Group formation in learning flow activities across virtual and physical spaces

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Abstract. One of the main challenges in Computer-Supported Collaborative Learning is group formation according to different types of polices that depend on the pedagogical method or/and the students' profiles, and the communication of the resulting group formation to the students and the flow engines that orchestrate the collaborative learning processes. This challenge is even more demanding when the learning flows are not only supported by computers but they also integrate activities taking place in physical spaces without the assistance of computing devices. In this extended abstract we propose to combine previous contributions towards the development of an integrated solution for supporting group management across IMS Learning Design compliant virtual learning environments and activities in the physical space, such as the classroom or the playground.

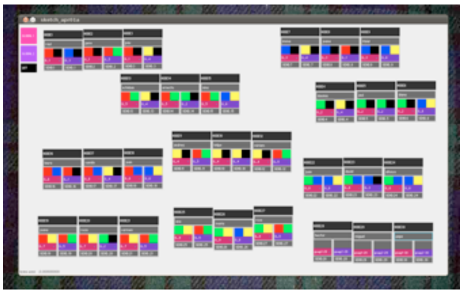
Keywords: Collaborative Learning Flow Patterns, virtual spaces, physical spaces, group formation, physical devices, managing system.

1 AcrossSpaces2011 EC-TEL Workshop extended abstract

Collaborative Learning Flow Patterns (CLFP) formulate best practices in scripted Computer-Supported Collaborative Learning (CSCL). These patterns propose specific structures for learning flows describing sequences of (collaborative) learning activities and grouping aspects that potentially lead to a set of educational benefits. For example, to achieve positive interdependence and individual accountability in an educational context where the task to solve is divisible, the Jigsaw CLFP suggest as an effective learning flow to form groups whose members study individually only a part of the task. Then, the students having worked on the same sub-task form expert groups to collaboratively analyze such sub-task. Finally, the initial groups join, having a member expert in each sub-task, so as to solve a global task that requires of a partial solution associated to every sub-task. Collage is an authoring tool that enables teachers to create their own flows of activities based on CLFPs [1]. As a result of the authoring, Collage generates an IMS Learning Design (IMS LD) computationally represented file. This file can be interpreted by virtual learning environments including a learning flow engine compliant with the IMS LD specification [2]. When accessing the virtual learning environments using a computer students can see which activity is the following one they should complete as part of a longer flow and with whom they should collaboratively work in the activity (i.e. which group they belong to).

Visualizing the group formation in virtual learning environments is still a relevant problem in broadly used learning management systems such as Moodle, whose support for group management and visualization is limited [3]. However, this problem is even more challenging when part of the activities in a learning flow are not supported by computers, but take place in a physical space such as in a traditional classroom without computers [4], in several different physical spaces such as a museum or a campus [5] or in an augmented classroom with interactive furniture [6].

For face-to-face educational situations in learning spaces without computers and when it is not possible to use mobile devices indicating group formation (because of cost reasons, software compatibility, avoidance of attention distraction, children that are not allowed to use mobile phones, etc.), we have proposed a low-cost solution based on the use of wearable personal devices (Fig. 1b) [7]. These devices show color signals by the teacher using a central manager to compose groups (Fig. 1a). Students know to which group they belong to according to the colors visualized in their personal devices so as to join and work face-to-face on a specific activity. See [7] for more details about the devices.



(a)

(b)

Fig. 1. (a) Color signals manager enabling the teacher to configure group formation (b) Personal device indicating group formation with color signals (see [7])

In this document we propose to integrate the color signal manager with virtual learning environments and authoring tools, such as those compliant with IMS LD, so as to enable coordinated flows of activities across virtual and physical spaces. This integration will enable teachers to configure the group formation just once. Then, the students will receive signals in the wearable devices or group formation visualizations in the PCs depending on the space where each activity takes place. For example, a learning flow based on the Jigsaw CLFP can be planned so that it is carried out partially in the classroom and partly at home as follows. The individual and the expert phases, in which students work in subtasks, can take place in the classroom. Expert group formation can be indicated using the personal signal devices. Besides, the final phase of the Jigsaw in which groups formed by students having worked on different subtasks can be done from the distance, at home, using a virtual learning environment that shows to each Jigsaw group the tools (e.g., a wiki and a chat) and resources (e.g., the description of the global task) that they must use to complete the activity. The group formation shown at home will be consistent to what happened in the classroom if the configuration of the groups follows the initial design planned by the teacher and according to any change performed during the actual deployment of the activity in the classroom.

A possible implementation is to extend the InstanceCollage tool [8] with the signal manager and the CLFP-intrinsic constrains manager for group formation [9]. [9] also discusses alternative approaches for group formation technologies that could be considered for being connected to the wearable personal devices. InstanceCollage enables the instantiation of CLFP-based full-fledged designs by assigning the specific persons that will be associated to each group and deploying it in enacting systems, which in this case will be IMS LD players and the personal signal devices. The CLFP-intrinsic constraints manager for group formation allows re-organizing the planned group distribution *on the fly* according to unpredictable circumstances arising from the context (the extrinsic constraints, [10]) without violating the CLFP principles (or intrinsic constraints) that make the design effective (e.g., Jigsaw groups must always be composed of at least one member from every previously joint expert group). This dissociation between extrinsic and intrinsic constraints set the basis for flexibly facing the group management at runtime in a virtual learning environment or during an activity in a physical space using the wearable personal devices (see Fig. 2).

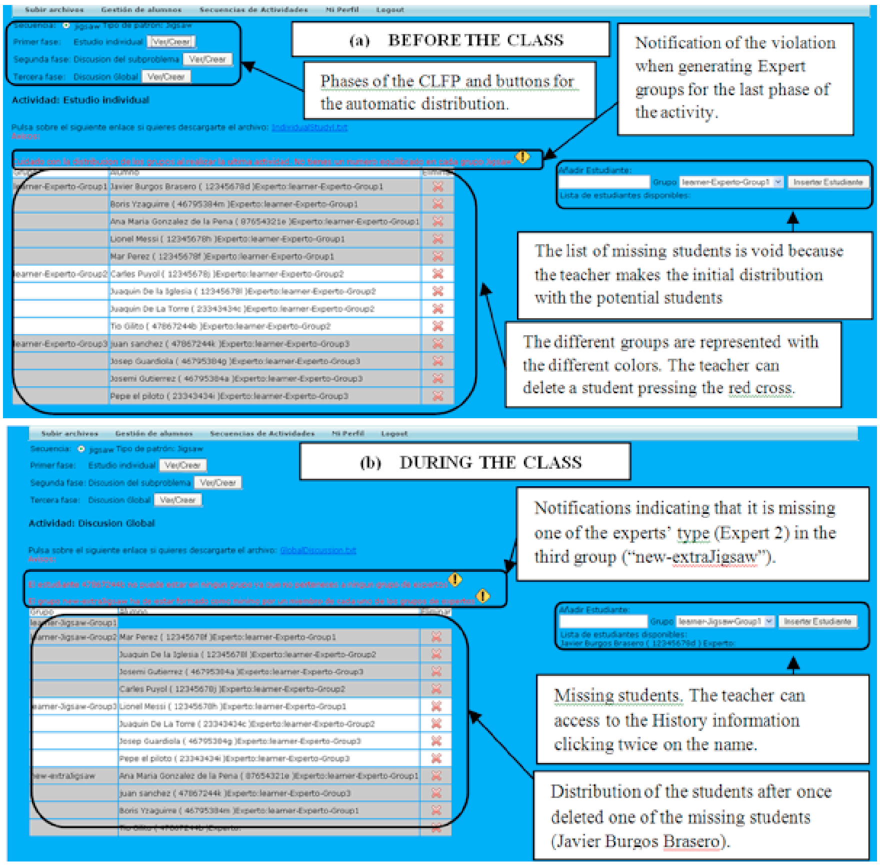


Fig. 2. CLFP intrinsic constraints group formation manager (see [9])

This extended abstract proposes a solution towards the orchestration of collaborative learning flow activities that occur in different virtual and physical spaces. Its contribution is focused on proposing an integrated solution that facilitates a coherent group formation, management and visualization along spaces. In the workshop, a scenario showing how the operational system could be used for a concrete learning activity will be presented. Other related aspects for discussion are how the characteristics of the multiple spaces may influence the design of learning flows, the design of the wearable devices, if the proposed solution solve different flexibility issues that may appear in educational scenarios, and how the task descriptions, the distribution of resources and the flow of information between activities can be also easily orchestrated in physical spaces (the classroom and beyond) and across physical and virtual spaces.

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