Chapter 7
Monitoring Activity in E-Learning: A Quantitative Model Based on Web Tracking and Social Network Analysis

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ABSTRACT

In this chapter the authors will focus on the monitoring of students’ activities in e-learning contexts. They will start from a socio-cultural approach to the notion of activity, which is conceived of as a context composed by actions, which, in turn, are composed by operations. Subsequently, the authors will propose a model for monitoring activities in e-learning, which is based on two principal measures. Firstly, they will take into consideration specific data collected through Web tracking, which they will elaborate further in order to obtain indicators that do not simply express frequencies, but that measure individuals’ actions within a Web environment. Secondly, the authors will suggest a possible application of social network analysis (SNA) to Web interactions occurring in collective discussions within Web environments. In the model that the authors will present, Web tracking data are considered as indicators of individual actions, whereas SNA indices concern two levels: collective indices referring to the activity carried out by groups and individual indices referring to the role that members play in collective e-learning activities.

INTRODUCTION

This chapter will develop according to three principal sections. The first section will provide the theoretical background of our research. One of the main points of this section is the concept of e-learning. We will particularly focus on three main web artifacts, which significantly contribute to the development of e-learning: learning objects, web groups or web communities, and social networks. We will offer a brief discussion on web evolution, and then we will focus on learning objects and web groups as web artifacts 1.0, and on social networks.
as web artifacts 2.0. These web artifacts share one important aspect, i.e., the possibility to monitor and analyze online actions performed by students/learners. Such a possibility allows the evaluation and assessment of web activities: a further central point of this theoretical section, therefore, will be our proposal for defining web activities and, in particular, web actions that can be automatically monitored in e-learning contexts.

The second section will be focused on the monitoring of web actions and, in particular, on the indices that may be employed for analyzing or assessing individual and/or collective actions. To this purpose, we will propose two different types of indices: indices obtained from an elaboration of web tracking data for individual actions, and indices derived from Social Network Analysis (SNA) for collective actions. The first type is typically used in relation to web artifacts 1.0 (e.g., web platform), while the second type represents a proposition for integrating and constructing a model for monitoring, analyzing and assessing not only individuals, but also web groups or networks of students in e-learning environments.

The third section will finally describe our model for monitoring, analyzing and assessing individuals and groups/networks in e-learning environments. This model, based on web tracking and SNA indices, responds to three requests in e-learning processes:

- observing and analyzing e-learning processes by researchers;
- monitoring and assessing students and groups by instructors;
- self-monitoring the personal actions and the personal role in collective activity by students.

To sum up, starting from a socio-cultural approach to activity, this chapter proposes a model for monitoring students actions in e-learning environments based on web tracking and SNA.

THEORETICAL BACKGROUND

In everyday discussions, the concept of e-learning (electronic learning), often improperly, involves multiple aspects of distance education, which range from content selection to the organization and coordination of specific on-line courses. Nowadays, the three key aspects that could best define what we mean by “e-learning” are the so-called learning objects, web groups or web communities, and social networks. While we can conceive learning objects and web groups/communities as elements that characterize e-learning 1.0, social networks are more informal environments typical of e-learning 2.0. On the one hand, the first type of e-learning seems to be characterized principally by formal learning, i.e., a structured course, well organized and preset by an instructor, in which students have to download/upload documents, accomplish predetermined assignments/tasks and participate in controlled on-line discussions (which are normally developed through web forum). The second type of e-learning, on the other hand, is characterized by informal learning (Attwell, 2007), which enables students to manage their personal learning space (normally a blog in which access permissions are set by students themselves), construct their relational network (by inviting other students or accepting invitations), propose their discussion groups (by selecting participants) and finally choose the level of interaction to be implemented with other students or with the instructor. This may be a private, one-to-one interaction (in which messages are read only by the receiver), a personal interaction (in which the message is posted to the personal area but it is public), an interaction with the personal network (constructing specific groups) or, finally, an interaction with the whole network, which normally occurs within a web forum.

In this evolution of e-learning web artifacts, we can identify two different ways of conceiving knowledge transmission and construction in e-learning environments, which distinguish e-
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