A Part Practical and Part Conceptual Response to Orchestration

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Abstract

This response details how the notion of orchestration aligns with the perspective of user-centred design. It emphasises the importance of understanding and designing for the classroom, as well as involving key stakeholders, such as teachers and students in the design process. A focus is placed on the orchestration feature of visibility and a short case study is presented which describes and reflects on a technology, the Subtle Stone, which aimed to make emotion more visible in the classroom.

1. Introduction

As I read through Dillenbourg’s position paper on orchestration I hear a call to arms. A shout to the TEL community to start from a consideration of what the classroom is, and what it is to be a teacher or a learner in the classroom when designing educational technologies.

2. Orchestration as a design concept

For me it is interesting that Dillenbourg refers to orchestration as a “technical concept”. I would add to this that orchestration is also a design orientation and specifically I would argue that key to orchestration is user-centred design. Orchestration is about understanding what happens in the classroom and why and then attending to this in the design process so that research technologies can make the transition to being bog-standard tools that support learning in the classroom. I would also argue that Dillenbourg’s design principles are findings from a longitudinal user-centred design process where Dillenbourg and his team have engaged with teachers both in the design of educational activities with newly developed technologies and in studying the impact of these technologies in the classroom. It is through working with teachers over an extended period that Dillenbourg has been able to identify the elements of designs that make them useful and usable in the classroom, as well as what doesn’t work and why. It is worth making clear at this point that user-centred design does not mean only building the technologies that teachers or students want or ask for. It also does not mean that designers no longer have the ability to innovate. It certainly doesn’t mean that designers outsource the activity of design to the teacher or to the student. Instead, user-centred design is about utilising specific design practices to sensitise oneself to the classroom as a context for design. There are many appropriate user-centred methods to choose, from wizard-of-oz and paper prototyping through to technology probes and experience prototyping. Each of these methods, and many more, can be used to scaffold teachers and learners creativity and communication such that the designer can come to understand the problems, constraints and opportunities for carefully designed technologies for the classroom.

Dillenbourg’s aesthetic of ‘modest computing’ it seems to me, is intrinsically bound up with a user-centred understanding of the classroom. The idea that the classroom needs simple, modest technologies that allow people to do smart things seems to result from many experiences of learning, teaching and researching in real, authentic learning environments. As Dillenbourg states less is more. Certainly from my experiences of designing for and researching in the classroom, I can do no more than wholeheartedly agree with this design aesthetic. Neither teachers nor students want to be told what to do by a technology, they do however want help making sense of what happens in the classroom in order to at times improve the kinds of teaching and learning interactions that are possible.

3. Making the invisible visible

One of the prime ways that technology can help learners and teachers make sense of what happens in the classroom and how it impacts on teaching and learning interactions is related to visibility. This is a reoccurring theme in Dillenbourg’s position paper and in several of the...
responses to this paper I find a number of different technologies that are concerned with making the invisible visible, or that explicitly seek to maintain visibility in the classroom. This seems to me to be a simple, yet radical premise for the design of educational technologies. One of the common implications of technology is the invisibility that it so often engenders as to the state or activity being completed with and through it. Mobile phones, mp3 players, tablet computers, eReaders, laptops and PCs are more often than not designed for one user. These types of technologies enable the user to enter into their own personal world of learning, communicating, listening, reading, with little consideration of how those physically present around the user might elegantly enter into, or share this digital world. These kinds of personal technologies seem not to work well within the classroom exactly because they make it difficult for a teacher to oversee, manage and adapt their practices to the progress of students using these devices. Some interesting design decisions have been described in this issue which have sought to make learning conducted through digital technologies more shareable and glanceable. Whether this is, students getting up and moving around the classroom to share data via infrared rather than over a wireless network, enabling the teacher to see at a glance the dataflow around the classroom, or Lantern, which makes explicit to the teacher, what task a team of students are working on, which teams have questions and how long they have been waiting for help. In this sense, Lantern starts to make something that would ordinarily be invisible to the teacher, or at least difficult to track (roughly how long a group of students have been waiting for help) more visible through the use of a table-based ambient display.

Collecting data and making data regarding the dynamics of the classroom visible is something that well designed technology can do very well, and something that has great potential to support the teacher in their orchestration of the classroom. Emotion is one factor central to the effectiveness of teaching and learning interactions that can often be invisible within the classroom. Looking around a classroom you might sometimes, fleetingly see a student’s emotional experience dance across the features of their face, or perhaps something about the way the student is sitting, or moving around the classroom will suggest something about a students’ emotional experience. But more often than not the teacher is left to guess at what a student might be feeling in response to their teaching and learning. And, research is beginning to suggest that often these guesses are inaccurate. This is not because teachers are somehow not good at their jobs, but because it is actually very difficult to infer how someone is feeling solely based on observing their behaviour and this is hindered further by the social context of the classroom where students can and do mask their emotional expressions. Yet, if emotion has an impact on what a student goes on to know, learn and understand then it is of course imperative that a teacher to some extent takes their students’ emotions into account in their orchestration of the classroom. In response to these ideas I designed and deployed a tangible technology (the Subtle Stone) that gives students a private communication channel through which to express their emotional experiences to their teacher throughout a lesson. Whilst, the Subtle Stone aids students in reflecting on their emotional experiences and gives students a voice within the classroom, there remains the open question as to the extent to which the technology can help the teacher orchestrate students’ emotional experiences in the classroom (Fig. 1).

In the deployment of the Subtle Stone I found that the teacher used the data from the students’ Subtle Stone use in two ways. The teacher used the Subtle Stone data during his teaching activity to identify and respond to the students who were in real trouble in the classroom, whilst out of the classroom the teacher used the Subtle Stone data to reflect on the effectiveness of particular pedagogical strategies, their impact on students’ emotional experiences and develop new ways of teaching particular skills in response. This two-pronged approach may well indicate that technologies that support a teacher’s orchestration of the classroom have a role to play both at the lesson planning stage and at the stage of real time classroom management. In addition, it illustrates the type of reactive/adaptive activity that teachers are able to do whilst engaged in the prime activity of teaching (i.e. progressing through a curriculum, ensuring students understand what they should be doing, managing behaviour, etc.) versus the more reflective, higher-level activity which teachers are capable of doing outside the classroom. Technologies that support teachers in orchestrating their classroom in real time should be designed in accordance with the amount of attention and resource that teachers are able to expend on such tasks while working at the coalface. This design need is reflected strongly in Dillenbourg’s design principle of minimalism and in my reading is an area clearly where user-centred design work becomes helpful. It is through engaging with teachers that designers can gain an understanding of what kinds of data are helpful in supporting a teacher orchestrating their class, the level of data a teacher can interpret during teaching activities and the kinds of decisions that a teacher might make based on this data. Such knowledge can help drive the way in which data is represented to a teacher as well as what kinds of data a teacher might find useful to see during their teaching activities, and what might be useful to see during a lesson planning phase.

And, similarly to Sharple’s response earlier in this issue, my work exploring the role of emotion technologies in the classroom has led me to believe it should not be solely the teachers’ job to orchestrate students’ emotional experiences during their learning interactions. In some sense, the Subtle Stone begins to offer students a route through which they can begin to contribute to the orchestration of their learning, since it allows the students to feed back to the teacher the emotional impact of particular teaching strategies. But, the onus stills sits with the teacher to respond appropriately to these emotional reports. It would be more practical and empowering if such technologies also facilitated students in involving themselves in actively managing their emotional experiences, for example sharing productive strategies for dealing with frustration, anxiety, boredom, and excitement. Such meta-affective awareness has the potential to create learners who know what it feels like learn as well as how to persist at tasks when they are challenging.

Fig. 1. (left) A Subtle Stone (right) The teacher’s interface which displayed the data captured through the students’ use of the Subtle Stone to the teacher throughout the lesson.

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To wrap up, I find the core ideas behind orchestration useful in laying out a set of concerns that should lie at the heart of any future TEL research agenda. Clearly, educational technologies need to respond to a holistic understanding of the classroom and the work of the teacher if they are ever going to become tools that are actively adopted by teachers and schools. As a community, concerted effort needs to be expended on understanding and defining for others what the classroom is as a context for design as well as what technologies work in the classroom and why. With a lot of hard work, innovation, creative design and by keeping the reality of the classroom at the heart of our research agenda I hope to be able to look back in forty years time and find that TEL research has finally started delivering on its promise.