Learning design of collaborative activities with digital technologies for teaching STEM disciplines

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INTRODUCTION

The second year of my PhD project has been dedicated to the testing phase of STEM educational scenarios in the upper secondary school. In the initial design step, particular attention have been based to the dimension of STEM Learning Design (LD) of collaborative activities. According to Ceregini and collaborators (2019), collaborative learning engage learners in a process of co-construction of knowledge, and it is particularly relevant for scientific disciplines (Bell, et al., 2010). Unfortunately, an effective design of collaborative learning activities is not simple, particularly when teachers are not confident with LD process (Ceregini, et al., 2019). This was the context in which the team of Institute for Educational Technology – National Research Council (ITD-CNR) has developed a collaborative board game that supports teachers in the initial step of design (conceptualization) of collaborative learning (Pozzi, & Persico, 2013). This game has been used to support the LD process of educational scenarios implemented in the school.

METHODOLOGY

For the co-design of the educational scenarios, it was used the 4Ts game. It is a collaborative board game that supports teachers the initial step of design (conceptualization) (Pozzi, & Persico, 2013). This tool includes 4 dimension of collaborative learning (Task, Time, Team, Technology) corresponding to specific cards to be used in the digital board represented in Figure 1. In fact, teachers used the digital version of this game, developing the macro design of the educational scenarios (as shown in Figure 2). To move from a macro design (the conceptualization phase) to the micro design, a template were structured, reporting each 4Ts game dimension with the possibilities to add more details (i.e., tasks modality, use of resources,...).

Moreover, a specific instructional instance was associated to each teaching sequence, according to Merrill (2002) instances for an effective and engaging learning experience. The support of the digital technologies were also associated to some instances.

Figure 1: The board of 4Ts game

Figure 2: The board of 4Ts game for the Peer Review technique

RESULTS

The results of the Design Step are the two scenarios developed: one on Earth Science argument (the Rocks) and the second related to the Chemistry discipline (Acids and Bases). After an initial training with the 2 teachers on the 4Ts game use, the collaborative activities of the scenarios were designed, in particular a technique choose by both teachers was the Peer Review. The conceptualization of Peer Review Technique is showed in Figure 2, each phase of this technique were structured specifying the tasks, the size of the team and the technology use. Furthermore, teachers used the template developed to go more into the details of their design, thus to better structure the activities.

CONCLUSIONS AND FUTURE STEPS

These scenarios were tested in two fourth graders classes of an upper secondary school in Liguria, during April and May 2023. The data of this first implementation phase of both scenarios were collected and analysed, bringing out the critical issues and the difficulties. The refinement step (both from methdological and didactical point of view) will identified the possibile solutions to be used during the second testing phase.

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