Sharing the Burden: Introducing Student-Centered Orchestration in Across-Spaces Learning Situations

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Abstract: We propose the notion of "learning buckets": Configurable containers of positioned learning artifacts, that teachers may include in learning designs, and that are filled during the enactment by students or teachers.

Keywords: Augmented reality, orchestration, ubiquitous learning, student-centered

1 Sharing the orchestration load using learning buckets

The orchestration [1] of learning situations involving multiple physical and virtual spaces is challenging for teachers. To aid the orchestration of such learning situations, related literature [2] proposes the use of authoring tools to translate pedagogical ideas to a computerized format, as well as augmented reality (AR) to access virtual artifacts from physical spaces. However, most of these proposals force students to follow a predefined learning design in which most details (e.g., tools to use or learning artifacts to produce) are specified *a priori*, thus reducing student autonomy during enactment. This "agency issue" is defined by some authors [3], as a clear challenge for practitioners in ubiquitous learning scenarios. Teacher-centered designs are asked to evolve to student-centered ones, where activities can be managed by the students themselves, thus helping the improvement of the learning experience with the decisions taken by them [4]. As an intermediate solution between a purely teacher-centered solution (e.g., everything is pre-defined in a learning design) and an entirely student-centered approach (i.e., students have total freedom), we propose *learning buckets* as an aid for teachers in orchestrating such learning situations. Learning buckets can be seen as learning artifacts containers, included by teachers in the learning design of across-spaces learning situations. Buckets are configured with constraints, defining what the students are allowed to do within them. During the enactment of a learning situation in different spaces, students can fill the bucket with learning artifacts (e.g., instances of Web 2.0 tools, Web documents, 3D models), which are tagged with properties of the space of interest (e.g., the geographical location or the association with a fiducial marker). Since some decisions about artifacts (e.g., type, number, place) and the operations over them (create, update, delete) are delegated to

the students during enactment, part of the orchestration load is transferred from the teacher to the students. Additionally, such decisions represent a more student-centered approach, favoring students' agency. We summarize both aspects under the term student-centered orchestration, because facilitating teachers the use of student-centered approaches may as well be a form of sharing the orchestration load with students.

The pedagogical opportunities learning buckets may offer can be illustrated through an across-spaces learning situation sample scenario aimed at fostering orienteering skills in K-12. The situation is composed of two inter-related activities that take place in the classroom and at a park, respectively. In the first one (to take place in the classroom using a VLE such as Moodle), students are divided into three groups. Each group has to prepare an orienteering route for another group, consisting in a sequence of quiz questions to answer, located in different places of the park. Students can use different Web 2.0 tools to create each question. In the second activity (to take place physically at the park), each group must find the questions of its corresponding route (created by another group) using a map, orienteering techniques and a tablet with an AR application to access to the questions.

The described situation poses two main challenges to the teacher: how to allow students to create their own learning artifacts using Web 2.0 tools as well as positioning them in a physical space (increased flexibility and more student-centered orchestration); and how to control that creation process using a set of restrictions defined by the teacher (maintaining the pedagogical intentions of the teacher expressed in the learning design). In this case, a learning bucket for each group may be defined at design time by the teacher, and configured with constraints (e.g., types and maximum number of artifacts that can be created as well as the permitted operations and positioning types). Such buckets could be embedded in the VLE, allowing students to use them during the enactment.

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