ORCHESTRATION OF SOCIAL MODES IN E-LEARNING

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ABSTRACT

The concept of orchestration has recently emerged as a useful metaphor in technology-enhanced learning research communities, because of its explanatory power and appeal in describing how different learning activities, tools, and arrangements could be combined to promote learning. More than a buffet of tools offering possibilities to the teachers, orchestration refers to the purposeful mixture of different aspects of the learning experience, serving a particular set of learning goals. In this paper, we present the current dialogue on e-learning orchestration, identifying the questions and open issues in orchestrating different social modes and learning arrangements.

KEYWORDS

Orchestration, social modes, e-learning, learning arrangements

1. ORCHESTRATION IS MORE THAN A BUFFET OF TOOLS

Typically, e-learning arrangements and technologies either serve only one isolated purpose or juxtapose a large number of tools to interact with. There are equivalents of egg boilers in educational technology that are designed to foster understanding of one particular knowledge sub-component, e.g., an iPad app fostering proportional reasoning (Weinberger & Schmitt, 2016), as well as multi-purpose kitchen appliances that claim to support different social modes of learning with interchangeable content following any instructional approach, e.g., mash-ups of learning management systems, e-books, and social networking sites (Hori, Ono, Kobayashi, Yamaji, Kita, & Yamada, 2016). Regardless of how specific or generic an e-learning technology may be, however, there is a notion that it is not only which and how many arrangements and tools are being applied, but also how these different learning opportunities are being orchestrated. How is a specific educational technology being introduced and referred back to in an existing educational context? How are the different possibilities of a generic tool exploited and how are they interlinked? How both, egg boilers and multi-purpose kitchen appliances result in fine dining strongly depends on how these tools are part of a larger set of cooking activities, skills of the cook, and quality of the food.

1.1 Questions of Orchestration

The concept of orchestration acknowledges that learning encompasses multiple activities distributed among learners and teachers in different learning arrangements (Dillenbourg, 2013; Kollar & Fischer, 2013; Roschelle, Dimitriadis, & Hoppe, 2013). Orchestration emphasizes whether and how learning activities and arrangements are being linked. Technological tools typically serve orchestration by providing and linking different learning arrangements. Recent approaches, like the flipped classroom, are examples of orchestration that beg the question how and why re-arranging phases of presenting and practicing with the help of technology may influence learning (Prunuske, Batzli, Howell, & Miller, 2012). Moreover, orchestration also addresses the question how different devices can be used together to build a coherent learning experience, e.g., connecting learners' smartphones to smart classroom displays and interfaces (e.g., Gehlen-Baum, Weinberger, Pohl, & Bry, 2012).

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1.2 Orchestration: More Than a Metaphor?

Orchestration may be a particularly useful new concept in e-learning, because of its explanatory power and appeal for the under-investigated, but crucial, aspect of combining different learning activities, tools, and arrangements. Rather than "cooking", orchestration clearly alludes to the metaphor of making music with a set of tools and people with different roles and tasks. Orchestration takes place at both design- and run-time (Kollar & Fischer, 2013). This includes setting up a technology-enhanced learning environment foreseeing different learning activities. But in actual learning situations, plans are to be commanded by learners and not the learners be commanded by the plans. Teachers and learners often adapt the plans to momentary needs. While evidence-based instructional designs can guide learners to engage in effective activities, circumstances require adaptation of original designs to realize its underlying principles – for instance, one learner may have gotten sick and groups need to be re-designed (Dillenbourg, 2015).

2. ORCHESTRATION OF DIFFERENT SOCIAL MODES OF LEARNING

Social modes of learning refer to the ways students are learning individually or in small groups or larger communities. Orchestration of social modes of learning pertains to both, structuring learning within one social mode, as well as combining different social modes in a larger learning landscape.

2.1 Orchestrating Groups of Learners

Learning together raises the questions on how the student cohort is grouped, the size of the group, the mode of peer interaction, the goal of group work, and distribution of roles and specific group tasks and sub-tasks. Each characteristic can alter the learning experience for the student and serve a different purpose. There are strong indications that defining, sequencing, and distributing learning activities with collaboration scripts substantially enhances collaborative learning (Weinberger, Stegmann, & Fischer, 2010). For example, in the case of ArguGraph (Jermann & Dillenbourg, 2002; Puhl, Tsovaltzi, & Weinberger, 2015), pairing together students that express diverging opinions on a topic could be an appropriate strategy to engage them into a meaningful dialogue and allow them to develop their argumentation skills. Larger group settings could accommodate additional roles and more complex scenarios for the students. A typical example is the jigsaw collaboration script (Aronson, Blaney, Stephan, Silkes, & Snapp, 1978) in which students are, first, organized into expert groups, each of which is focused on a different aspect of the learning activity, and next, they form mixed groups that have members from the previous expert groups. The jigsaw collaboration script is an application of the SWISH (split-when-interaction-should-happen) model (Dillenbourg & Jermann, 2010) that prescribes the intentional distribution of roles/resources amongst the group members, in order to make peer interaction a necessity for successfully completing the learning activity.

The mode of peer interaction could be face-to-face or online, written or oral, and open or blind. F2F interactions could be engaging, but also intimidating for shy or introvert students, while online communication allows for private space, but raises the risk of disengagement – particularly in MOOCs (de Barba, Kennedy, & Ainley, 2016). Oral discourse may require less effort from the students, while written interaction forces them to make their position explicit and clear (Papadopoulos, Demetriadis, & Weinberger, 2013). Finally, open interaction could provide a better context for peer interaction, while blinded-interaction could reduce biases and turn focus on what is being discussed.

The goal of groupwork could be acquisition of domain knowledge or the development of transversal skills and competences. In addition, a distinction could be made in situations where collaboration suggest transactivity (Noroozi, Teasley, Biemans, Weinberger, & Mulder, 2012) and situations where cooperation is acceptable. Collaborative learning is strongly based on the notion that students work and learn *together*, while cooperation demotes peer interaction into parallel individual processes (Weinberger, 2011). Nevertheless, both settings could appear as groupwork in a classroom setting.

2.2 Orchestrating Individual and Social Learning Arrangements

Beyond orchestration of learning within one particular social mode of learning, the second and somewhat under-investigated question is how to orchestrate different social modes. One could argue that individual learning should precede collaborative learning, so that students would acquire domain knowledge, develop their own understandings, and be able to present arguments later on. There is strong evidence that individual-collaborative orchestration can reap both, motivational and cognitive benefits. Expectancy of having to teach peers motivates individual learning and individually prepared learners can be expected to discuss learning material on higher levels (Benware & Deci, 1984). There is counter-evidence, however (Tsovaltzi, Judele, Puhl, & Weinberger, 2015), showing that in collaborative scenarios, building on argumentation of different, equally valid perspectives, individual preparation can lead to premature knowledge solidification and unwillingness to modify once taken positions. Students do not abandon their initial position easily (which they have developed while they were individually forming first arguments) and adopt a new position presented to them by a peer. In a similar vein, flipped classrooms can both fail or succeed depending on how learners expect testing of knowledge that they need to receive from individual "at-home" viewing of video explanations and how social in-classroom activities actually complement and build on the video knowledge representations (Prunuske et al., 2012).

There is not a simple answer to the orchestration question, especially not without analyzing further what goals each social mode of learning offers in a particular context. For example, if the purpose of an individual learning task is to help students get informed and get an opinion, then producing an artefact should not be encouraged, because this would solidify, in a sense, the individual understanding and make students more resilient in adopting other perspectives. And of course, in scripted collaboration, the teacher has also to take into account the expected distance between the external, i.e., collaboration guidelines, as presented to the students, and the actual script, i.e., the actual interactions that take place amongst the students (Tchounikine, 2011). The teacher needs to plan and organize the transition from one social mode of learning to the next, taking into account how each learning task will feed the next and get students closer to the overall learning goals of the course.

3. CONCLUSIONS ON ORCHESTRATION AND E-LEARNING

Technology has been a powerful agent in instructional design, necessitating and facilitating orchestration. The teacher is in the middle of a complex and elaborate technological ecosystem. Today's classroom contains a range of tools and services for teaching, assessment, management, and administration, while an additional level of complexity is added by the technology students bring into the classroom, as the bring-your-own-device model tends to be the norm. Dillenbourg (2013) underlines the need to design technology *for* orchestration, while Sharples (2013) argues that orchestration as a learning design paradigm will fail if it requires yet another level of complexity for the researchers and the teacher.

In an educational context, a technology can be deemed appropriate only according to how teachers and students perceive its e-learning affordances. Of course, not all tools offer the same. For example, there are several tools for sharing documents, while simultaneous co-authoring is offered by only a smaller set. If analysis of individual contributions to the co-produced text is desirable, then a teacher should opt for a technology that records the revision history, marking contributions made by each participant. An additional criterion or selecting a technology is whether it affords transition from one arrangement to another. In other words, how easy it is to move from an individual setting to a collaborative one and from consuming material to practice. Adaptivity and adaptability could be essential to bind seamlessly the different steps in a learning activity. Once again, literature could be the reference point for the teacher on effective/efficient uses of different technologies.

In this contribution, we summarize some exemplary empirical results of orchestration in e-learning environments and outline basic educational and technological dimensions of orchestration in e-learning environments. We are interested in exploring orchestration in an "ecology of different technologies" and we are interested in exploring how technology necessitates and facilitates orchestration. We claim that it is insufficient to look at isolated functions of learning and instruction, but that we need to comprehend learning in a concert of learning arrangements, tools, and activities.

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