Bridging the Gap between LMS and Social Network Learning Analytics in Online Learning

Ángel Hernández-García, Universidad Politécnica de Madrid, Madrid, Spain
Miguel Ángel Conde, University of León, León, Spain

ABSTRACT

Despite the great potential of social network analysis (SNA) methods and visualizations for learning analytics in computer-supported collaborative learning (CSCL), these approaches have not been fully explored due to two important barriers: the scarcity and limited functionality of built-in tools in Learning Management Systems (LMS), and the difficulty to import educational data from formal virtual learning environments into social network analysis programs. This study aims to cover that gap by introducing GraphFES, an application and web service for extraction of interaction data from Moodle message boards and generation of the corresponding social graphs for later analysis using Gephi, a general purpose SNA software. In addition, this paper briefly illustrates the potential of the combination of the three systems (Moodle, GraphFES and Gephi) for social learning analytics using real data from a computer-supported collaborative learning course with strong focus on teamwork and intensive use of forums.

KEYWORDS

Computer-Supported Collaborative Learning, eLearning, GraphFES, Learning Analytics, Learning Management Systems, Moodle, Social Network Analytics, Web Services

1. INTRODUCTION

Learning Management Systems (LMS) enable access to learning resources and implement assessment tools (quizzes, essays, etc.) to support individual, self-directed learning. Additionally, in online and ICT-supported learning LMS also provide symmetric (e.g., chats) and asymmetric (e.g., message boards) communication tools to make up for the lack of physical contact between students and teachers, as well as among students, in order to facilitate social construction of knowledge. As ICT-supported learning becomes ubiquitous—learning and interactions may happen anywhere, anytime—message boards, or forums, become an essential part of social learning in online environments.

In formal online learning contexts, interactions, participation, social exchanges and discourse-based knowledge building processes take place fundamentally in course forums. Therefore, the description, explanation and understanding of the social dynamics that take place in forums on online courses has raised increasing interest for researchers and practitioners. One popular and novel approach...
to the study of social dynamics in online courses is the application of social network analysis (SNA) to course data, known as social learning analytics (Buckingham-Shum & Ferguson, 2012).

Even though social learning analytics may have many possible uses, most recent research using this approach focuses on the identification of relevant learning agents, such as at-risk students, knowledge brokers, active users or influential students (Hernández-García, González-González, Jiménez-Zarco, & Chaparro-Peláez, 2015). SNA provides information to facilitate this identification in two ways: analysis and visualization. Analysis includes calculation of SNA parameters and metrics, mainly those that relate to centrality metrics (Freeman, 1978), for each node, where a node is just an element of the network. Most commonly, in social learning analytics nodes represent learning agents—students, teachers—or messages (Hernández-García, 2014). Visualization of social networks offers graphic and almost direct identification of different course social dynamics, such as participation, engagement, or social activity; furthermore, filtering and visual transformations of a network graph using relevant metrics or node attributes may facilitate further understanding of the social dynamics of the course. That is, with a little understanding of SNA, social graph visualizations complement the numerical information from the SNA in a direct and eye-candy way, once the main concepts are learnt.

Currently, there are three main trends when it comes to choosing what tool to use to perform social learning analytics: LMS built-in add-ons, standalone social learning analytics applications, and general purpose SNA applications.

Section 2 of this paper discusses the advantages, disadvantages and suitability of each type of tools for effective social learning analytics, choosing representative tools within each category. As a result, we argue that general purpose SNA applications are superior for effective social learning analytics. Nevertheless, while built-in add-ons and standalone social learning analytics applications streamline data analysis, the use of general purpose SNA applications generally requires burdensome data transformation from the LMS data log format to a format supported by the SNA application. This paper introduces GraphFES (Graph Forum Extraction Service), a web service and application that enables seamless integration between the LMS log system and the SNA application. In order to understand the operating principles of GraphFES, Section 3 describes Moodle’s log system and Gephi (Bastian, 2009), a SNA application that has already been used for social learning analytics in prior studies—e.g. (Hernández-García, 2014). After this description, Section 4 offers a detailed description of GraphFES, explains how GraphFES operates to support social learning analytics of Moodle forum interaction data in Gephi, and illustrates the operation of GraphFES with an example using actual course data. Finally, Section 5 presents the concluding remarks for this study.

2. TOOLS FOR SOCIAL LEARNING ANALYTICS

As mentioned in the introduction, there are three main types of application for social learning analytics: LMS built-in add-ons, standalone social learning analytics applications, and general purpose SNA applications. In this section, we focus on social learning analytics tools for Moodle, the leading open-source LMS (Edutechnica, 2015), and we describe two—for reasons explained later on—representative LMS built-in add-ons (SNAPP and Forum Graph), one standalone social learning analytics application (Meerkat-ED), and discuss the suitability of generic SNA software for social learning analytics.

2.1. LMS Built-In Add-On for Social Learning Analytics

2.1.1. SNAPP (Social Networks Adapting Pedagogical Practice)

SNAPP (SNAPPVIS, 2013) is a web browser bookmarklet that extracts information about message board activity from the most widely adopted LMS (Sakai, Blackboard, Moodle and Desire2Learn) by pre-loading, reading and parsing the HTML contents of all the threads and messages in a forum, and then builds up the resulting social network in a Java applet. There are two versions of SNAPP
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