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Streamlined orchestration: An orchestration workbench framework for effective teaching

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ABSTRACT

Effective classroom management is considered a key criterion to making classrooms effective learning environments. Supporting classroom orchestration—the teacher-centric real-time management of classroom activities—is central to achieving effective classroom management. However, the multi-faceted nature of classroom orchestration, its complexity, and general classroom constraints such as time, present challenges for the effective management of the modern-day classroom environment. Though effective, most existing approaches for overcoming orchestration challenges, such as Google Classroom, are arguably ad hoc. We argue that streamlined technology-driven orchestration can be attained through the use of an orchestration workbench, potentially making educators more effective within formal learning environments. Early supporting evidence, from a study involving the use of a prototype orchestration tool, demonstrates the feasibility of organised orchestration and its potential to improve students' learning experience.

1. Introduction

Learning scenarios that occur in formal learning environments, such as classroom settings, encompass a wide range of activities and processes that require effective management. The management of these activities and processes, generally driven by the educator, is referred to as orchestration. Though the core focus of orchestration is on pedagogical activities, extrinsic activities and constraints (Dillenbourg, 2013) additionally need consideration.

Supporting educators in such complex and challenging environments could be achieved by simplifying classroom orchestration. However, the multi-faceted nature of classroom orchestration is a daunting process. Not only do teachers need to manage the various in-classroom activities, but also the other most important actor within the classroom—the student. Additionally, the orchestration needs to be conducted in such a manner that critical constraints like time (Dillenbourg, 2013) are taken into account.

Contemporary orchestration is not only challenging, but also ad hoc, resulting in the use of a variety of tools and services. In order to achieve our broader goal of turning the classroom into a more effective learning environment, we propose the explicit streamlining and organisation of orchestration. We premise that streamlined technology-driven classroom orchestration can be attained through the use of an orchestration workbench. The orchestration workbench will provide a

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centralised way of accessing an assortment of integrated tools and services required to perform typical orchestration activities, potentially making educators more effective.

This paper details a proposed approach at appropriately organising classroom orchestration and, additionally, presents experimental results from an early-stage study. The remainder of the paper is organised as follows: Section 2 highlights literature closely related to this work; in Section 3, we outline our claim, and propose an approach to achieve more streamlined and organised techniques for effective classroom orchestration; Section 4 details early evidence obtained during the use of a prototype orchestration tool; and, finally, Section 5 provides concluding remarks and potential future implications of this work.

2. Related work

2.1. Orchestration

The orchestration term is used within the Technology Enhanced Learning (TEL) field to describe technology-oriented techniques for teaching and learning that place significant emphasis on supporting teachers within the classroom.

Roschelle et al. note that the support is generally focused on challenges associated with technology use within the classroom (Roschelle, Dimitriadis, & Hoppe, 2013). Dillenbourg contends that orchestration has more to do with how teachers manage the complexities of the multi-layered activities conducted in learning space, and notes that multiple constraints existing within the classroom are a major obstacle in effectively managing classrooms (Dillenbourg, 2013).

Furthermore, Dillenbourg, comprehensively classifies activities and constraints in order to highlight fundamental differences between orchestration and instructional design, with the latter being more concerned with intrinsic activities (Dillenbourg, 2013). Tchounikine pointed out that orchestration is real-time while instructional design is a pre-session activity (Tchounikine, 2013). Perotta and Evans, however, provide an argument for why an emphasis on instructional design is insufficient. The central theme to their argument is that more emphasis ought to be placed on more human elements in order to better understand the broader challenges faced during orchestration (Perrotta & Evans, 2013).

Orchestration has been applied in a wide variety of TEL fields, most notable Computer-Support Collaborative Learning (CSCL) (Koschmann, 1996; Dillenbourg, Järvelä, & Fischer, 2009).

Our work is strongly rooted in Dillenbourg's view of orchestration, and also resonates with his notion of using technology to make formal learning spaces effective learning environments.

2.2. Technology for orchestration

Integrating technology within the classroom is considered a vital strategy for 21st century classrooms (Saxena, 2013). However, with the exception of mainstream technologies such as interactive whiteboards, LCD projectors and mobile devices such as laptops and tablets, several of these proposed classroom technologies are hardware-based, and generally targeted for learners.

Although GLUEPS-AR (Muñoz-Cristóbal, Prieto, Asensio-Pérez, Jorrín-Abellán, Martínez-Monés, & Dimitriadis, 2013) was designed to provide a potential solution to the orchestration burden, it is specifically aimed at orchestration of across-spaces learning situations. Similarly, GLUE!-PS (Prieto, Asensio-Pérez, Cristóbal, Jorrín-Abellán, Dimitriadis, & Gómez-Sánchez, 2014) is focused on computer-supported collaborative learning. However, looking at evidence obtained from their experiments (Munoz-Cristobal, Jorrin-Abellan, Asensio-Perez, Martinez-Mones, Prieto, & Dimitriadis, 2015), it is evident that supporting orchestration activities presents opportunities necessary to support educators.

Further, there are some notable teacher-centric attempts to turn classrooms into effective learning environments. Google Classroom ("Google for Education: Save time and stay connected") is perhaps one of the most recent orchestration software platforms. Classroom promises to increase teachers' productivity by "weaving together" existing productivity tools such as Docs, Drive and Gmail. Google Play for Education ("Google Play for Education") is another Google initiative aimed at increasing innovation in education by facilitating easy access to approved tools and content in order for teachers to meet individual student needs. While meant to be a generic hub for educational resources, it is in part aimed at facilitating tablet use within the classroom.

That being said, an important point to note is that the use of orchestration technology, though warranted, poses the risk of making the already complex classroom ecosystem (Dillenbourg & Jermann, 2010) more difficult to manage. Sharples (Sharples, 2013) notes that teachers in the modern day classroom grapple to manage its demands and so adding an orchestration technology to this "volatile mix" could potentially worsen the situation.

From what is known, based on available evidence, orchestration is complex, and predominantly facilitated in an ad hoc manner, through the use of specialised tools aimed at achieving a single specific objective.

3. Streamlining orchestration

Using the concept of cross-plane integration (Dillenbourg & Jermann, 2010) we view orchestration as a function of the scale of learning activities—individual, group or class—with respect to time. The nature of activities, as shown in Fig. 1, determine the time-frame within which they are undertaken.