
<td>Learning by discussion with other learners</td>
<td>[10,27,30]</td>
</tr>
</tbody>
</table>
### Formalizing CL

#### Knowledge Organization: Role for learners

<table>
<thead>
<tr>
<th>Role</th>
<th>Condition</th>
<th>Predictable benefit (I-goal)</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentice</td>
<td>• nothing</td>
<td>• Development of cognitive and/or metacognitive skill (cognitive stage &amp; associative stage)</td>
<td>[6]</td>
</tr>
<tr>
<td>Master</td>
<td>• knowing how to use cognitive skill</td>
<td>• Development of cognitive and/or metacognitive skill (autonomous stage)</td>
<td>[6]</td>
</tr>
<tr>
<td>Peripheral participant</td>
<td>• knowing how to use cognitive skill</td>
<td>• Development of cognitive skill (associative stage)</td>
<td>[21]</td>
</tr>
<tr>
<td></td>
<td>• knowing how to use metacognitive skill</td>
<td>• Development of metacognitive skill (associative stage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• not having experience in using the cognitive skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• not having experience in using the metacognitive skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full participant</td>
<td>• having the knowledge</td>
<td>• Acquisition of content specific knowledge (restructuring)</td>
<td>[21, 25, 28]</td>
</tr>
<tr>
<td></td>
<td>• having experience in using the knowledge</td>
<td>• Development of cognitive skill (autonomous stage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• having related knowledge in the domain</td>
<td>• Development of metacognitive skill (autonomous stage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• knowing how to use cognitive skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• having experience in using the cognitive skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• having how to use meta-cognitive skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• having experience in using the metacognitive skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer tutee</td>
<td>• not having the knowledge</td>
<td>• Acquisition of Content Specific Knowledge (accretion)</td>
<td>[7]</td>
</tr>
<tr>
<td>Peer tutor</td>
<td>• having the target knowledge</td>
<td>• Acquisition of Content Specific Knowledge (tuning)</td>
<td>[7]</td>
</tr>
</tbody>
</table>
✓ Group Goals
✓ Learning Strategies
✓ Learning Goals
✓ Roles

Interaction Patterns

Y<=I - goal(L_A<=L_B)

Y<=I - goal(L_B<=L_A)

W(L)-goal({L_A,L_B})

I-goal(L_A)

I-goal(L_B)

I-goal(L_C)

HOW?

Interaction Patterns
**CL Ontology**

- **CL Scenario**
  - **Learning Strategy**
    - **Y<=I-goal**
      - **I-role**
        - **Role Holder**
        - **Leaner**
      - **You-role**
        - **Role Holder**
        - **Learner**
      - **I-goal (I)**
  - **W(A)-goal**
    - **Common goal**
    - **How to interact**
      - **Interaction Pattern**
  - **W(L)-goal**
    - **Necessary Interaction Activity**
      - **Influential I_L event**
    - **Complementary Interaction Activity**
      - **Influential I_L event**

- **CL Role**
  - **Necessary Condition**
    - Knowledge/cognitive state
  - **Desired Condition**
    - Knowledge/cognitive state
  - **How to collaborate**
    - Behavioral Role

- **Influential I_L event**
  - **I event**
    - **Instructional event**
      - **Instructor**
      - **Role Holder**
    - **Instructional action**
      - **Action**
    - **Benefits for the Instructor**
      - **Role Holder**
      - **I-goal**
  - **L event**
    - **Learning event**
      - **Learner**
      - **Role Holder**
    - **Learning action**
      - **Action**
    - **Benefits for the Learner**
      - **I-goal**

- **Behavioral Role**
  - **Object**
  - **Learning object**
  - **Learning action**

- **Action**

- **Benefits**
CL Ontology
CL Ontology: Example
This ontology solves several problems to model and apply pedagogical knowledge

OK. But let’s be realistic …
Almost nobody can understand this ontology
Takeaway Message:

1. Take a **real world problem** that is hard to solve
2. **Organize the knowledge** from different sources
3. Build an **ontology**
4. **Hide the ontology** behind a model that (some) people can understand
5. Apply the model and the ontology to solve the problem
## Learner’s Growth Model

<table>
<thead>
<tr>
<th>I-goal</th>
<th>Graphical Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acquisition of Content-Specific Knowledge</strong></td>
<td></td>
</tr>
<tr>
<td>Nothing</td>
<td></td>
</tr>
<tr>
<td>Accretion</td>
<td></td>
</tr>
<tr>
<td>Tuning</td>
<td></td>
</tr>
<tr>
<td>Restructuring</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Development of Skills</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
</tr>
<tr>
<td>Rough-cognitive</td>
<td></td>
</tr>
<tr>
<td>Explanatory-Cognitive</td>
<td></td>
</tr>
<tr>
<td>Associative</td>
<td></td>
</tr>
<tr>
<td>Autonomous</td>
<td></td>
</tr>
</tbody>
</table>

[Rumelhart D.E. and Norman, D.A., 1978]

[Anderson, J. 1982]
Learner’s Growth Model (LGM)

LGM is a graph that represents all possible transitions in learner’s development.

A learning theory shows some possible transitions in the LGM graph.
Facilitating Visualization with LGM

[Stages of Skill development]
- nothing (0)
- rough cognitive stage (1)
- explanatory cognitive stage (2)
- associative stage (3)
- autonomous stage (4)

[Stages of Knowledge acquisition]
- nothing (0)
- accretion (1)
- tuning (2)
- restructuring (3)

learning by apprenticeship in Cognitive Apprenticeship

learning by guiding in Cognitive Apprenticeship

Learning by Discussion in Legitimate Peripheral Participant (LPP)
[Stages of Skill development]
- nothing (0)
- rough cognitive stage (1)
- explanatory cognitive stage (2)
- associative stage (3)
- autonomous stage (4)

Facilitating Visualization with LGM

Learning by apprenticeship in Cognitive Apprenticeship

Learner plays an **apprentice role** following the learning events
Cognitive Apprenticeship
Learning by Apprenticeship

GMIP: Growth model improved by Interaction Patterns

[Stages of Skill development]
nothing (0)
rough cognitive stage (1)
explanatory cognitive stage (2)
associative stage (3)
autonomous stage (4)

[Stages of Knowledge acquisition]
nothing (0)
tuning (2)
restructuring (3)
accretion (1)

[Interactions]
1. Setting up the learning context
2. Demonstrating how to solve a problem
3. Clarify the problem
4. Monitoring
5. Notifying how the learner is
6. Instigating thinking
7. Requesting problem’s details
8. Showing a solution
9. Affirmative reaction

The dashed ellipses means that the interaction on the top/left must be followed by another interaction bottom/right.
The ellipses means that the interaction on the top/left will be followed by another interaction bottom/right and vice-versa (cycle)
The model offers a solution to create theory-aware tools that help to design CL activities

Takeaway Message:

1. Take a **real world problem** that is hard to solve
2. **Organize the knowledge** from different sources
3. Build an **ontology**
4. **Hide the ontology** behind a model that (some) people can understand
5. **Apply the model and the ontology to solve the problem**
CHOCOLATO: Concrete and Helpful Ontology-aware Collaborative Learning Authoring Tool

Effective Groups

Ontologies

Theories

Group Formation

Learners

Meaningful results

CHOCOLATO

CL Design

Sequence of activities

Interaction Analysis

Why does the learner want to interact with other learners?

What activity does the group want to do?

How does the group change its state?

How does the learner change his/her state?
MARI – Main Adaptive Representation Interface

Search for theories

Initial stage

Final stage

Search Results
MARI – Main Adaptive Representation Interface

- Setting up learning context
- Ontology
- Interaction Pattern
- Development of meta-cognitive skills (Associative stage)
- Development of cognitive skills (rough cognitive stage)
- Master
- Apprentice
- Learning by Apprenticeship
- Learning by Guiding
- Receiving information
- Giving information
CHOCOLATO (CL Design system)

Domain Independent

Interaction Patterns for Learning Theories

Domain Knowledge

Domain dependent Resources

Domain Specific Scenarios

General recommendations

Teacher/Designer

Designer's intention

Instantiation to fit the domain

Application

Domain dependent Scenario

Specific recommendations

Mapping to fit in our Model

Domain specific knowledge and skill
CHOCOLATO: Concrete and Helpful Ontology-aware Collaborative Learning Authoring Tool

Group Formation

Effective Groups

Learners

CHOCOLATO

CL Design

Sequence of activities

Interaction Analysis

Meaningful results

Ontologies

How does the learner change his/her state?

What activity does the group want to do?

How does the group change its state?

Why does the learner want to interact with other learners?
How to group students?

Student 1

Student 2

Student 3
How to group students?

Student 1

Student 2

Student 3
How to group students?

Student 1

Student 2

Student 3
How to group students?

Student 1

Student 2

Student 3
Theory-Driven Group Formation

Identify which theories can help learners to achieve their goals

learning goals

Teacher’s intention

CL scenario

Learning Strategy IT<=LR

Y<=I-goal

Learning Strategy LR<=IT

Y<=I-goal

Can play

Can play

Satisfies

Satisfies

Learner

Behavioral role

participant

G1 ... Gn

L_A

G1 ... Gn

L_B

Teacher’s intention

...
Suggest group formation - MAC110 - Osaka University - Mozilla Firefox

Osaka University
Department of Knowledge Systems

Seiji Ishitani | My course list | My calendar | My User Account | Logout

Course test 1
MAC110 - Seiji Ishitani

Osaka University > MAC110 > Groups > Pedagogical groups > Suggest group formation

Pedagogical groups
Suggest group formation

Select the group goal

Select applicable theories

Anchored Instruction
It supports a scenario where users can play 2 roles: (1) the Anchor holder role, in which the player should behave as a Presenter; (2) the Anchored instructor role, in which the player should behave as an Adviser. The desirable number of users playing the Anchor holder role is X1, and playing the Anchored instructor role is X2.

More about this theory

Topics
Add child | Add brother | Delete

Skills
Add child | Add brother | Delete

Knowledge
Add child | Add brother | Delete

Select the topic, skill/knowledge and students to start the group formation process (only adequate students are shown)

Select an User Role

Select Users

Summary of Student's Profile
Select a student in the left box to obtain more information about it

Manager(s) for MAC110: Seiji Ishitani

Administrator for Osaka University: Seiji Ishitani

Developed by Nofress Laboratory. Using Ontologies and Semantic Web Technologies to Enhance Clariflash

30
Development

- RDF/OWL Parser (ARC2), PHP, Claroline (LMS).
### (a) Created groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Registered</th>
<th>Max.</th>
<th>Edit</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 - Distributed Cognition</td>
<td>6</td>
<td>8</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Group 2 - Peer Tutoring</td>
<td>3</td>
<td>8</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Group 3 - Cognitive Apprenticeship</td>
<td>4</td>
<td>8</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Group 4 - LPP</td>
<td>4</td>
<td>8</td>
<td>✔</td>
<td>✗</td>
</tr>
</tbody>
</table>

### (b) Users’ details

<table>
<thead>
<tr>
<th>Last name</th>
<th>First name</th>
<th>Profile</th>
<th>Role</th>
<th>Group</th>
<th>Group Tutor</th>
<th>Course manager</th>
<th>Edit</th>
<th>Unregister</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Isotani</td>
<td>Manager</td>
<td></td>
<td>Group 2 - Peer Tutoring (35)</td>
<td>Group Tutor</td>
<td></td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>2</td>
<td>Student 1</td>
<td>User</td>
<td>Peer Tutee</td>
<td>Group 1 - Distributed Cognition (34)</td>
<td></td>
<td></td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>3</td>
<td>Student 10</td>
<td>User</td>
<td>Full Participant</td>
<td>Group 1 - Distributed Cognition (34)</td>
<td></td>
<td></td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>4</td>
<td>Student 11</td>
<td>User</td>
<td>Full Participant</td>
<td>Group 1 - Distributed Cognition (34)</td>
<td></td>
<td></td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>5</td>
<td>Student 12</td>
<td>User</td>
<td>Peer Tutor</td>
<td>Group 2 - Peer Tutoring (35)</td>
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<td></td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>6</td>
<td>Student 13</td>
<td>User</td>
<td></td>
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<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>7</td>
<td>Student 14</td>
<td>User</td>
<td>Full Participant</td>
<td>Group 1 - Distributed Cognition (34)</td>
<td></td>
<td></td>
<td>✔</td>
<td>✗</td>
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Does it really work in practice?

CHOCOLATO: Concrete and Helpful Ontology-aware Collaborative Learning Authoring Tool

Group Formation

Effective Groups

Ontologies

Theories

Learners

CL Design

Sequence of activities

Why does the learner want to interact with other learners?

What activity does the group want to do?

How does the group change its state?

CHOCOLATO

Meaningful results

Interaction Analysis
Cluster of utterance-labels

Interaction Patterns

- 1
- 2
- ... 
- 7

Expected interaction

Designing

Designer’s intention

Learning Group

Tagging

protocol

protocol with labels

Abstraction of pattern

- Roles for learners
- Group/individual goals
- Sequence of activities
- Expected interactions
- Expected benefits
- etc...

Designer’s intention

Idealized by Inaba et al. (2002)
In vivo studies

2008

Score in the first test

Average score of all tasks

2009

Score in the first test

Average score of all tasks

2001

Score in the first test

Average score of all tasks

2006

Score in the first test

Average score of all tasks

2007

Score in the first test

Average score of all tasks

1st principal component

2nd principal component
Does it really work in scale?

"EU SOU UM DOS FINALISTAS DOS PRÊMIOS SANTANDER UNIVERSIDADES 2013"

#MUITOFELIZ #MANDEIMUITO #AGORAVAI

Uma das empresas mais inovadoras do setor de educação
ALAGOAS GOVERNO DO ESTADO

MOST INNOVATIVE STARTUP

USP

OLIMPADA INOVAÇÃO

INFO 2014

1º

1º Lugar

1º

AWARDS
Future Directions
Opening educational data ...

http://learnsphere.org/
Understand the role of affective states in group formation (and collaborative learning processes)
Results

Understanding the Importance of Affective States in CSCL

• Studying working in Pairs
• Experiment setup (45 dyads)
  1. Positive-Positive
  2. Negative-Negative
  3. Positive-Negative
• Which one correlates to better students’ performance?
  o Negative-Negative → Better Performance

Results

Understanding the Importance of Affective States in CSCL

• Why students tends to not like to work in groups overtime?

• Experiment setup (118 undergrad students)
  1. Control group
  2. Experimental groups

○ Results: collaboration may improve perceived quality, but students may avoid it because they do not want to lose a sense of personal ownership (feeling of contribution)

Dealing with the *demotivation problem* when using scripted collaboration
Context: Demotivation problem in CSCL Scripts

CSCL Script describes the way students should collaborate to improve their knowledge about a given domain (Kollar et al., 2006; Villasclaras-Fernandez, 2013)

In some circumstances, it may cause demotivation

Negative influence learners’ attitudes + Degrade the groups’ dynamics

Negative learning outcomes
Support group formation in Massive Open Online Courses (MOOCs)

Many thanks
Takeaway Message:

1. Take a **real world problem** that is hard to solve
2. **Organize the knowledge** from different sources
3. Build an **ontology**
4. **Hide the ontology** behind a model that people can understand
5. Apply the model and the ontology to **solve the problem**
Advancements in Intelligent Support for Collaborative Learning
From Well-Thought-Out Group Formation to Effective Peer Interactions

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