

Improving Role Taking in CSCL Script using SNA and Semantic Web

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Abstract— Designing effective CSCL processes is a complex task that can be supported by existing good practices formulated as pedagogical patterns or script. Over the past years the TEE research has shown that CSCL script acts as Mediating Artifacts (MA) designing educational scenarios and structuring and prescribing roles and activities. This work proposes an approach, based on Social Network Analysis and Semantic Web, in order to improve definition and instantiation phases of IMS-LD scripts.

Keywords—CSCL; eLearning; Social Network Analysis, Semantic Web; Learning Design.

I. INTRODUCTION

The research field on Technology Enhanced Education (TEE) suggests that the collaborative dimension is one of the most important factors to take into account when thinking of ensuring a high level of sustainability of e-learning. In order to advert the difficulty in managing discussions, knowledge sharing and argumentation [1], the scientific community has recently developed and sustained the validity of new theoretical approaches related to CSCL scripts [2]. According to [3], collaboration scripts are instructional sequences that organize learning activities into phases defined by using five different items: activity (or activities) that learners have to perform, group composition, assignment of roles (to learners within the groups), interaction modes and phase timing. These scripts are fundamental to guide the collaboration [4] and they are expected to facilitate learning by guiding peers' collaboration and engaging all participants in roles and activities that trigger the activation of their cognitive and metacognitive processes. With respect to the CSCL roles identification, there are two perspectives: scripted roles and emergent roles [5]. Scripted roles are assigned by a teacher. Emergent roles spontaneously emerge through a negotiation phase carried out by learners without teacher's interactions.

In order to take the opportunities related to CSCL scripts, each learner has to play the role that best fits with his/her personal qualities. The study here presented intends to contribute to the current debate about how technology-enhanced learning environments should support the prospect of "educational CSCL patterns" for the design of learning activities whose effectiveness is closely linked to the way they can facilitate, in intelligent educational system, the processes of role taking in setting groups.

II. THE PROPOSED APPROACH

This work proposes an approach based on Social Network Analysis (SNA) to support teachers in assigning the right role to a specific learner during the enactment of a CSCL script. We propose a taxonomy for scripted roles, which are divided in *content-oriented* (Starter, Editor, Summarizer, Cybrarian, Revisioner, Info-Broker) and *process-oriented* (Task Manager, Balancer of Participation, Monitor, Critician, Theoretician, Disseminator), [1] and an extension of the IMS-LIP specifications in order to take care about roles played by learners during the CSCL scripts execution and score of proficiency with respect to their performances. In particular, the taxonomy is represented using SIOC schema in order to simply link roles with collaborative environment. The presence of roles information in learner profiles and in collaborative environments is used to support instructors in binding learners, roles and groups appropriately within the CSCL scripts instantiation/enactment phase, so improving the development of cognitive and social capital inside a collaborative script.

The last component of the approach proposed in this paper concerns the evaluation of learners' performances during the execution of a CSCL script with respect to the role played. We propose the application of the Social Network Analysis (SNA) to evaluate the learners playing scripted roles within collaborative environments (represented with SIOC) in the context of a CSCL script described using

IMS-LD. We propose the application of Social Network Analysis (SNA) to evaluate the learners playing scripted roles [6] with collaborative environments (represented with SIOC1) in the context of a CSCL script described using IMS-LD [7]. The main aspects of the approach here proposed are illustrated in Figure 1 where the life cycle of a CSCL script is depicted.

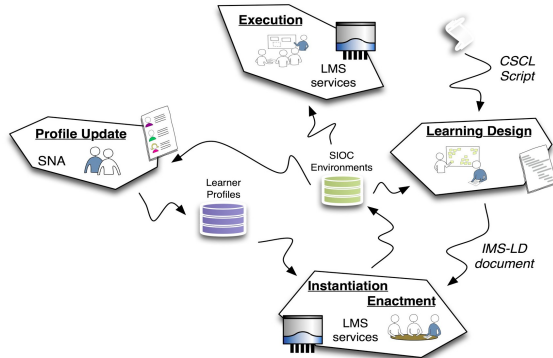


Figure 1: The CSCL script lifecycle

Learner Profiles and SIOC Environments are central components. SIOC Environments provides two main contributions: (i) the semantic definition of collaborative environments with admissible roles, and (ii) the semantic organization of data produced during collaborative sessions (e.g. discussion forums, blogs, etc.). The first contribution is exploited by the Learning Design phase where instructor designers map empty groups to one or more roles defined in the selected SIOC environment. The second contribution is exploited by the Profile Update phase that uses data (in SIOC format) produced during the collaborative session, in order to update Learner Profiles with new information (obtained through the application of SNA) regarding the ability of learners to play the assigned roles in the last collaborative learning experiences. Furthermore, Learner Profiles are also used in order to sustain the teacher (or other support actors) when he/she has to assign specific roles to learners during the Instantiation/Enactment phase, where some LMS services are used to get users account information and bind them with the IMS-LD document (provided by the design step). During the Execution phase, the LMS services also tracks the actions/data (in SIOC format) of users in the collaborative environment.

SNA is applied to SIOC data coming from collaborative sessions during a CSCL script execution. This work deals with the case of collaborative sessions based on Discussion Forums, but the approach is general because SIOC is able to model data coming from several collaborative tools (e.g. blogs, wikis, instant messaging, etc.). At the same time, in SIOC data there is a registration of the messages' content and this allows the application of Network Text Analysis (NTA) to messages' contents. In particular, the analysis is focused on how the argumentations of a learner are central with respect to the treated knowledge domain (the discussions). The following table shows which types of SNA and NTA indexes are associated to some examples of Scripted Roles.

SNA indexes	applied to relations and exchanges					applied to contents (NTA)		
	Degrees	Neighborhood	Closeness Centrality	Centrality	Betweenness Centrality	Flow Centrality	Degree Centrality	Eigenvector Centrality
Disseminator	High		High			High		
Monitor	High							
Balancer				High	High			
Task Manager	High				High			
Starter	High	High				High		
Summarizer			High					High
Revisioner						High		
Infobrokers	High	High						High

Table 2: Examples of Scripted Roles and their relative SNA indexes

III. FINAL REMARKS

In this paper an approach aiming at improving role taking for CSCL scripts is proposed. In future works, the proposed approach will be developed and evaluated in ARISTOTELE and ALICE Projects, both co-funded by European Community in the context of FP7, focusing on the opportunity to design collaborative activities following acknowledged scripts, to organize them in a structured flow (e.g. Collaborative Dyads or Argumentative Discussion) supporting the development of an optimal setting group process.

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