A GEOPOSITIONING VIEW OF TEACHERS' ORCHESTRATION IN ACTIVE LEARNING CLASSROOMS

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INTRODUCTION

In this study we report on a method to answer a simple yet fundamental question: How do teachers navigate their space resources in active learning classrooms? Specifically, we document how a software, designed for physics education, might provide an alternative to documenting the physical position of the teacher as a function of time. This approach shows clear patterns can be produced, thereby revealing one dimension of the larger question of teacher orchestration.

ORCHESRATION IN ACTIVE LEARNING CLASSROOMS (ALCs)

A logical extension of active learning pedagogies (e.g., Chickering & Gamson, 1987) are ALCs (e.g., the SCALE-UP & TEAL models), technology-rich collaborative learning environments that support students' learning experiences. In these student-centered environments learning becomes distributed across the physical space because there is no definite "front" to the classroom. Managing feedback from multiple streams (visual, aural, analog, digital) and reacting adaptively becomes the challenge – referred to as *orchestration*, the real-time management of activity, along with the management of classroom resources (e.g., Dillenbourg & Jermann, 2010). Where the teacher is located, what the teacher can access does make a difference to the possible interactions and feedback to learners Dillenbourg & Jermann, 2010). To date, eye trackers have provided a method to examine teacher orchestration (Prieto, Sharma & Dillenbourg, 2015). This poster reports on an alternative: a post-hoc software, which also allows for the examination of one part of the orchestration puzzle: how the teacher moves in the learning space, as a function of time.

VIDEO METHODOLOGY

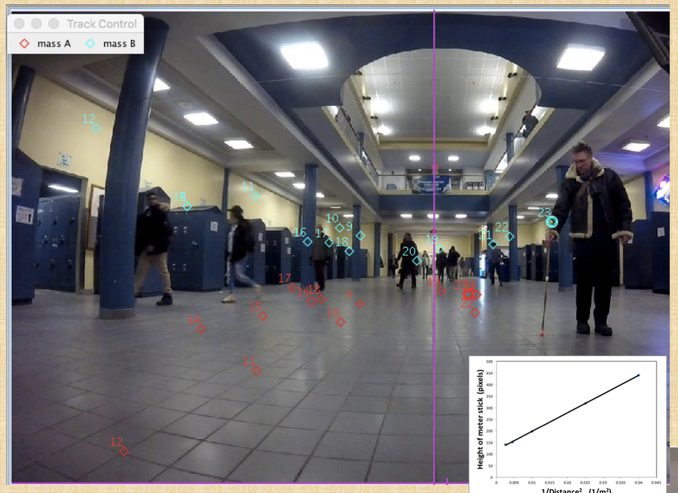

Figure 1: The calibration of the GoPro cameras. The camera images were calibrated by measuring the image of the meter stick as a function of position (using the square tiles on the floor). The inset shows the image height has an inverse square dependence on object distance.

Protocol for collection of the video data: two micro cameras (GO-PROs) mounted on the front and back walls of the classroom. *Tracker* software (Brown & Cox, 2009) used to determine the physical position of the teachers in the classrooms as a function of time. Tracker is an open source video analysis and modeling tool. It was designed to be used in physics education, but is repurposed here to track the teacher every 5 seconds.

Procedure: To determine a position vector relative to the camera: calculate the angle and the distance from the camera. Perspective dictates that the further from the camera, the smaller the image on the camera sensor as shown in Figure 2 with a meter stick.

To determine the relative size of the teacher's image: track two vertical points on the teacher in each frame (Figure 2). This, together with the angle on the video relative to the camera, gives a good indication of where the teacher is located in the room to within approximately 1m.

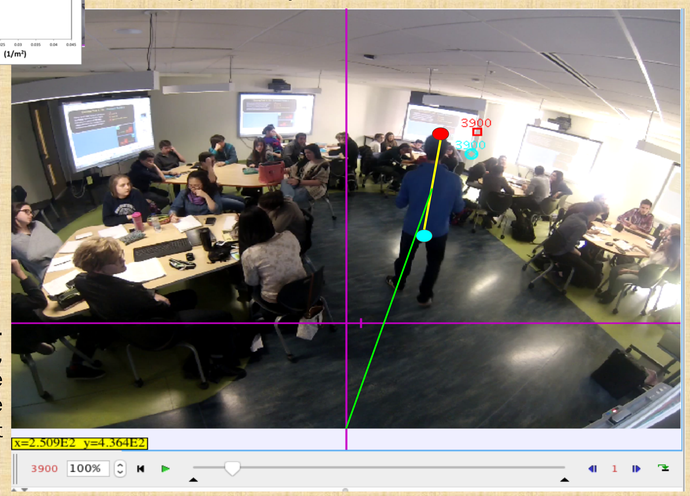

Figure 2: Implementation in the classroom. Using the calibration of distance and angle, the position of the teacher relative to the camera can be calculated, using the image height of a standard object [the head to waist length on the teacher].

CLASSROOM OBSERVATIONS

The research settings consisted of three AL classrooms (A,B,C), each with different layouts and technologies (see Figure 3). Data include classroom observations (fields-notes, video recordings, and teacher interviews) for three instructors teaching in different classrooms, from three post-secondary institutions, located in Montreal. The classrooms had different mixes of student tables, teacher podia, and a central area, largely used by the teacher.

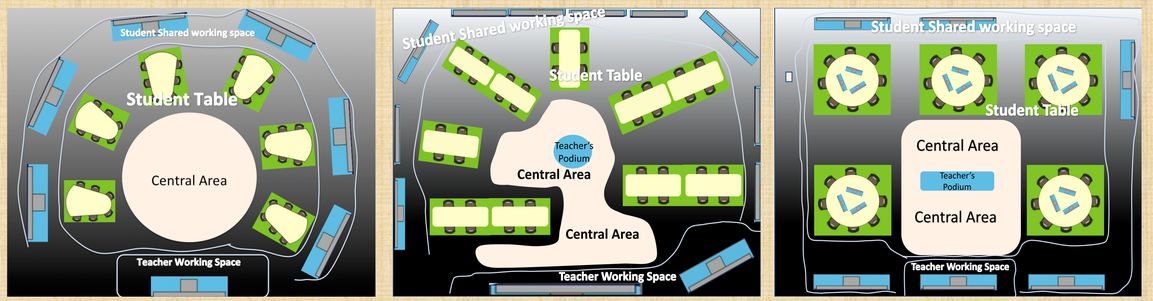

Figure 3: Layouts of the 3 ALCs – Classroom A-T1 (left), Classroom B-T2 (middle), Classroom C-T3

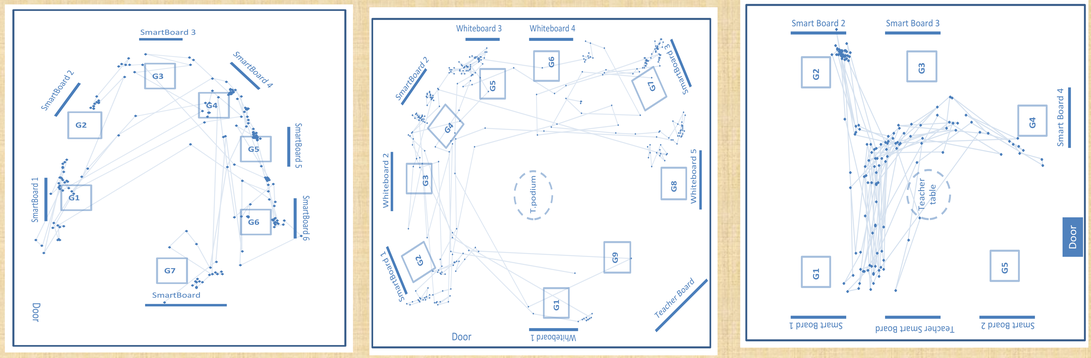

Figure 4: Tracker analysis of the physical location of the teacher during group work, taken from the perspective of three teachers in three ALCs. A, B and C correspond to the respective classrooms in Figure 3. Student groups are labelled consecutively G1, 2, etc.

Figure 4 show the results of the Tracker analysis (on 15 minute data segments) with the dot representing the physical position of the teacher every 5 seconds (connecting lines show the path), for the three classrooms. Interestingly, this visual representation allows us see differences between the teacher's patterns of accessing the student groups - one aspect of orchestration. Figure 4A, shows the teacher is with each group, in a somewhat even distribution (density of dots); and, the path is varied but more often sticks to the perimeter, occasionally stopping between tables (see G4-G5 and G5-G6). By contrast, Figure 4B shows the teacher moves back and forth close to the central podium with one main move to G2 (based on the density of dots), compared to the other tables.

CONCLUSIONS

Our aim was to explore the use of the Tracker software to help examine the movement of teachers within ALCs, as part of the larger question about classroom orchestration. The results suggest that the visualization produced by the software can show differences between teacher movement, which can be further analyzed and interpreted. This method holds potential for those doing this type of research into classroom orchestration.

REFERENCES

Brown, D. & Cox, A. (2009) Innovative Uses of Video Analysis *The Physics Teacher* 47(3), 145-150
Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE bulletin*, *3*, 7.
Dillenbourg, P. (2013). Design for classroom orchestration. *Computers & Education*, 69, 485-492.
Dillenbourg, P., & Jermann, P. (2010). Technology for classroom orchestration. In *New science of learning* (pp. 525-552). Springer New York.
King, A. (1993). From sage on the stage to guide on the side. *College teaching*, *41*(1), 30-35.
Prieto, L. P., Sharma, K., & Dillenbourg, P. (2015). Studying teacher orchestration load in technology-enhanced classrooms. In *Design for Teaching and Learning in a Networked World* (pp. 268-281). Springer

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