Designing networked learning with 4Ts

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Abstract

This paper tackles the issue of how to support the design of effective collaborative activities in networked learning contexts. At the crossover between the 'learning design' and the 'networked learning' research sectors, notions such as 'collaborative techniques', 'design patterns' or 'scripts' are often used to describe and/or run online collaborative learning activities. Based on these concepts, technological tools have been implemented that reify these notions and support several phases of the learning design process, including the sharing and reuse of design representations. Despite the differences among tools, most of the them support the representation of learning designs that are already "in the designer's mind", while few technological tools specifically provide guidance and support in the early phase of the design process of collaborative activities, i.e. the conceptualization of the design. Focusing on this gap, this paper proposes a model and, based on it, a game supporting the conceptualization of online collaborative activities for networked learning contexts. Both the model and the game are based on the interplay of four variables, the 4Ts: Task, Teams, Time and Technology, regarded as the key aspects of the decisions to be made. The model suggests that, to design the online activity, the teacher/designer will need to "juggle" around with these four variables and their reciprocal relationships in a cyclic, iterative process, regardless of whether she wants to start the design from scratch or to reuse an already existing collaborative. Implemented with the aim of scaffolding such iterative process and supporting a group of teachers in the decision taking phases, the game consists of a board, representing the Time component, and of 5 decks of cards (respectively for the Task, Team, Technology, Technique and the Jokers). Each deck contains cards describing instances of Task, Team, Technology or Technique, while the Joker cards are empty and should be filled in by players with new instances. To guide the decisions, each card illustrates the dependencies between that particular instance of T and the others, thus making the decision criteria as explicit as possible and stimulating reflection on how each variable impacts on the others. Both the 4Ts model and the game have been field tested and evaluated by the developers with a group of 48 teachers. The results encourage the development of a digital version of the game, where cards are still tangible objects, and augmented reality techniques are employed to digitize the results of conceptualisation.

Keywords

Networked learning, collaborative learning, learning design, 4Ts model, collaborative technique.

Introduction

Currently, the broad field of 'learning design', even though not at all new, still attracts a lot of attention in the TEL (Technology Enhanced Learning) research area (Conole, 2010), because it is on its promises that the success of teacher professional development initiatives seems to be rooted (Persico & Pozzi, 2013).
At the same time, in the field of 'networked learning', defined by Goodyear (2005) "as learning in which ICT is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources" (p.83), we witness the same attention to the general issue of learning design (Goodyear et al., 2004). Consequently, at the crossover between these two research areas, we find a variety of approaches and tools aimed to support the design of effective online collaborative learning initiatives.

In the past few years, there has been a lot of discussion about whether, to what extent and under what circumstances structuring the interactions between students online, would enhance the effectiveness of the collaborative process (Demetriadis et al., 2009; Dillenbourg, 1999). While some studies support the claim that an excess of freedom in the way collaborative tasks are proposed may fail to engage all team members in productive interactions (Hewitt, 2005; Bell, 2004, Liu & Tsai, 2008; all cited in Demetriadis et al., 2009), others

maintain that there is also a danger in providing too much guidance, that is "over-scripting" collaborative learning activities (Dillenbourg, 2002). According to these authors, a strong scaffolding may hinder learners' creativity, flexibility and ability to self-regulate, therefore jeopardizing the co-construction of knowledge and ultimately causing a loss of effectiveness of the learning process (Dillenbourg & Jermann, 2007).

Within such debate, several concepts and approaches have been proposed, such as for example the so called 'collaborative techniques' (Pozzi & Persico, 2011). These are basically procedures and behaviours to be enacted by students in order to carry out a given task, during a learning activity. Collaborative techniques usually allow the organization and scaffolding of activities (that is: they 'structure' them), so as to help students to collaborate effectively in order to reach the learning objectives. Examples of these techniques are: Discussion, Jigsaw, Role Play, Case Study, Peer Review, Pyramid, etc.

Some researchers (Dillenbourg & Hong, 2008; Dillenbourg & Jerman, 2007; Kollar et al., 2006; Weinberger et al., 2004; Fischer et al., 2007) have oriented the issue of scaffolding online collaboration towards the definition and use of "scripts", that is a set of direct instructions (often provided through interaction prompts) guiding learners in the online activity. Other groups have built on the notion of 'design patterns' and proposed 'pedagogical patters' (Bergin et al., 2012; Goodyear, 2005; Hernández-Leo et al., 2006, Persico, Pozzi, Sarti, 2009).

Despite the variety of conceptual and technological tools available in the learning design area (Persico et al., 2013; Prieto et al., 2013), only a few of them are specifically aimed at supporting the conceptualization of online collaborative activity. Some of the most well known tools, such as for example WebCollage (Villasclaras-Fernández, et al., 2013), CELs (Ronen et al., 2006) or the 4SPPIces (Pérez-Sanagustín et al., 2012), are oriented to support the authoring phase (i.e. micro-design), as well as the delivery to students, rather than the conceptualization, and they take it for granted that the teacher already has a clear idea of the design in her mind. So, supporting the conceptualization phase is still an open issue, and it is a rather critical one, because the design conceptualisation entails a strict intertwining of creative thinking with systematic application of design criteria, therefore posing significant challenges.

This paper proposes a model and a tool, which have been developed to support the conceptualization of effective networked learning activities.

The 4Ts model and game

The proposed model assumes that an online collaborative learning activity can always be regarded as a task to be accomplished by one or more teams of students within a certain time frame in a given technological environment (Persico & Pozzi, 2011; Pozzi et al., 2011; Pozzi & Persico, 2013).
Consequently, the model identifies Task, Team(s), Time and Technology as the main dimensions along which one may look at a collaborative activity. The model can be referred to as the '4Ts model' (Figure 1).
During the design process, the teacher/designer has to take decisions regarding:

- the Task to be accomplished by students, which usually envisages the production of a final output;
- the Teams which students should be aggregated into in order to accomplish the Task and their mode(s) of interactions;
- the Time schedule according to which students are to carry out the activity;
- the Technology used to carry out the whole activity and where the interactions among participants will occur.

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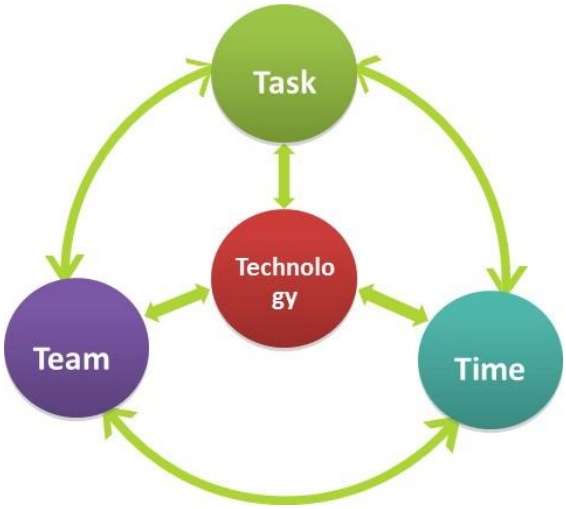

Figure 1: The 4 Ts model (Pozzi & Persico, 2013)

The interactions among these dimensions define the collaborative activity; the teachers can either start from scratch and try to define these elements, or she can start from a collaborative Technique (i.e. a pattern suggesting how to combine these elements) and instantiate it in one specific activity, according to the context at hand. In any case, the teacher will need to take decisions regarding each of the Ts, by taking into account that they are not independent of one another: starting from the definition of the learning objectives, as suggested by the literature in Learning Design and Instructional Design (Conole, 2013; Laurillard, 2012), the teacher will tentatively choose one Technique or one Task that can support achievement of those objectives. However, sometimes the length in Time of the course is given from the very beginning and this might affect the initial choices. Similarly, the target population may be already decided, and its size can influence decisions on the Teams' composition rather heavily, as well as on the Task and Technology components. In other, more techno-centric approaches, a designer may want to try out some interesting Technology and this will influence the choices regarding the other Ts. So, the teacher generally "juggles" around with these four components in a cyclic and iterative process (as shown in Figure 1).

The dependences among the Ts (the arrows in Figure 1) are very important in the design process and the model aims to support teachers-designers by making such dependences as explicit as possible, stimulating reflection on how decisions on one dimension impacts on the others.
In order to scaffold such iterative process and support the teacher in the decision making process, the '4Ts game' has been implemented. It is a board game, to be played by groups of teachers who interact among themselves and with cards to design effective online collaborative activities.

The game is composed of a board, representing the Time component, organized per time units (i.e. weeks) and of 5 decks of cards; in particular:

- the Task deck (red cards): one card for each kind of Task, for a total of 40 cards;
- the Team deck (yellow cards): one card for each type of Team, for a total of 24 cards;
- the Technology deck (green cards): one card for each type of Technology, for a total of 32 cards;
- the Technique deck (light blue cards): one card for each phase of a Technique, for a total of 15 cards;
- the Joker deck (white cards): a set of 9 empty cards.

Task, Team and Technology cards have got the same structure: each card contains the description of the item (for example the description of one Task, see Figure 2) and a set of suggestions regarding the relations with the other Ts (i.e. indications on how to select cards from the other decks).

Cards from the Technique deck are slightly different, because each describes one phase of one Technique (see for example Figure 3, where phase I of the Jigsaw is described) and indicates options as far as what Task, Team, Technology and Time are possible to design an effective activity based on such Technique.

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Cards from the Joker deck are empty, in such a way that they can be compiled by the teachers/designers in case - during the process - they feel the need to add extra cards: be them Task, Team, Technology or Technique cards. The Joker deck of cards is meant to deal with the obvious limitation that not all of the possible T instances have been forecast by the game designers, and also with the likely event that teachers, while becoming experienced in the game use, might feel the need to create their own cards.

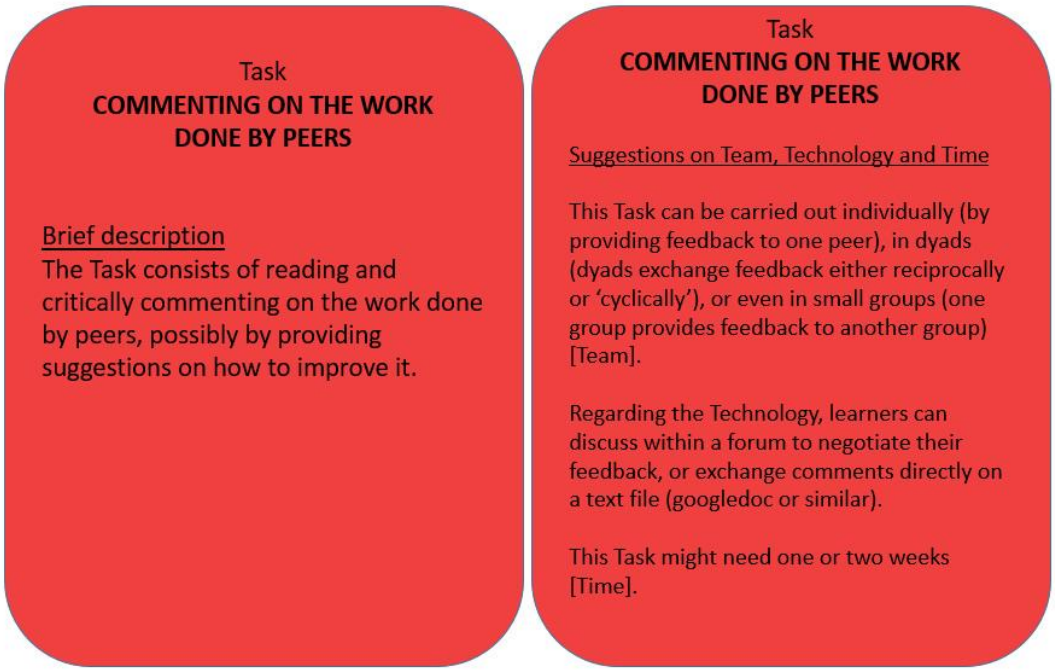

Figure 2: An example of a Task card (front and backside)

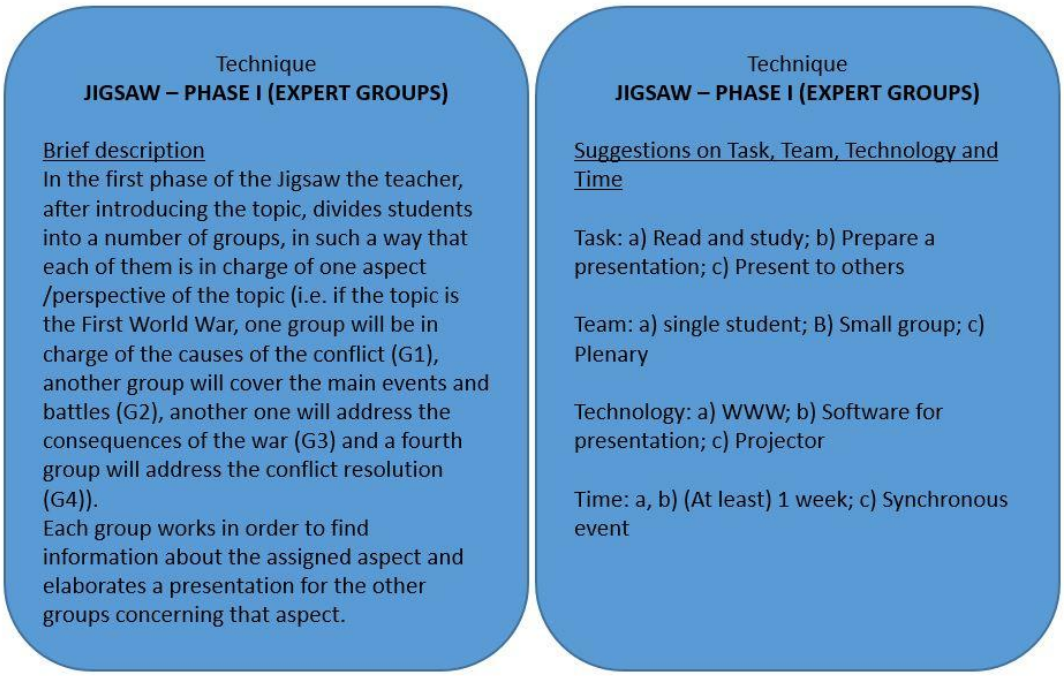

Figure 3: An example of a Technique card (front and backside)

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The game is intended to be played by teachers/designers in groups, sitting around a table: the aim of the game is to design one or more learning activities. To do so they analyse the cards, discuss, and consider the suggested relations among cards, in order to select suitable cards and lay them down on the Time-board to form a coherent description of an effective learning activity (Figure 4).

Figure 4: Teachers playing with the 4Ts game

At the end of the gameplay, teachers will have the board, containing the selected cards, in a sort of 'storyboard' representing the complete conceptualization of the online collaborative activity (Figure 4).

Experimenting with the 4Ts: preliminary results

The 4Ts model was developed during a workshop conducted in Autumn 2011 at the Alpine Rendez-Vous organized by the STELLAR Network of Excellence (Pozzi et al., 2011).
The workshop was attended by researchers active in the field of learning design and online collaborative learning. On that occasion, a preliminary draft of the model, based on 3 Ts only (Persico & Pozzi, 2011), was proposed to the experts, discussed with them and feedback was collected on its soundness. The model was subsequently fine-tuned on the basis of such feedback. One of the major changes was the addition of the fourth T, the T for technology. The model's origin is certainly one of its main assets, because this preliminary validation makes the model the result of a joint effort of experts and researchers in the field and not just of an isolated team of research. At the workshop, the model was judged as a good vehicle to study and represent a wide range of collaborative learning activities (Pozzi et al., 2011). This encouraged further effort in the direction of developing the corresponding game and the production of its board and cards.

The effectiveness of the game as a way to discuss learning design principles was evaluated with a group of practitioners. During a two-day teacher-training workshop held in Autumn 2015, the model and the game were tested by 48 teachers, working at different school levels and heterogeneous as for disciplines.

These teachers were observed by the researchers during the gameplay and at the end of the workshop they were asked to fill in a questionnaire, aimed to collect their feedback regarding the 4Ts model and game. While the researchers' observation allowed us to appreciate the important role of tangible cards in the gameplay, the questionnaire yielded more detailed results about its acceptance by participants. These are summarised below.

A total of 41teachers (85% of the participants) filled in the questionnaire, consisting of 13 items. The answers to the first two items of the questionnaire, aiming to investigate participants' previous competence about the collaborative techniques presented, reveal that 90% of the respondents were familiar with some of them, only 2% knew all of them, and 7% knew none of them. Moreover, 22% of the respondents use these techniques often, 66% only use them occasionally and 12% never use them.

The subsequent 9 items (Item 3 to 9) were questions concerning the teachers' opinion about the model and the game, and required them to answer on a Likert scale (from 1="not at all" to 5="very much"). Table 1 reports the items and basic descriptive statistics of the answers. The mean values of the teachers' rating of these items are all above 4, and these very encouraging results sustain the claim that the model supports the design of

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collaborative activities by facilitating the decision making process adequately and stimulating the discussion among designers thanks to the use of the cards. As for the 4Ts game, the data provided in table 1 show that the teachers believe it facilitates the initial phase of the design (conceptualisation), helps them to consider all of the variables involved in the decision making process, supports discussion and collaboration. Besides, the game is perceived as easy to use and useful, with regard to both the workshop context and in real-life co-design.

Table 1: Questionnaire results - Items 3 to 11
answers on a Likert scale (1="not at all" ; 5="very much")

Item n	Questionnaire Item	mean	St.dev.
3	To what extent do you believe the 4Ts model is useful to support the design of collaborative activities?	4,39	0,74
4	To what extent do you believe the 4Ts (Task, Team, Time and Technology) adequately cover the main design decisions for collaborative learning?	4,41	0,63
5	To what extent do you believe that the use of tangibles (the cards) stimulated discussion and collaboration with colleagues?	4,37	0,83
6	To what extent do you believe the 4Ts game facilitated the conceptualisation of the learning design?	4,29	0,75
7	To what extent do you believe the 4Ts game helped you to consider aspects that you would not have considered without it?	4,17	0,83
8	To what extent do you believe the 4Ts game helped your group to discuss and collaborate?	4,34	0,82
9	How easy was it to play the 4Ts game?	4,07	0,85
10	How useful did you find the 4Ts game, during the workshop?	4,34	0,76
11	To what extent do you believe this game would be useful in a real-life co-design context?	4,10	0,86

The last two items of the questionnaire were open ended questions. Item 12 required the teachers to choose three words describing positive features of the 4Ts game, while item 13 required them to indicate aspects that need to be improved in the 4Ts game. The information derived from these two questions are of a qualitative nature. Among the positive features, those most frequently mentioned by teachers were "creative" (N=10; 24%), "stimulating", "engaging", "captivating", (N=9; 22%); "interactive", "useful" (N=5; 12%) and "motivating", "straightforward", "collaborative", and "effective" (N=4; 10%). As for possible improvements, it is significant to note that 10 teachers (24%) had no suggestions, while 8 of them (20%) suggested to develop a digital version of the game, 7 (17%) teachers said they would need to think it over to be able to provide suggestions and 6 teachers (15%) provided comments intended to improve the game with more detailed instructions.

Conclusions and further developments

All in all, we regard the above results as encouraging enough to further our work. The game seems to support creativity, is considered appealing and motivating, effectively facilitates collaboration aimed at the conceptualisation of an online activity. The results also give us reasons to believe that a digitised version of the game would be welcome by perspective users. However, according to our observations, playing around with tangible cards was a key aspect, as the cards helped the teachers to share, physically, on the table, their ideas, and take into due account all the variables at play as well as their interdependencies.

Based on these results, the next steps of the project envisage the development of a digital version of the game. However, given the importance of the use of tangible cards in the conceptualisation phase, the digital game should allow teachers to manipulate the cards and create their own designs on a board, just as it does now. The innovation we intend to introduce is that the conceptualised designs can be captured by a software through augmented reality techniques and eventually transferred to one of the already existing authoring tools (such as for example WebCollage), in such a way that the authoring process can continue in a fully digital environment, up to the delivery of the activities to learners. This way, we will have an overall, augmented and integrated system, able to support the whole learning design life-cycle (Asensio-Pérez et al., 2014) for networked learning activities.

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