
Exploiting awareness to facilitate the orchestration of collaborative activities in physical spaces

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Abstract. Complex group dynamics in physical educational spaces, such as the classroom, can lead to significant learning benefits. Outstanding teachers apply these dynamics, but their adoption is not extensive. One of the reasons behind the lack of broad adoption refers to their implementation inconveniences, including the time and attention that teachers and students need to dedicate to the orchestration of the dynamic. This workshop paper discusses a technology, the Signal Orchestration System (SOS), which facilitates the organization of group activities in physical spaces by exploiting awareness indications. Using the SOS, students wear a device that renders signals denoting orchestration aspects (e.g., color signals indicating group formation) in a way that the signals are collectively perceived. The paper states the problem and presents the proposed solution discussing different designs for the wearable devices.

Keywords: group awareness, physical learning spaces, CSCL, orchestration

1 Problem statement and discussion of the proposed solution

Teachers plan and orchestrate activities in physical spaces, such as the classroom, at different social levels (individual, small groups, class) with the aim of achieving a set of desired learning outcomes [1]. Dynamic sequences of multiple group activities facilitate effective learning situations driven by knowledge-intensive social interactions (e.g., mutual explanation and regulation) [2]. However, the application of complex collaborative dynamics is not extensive. One of the factors that hinder its adoption refers to the implementation inconveniences derived from the orchestration of the dynamics. Teachers have to indicate group formation and role assignment for every activity, considering the use of multiple resources/tools and the evolution of the learning situation. This orchestration task is especially demanding when the number of students involved is high. Both teachers and students need to devote part of their attention to orchestration aspects. Orchestrating collaboration is time-consuming and typically generates a noise / mess effect that can lead to distraction and disorganization. We state that augmenting physical educational spaces with awareness visualization mechanisms can facilitate the orchestration of collaborative dynamics, ultimately promoting their adoption. Related ideas have been proposed to support classroom activity supervision using interactive lamps [3].

The Signal Orchestration System (SOS) enables teachers to distribute signals denoting orchestration aspects [4]. These signals are rendered in physical devices that students can easily wear in a way that the signals can be collectively perceived. This facilitates awareness of the social dynamic and the activity flow. For instance, to

indicate group formation, students' devices show color signals. The students with the same color form a group. Blinking lights can indicate role or resource distribution, sound signals change of activity, etc. However, the actual meaning of each signal depends on the needs and creativity of the teacher who design the collaborative dynamic and its orchestration.

The wearable devices achieve an ambient awareness effect that cannot be easily achieved with mobile devices. Three different low-cost designs have been implemented and used in several Jigsaw collaborative learning dynamics (Fig. 1). The use of the first two designs (a, b) was evaluated in two experiments framed in real scenarios [4]. The necklace was more visible, but its size and weight made it more uncomfortable. The fabric belt was lighter, thinner and aesthetically nicer, but it was less visible (too comfortable and similar to their clothes).

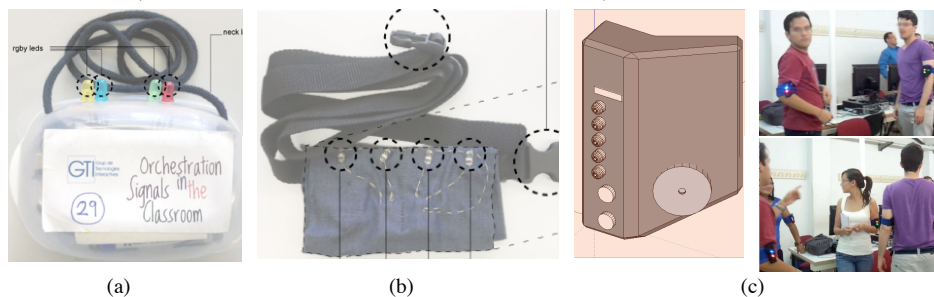


Fig. 1. Wearable signaling devices (a) necklace (b) fabric belt (c) arm bracelet

Considering these observations, we propose an arm bracelet as an intermediate approach (Fig. 1, c). It has been designed so that it is more compact (adapted to the size of its hardware components) and can be fixed to a bracelet worn in the arm. Its position in the arm facilitates the visibility of the signals even when the participants are sitting down at their desks. Fig. 1 (c) shows how students wearing the bracelets look for other students with the same color signals to form a group. We are currently analyzing the data collected in an experiment that compares the use of the SOS arm bracelets with a controlled group using a traditional approach based on paper cards. Preliminary results indicate that the awareness facilitated by the SOS leads to a more agile classroom orchestration promoting a more satisfactory learning experience.

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References

1. Dillenbourg, P., Jermann, P.: Technology for classroom orchestration. Technology for classroom orchestration. In Khine, M.S., Saleh, I. (Eds.), *New Science of Learning* (pp. 525-552). New York: Springer Science+Business Media (2010)
2. Roschelle, J., Teasley, S.: The construction of shared knowledge in collaborative problem solving. In C. O'Malley (Ed.), *Computer-supported collaborative learning* (pp. 69-197). Berlin, Germany: Springer Verlag (1995)
3. Alavi, H., Dillenbourg, P.: An ambient awareness tool for supporting supervised collaborative problem solving. *IEEE Transactions on Learning Technologies* (in press)
4. Hernández-Leo, D., Nieves, R., Arroyo, E., Rosales, A., Melero, J., Blat, J.: SOS: Orchestrating collaborative activities across digital and physical spaces using wearable signaling devices, *Journal of Universal Computer Science* (accepted)