Investigating Relationship Between Discourse Behavioral Patterns and Academic Achievements of Students in SPOC Discussion Forum

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ABSTRACT

As an overt expression of internal mental processes, discourses have become one main data source for the research of interactive learning. To deeply explore behavioral regularities among interactions, this article firstly adopts the content analysis method to summarize students' engagement patterns within a course forum in a small private online course (SPOC) system. Secondly, through sentiment word matching and sentiment density calculation, the authors characterize the evolution trends of collective positive and negative sentiments, and compare sentiment strengths of different achieving students. The analytical result shows that there is a significant correlation between most engagement patterns and academic achievements, and high-achieving group seems more active than low-achieving group in terms of interactive, register, question, viewpoint and thematic postings. Besides, both of high and middle-achieving students are superior to low-achieving students on positive sentiment. But, there is no significant difference among high-, middle- and low-achieving students on negative sentiments.

KEYWORDS

Discourse Behaviors, Engagement Patterns, Learning Analytics, Sentiment Density, Small Private Online Course (SPOC)

INTRODUCTION

As a data-driven research area, learning analytics aims to observe students' learning behaviors and intervene individual learning process through collecting and analyzing learning data (Brown, 2011). With the emergence of a variety of interactive learning environments in the last decade, learning analytics is being widely adopted in quantifying learning experiences, analyzing learning states, predicting learning effects and supporting personalized learning, etc. (Chatti, Dyckhoff, & Schroeder, 2012; Ferguson, 2012). Massive Open Online Course (MOOC) platforms like Coursera, Udacity, edX and Khan Academy have produced massive learning behavioral data, which offer great opportunities for applying learning analytics techniques to measure and predict learning performance (Chiou, & Shih, 2015; Moissa, Gasparini, & Kemczinski, 2015; Jiang, Williams, & Schenke, 2014). However,

few studies on learning analytics are carried out to explore learning regularities in private learning environments (Fox, Patterson, & Ilson, 2014).

In recent years, many higher education institutions have joined Small Private Online Courses (SPOCs), which use MOOC materials to supplement classroom teaching, including high-quality video resources and rapid feedback (Fox, 2013). Forum is an important component of the interactions between teachers and students in SPOCs, which plays a critical role in improving students' abilities of complex thinking and solving problems (Wen, Yang, & Rose, 2014). In order to promote the participation of students in collaborative learning, many teachers have incorporated students' performance within discussions into grading rules to assess their comprehensive learning abilities (Romero, López, & Luna, 2013). Moreover, students' opinions and feelings in forums are also quite valuable for teachers and researchers to understand their learning motivation and emotional states. In particular, positive emotions are beneficial for arousing students' learning interests, and enable students to actively achieve learning objectives under the mental pleasure (Altrabsheh, Cocea, & Fallahkhair, 2015). Some relevant studies conclude that participation levels of discussion forums could indirectly contribute to students' final academic achievement in MOOCs (Ezen-Can, Boyer, & Kellogg, 2015; Dowell et al., 2015).

Under the experimental context with massive discourse data, it is of great importance to investigate the relationship between discourses behavioral patterns (e.g., various interactive patterns and sentiment orientations) and academic achievements in SPOCs to reveal respective characteristics of different achieving groups. In order to promote the efficient collaborative learning in SPOCs, engagement patterns and sentiment states as well as their relationships with students' academic achievements have become the critical research subjects, which will be analyzed and discussed in this study.

Research on Discussion Forums

As learning analytics techniques have progressively drawn attention from the academia, an increasing number of studies have begun to focus on the analyses of discourse behaviors in asynchronous forums (Wang, Yang, & Wen, 2015). Our research on behavioral patterns mainly focuses on engagement patterns and sentiment states within SPOC asynchronous forums.

Exploration of Engagement Patterns

Recent years have witnessed that an increasing number of studies have focused on performance of students in interactive discussions. Ramesh, Goldwasser, and Huang (2014) adopted a latent representation to explain students' engagement patterns and developed a framework for a probabilistic model to combine engagement patterns with their academic achievements. They verified that the latent formulation for engagement patterns could predict student retention. Tobarra, Robles-Gómez, and Ros (2014) offered an automatic procedure to analyze students' engagement patterns in the forum of "Network Services Management in Operating Systems" subject at Spanish University for Distance Education. They concluded students could be divided into producers (posted messages periodically) and consumers (only read but never posted messages) in terms of engagement patterns.

Detection of Sentiment States

Sentiment states within interactive forums are critical indicators of students' learning motivation and feedback, which could be explored by recognizing sentiment orientations in student-generated texts. Bahrainian and Dengel (2013) developed a sentiment summarization system including an improved hybrid polarity detection method and an unsupervised recognition method to summarize opinional texts involving the comparison between two different iPhones among Twitter posts. Wen, Yang, and Rose (2014) utilized collective sentiment analysis to observe a significant correlation between sentiment ratio in forum posts and the number of students who dropped the course in MOOCs. Ramesh, Kumar, and Foulds (2015) predicted aspect-sentiment pairs in online course through building a weakly supervised joint model (PSL-Joint), which used hinge-loss Markov Random Fields to model the

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