Chapter 18
A Model for Improving Online Collaborative Learning through Machine Learning

E. Muuro Maina
Kenyatta University, Kenya

Peter W. Wagacha
University of Nairobi, Kenya

Robert O. Oboko
University of Nairobi, Kenya

ABSTRACT

Online collaborative learning provides new opportunities for student collaboration in an online learning environment and at the same time spawns new challenges for teachers supporting group work. With the current Course Management Systems (CMS) such as Moodle, technology has provided online tools that include discussions forums, chat rooms, e-mails, newsgroups, workshops, etc. These tools provide a collaborative learning environment. To include constructivist learning in an online learning environment is a good collaborative strategy that is necessary since it engages learners in learning activities through interaction with their peers and teacher. A good collaborative strategy in an e-learning environment must primarily ensure that the expected interaction occurs in line with the learning mechanism being employed. This cannot merely be met by offering a set of collaborative software tools alone. It also requires the instructors' support. As the number of students studying online continues to increase, there is need to develop models that can improve online collaborative learning with minimal involvement of the instructor because the instructor might not be able to cope with increased number of students. To address this need, this chapter discusses a novel model for improving online collaborative learning that uses Machine Learning (ML) techniques.

DOI: 10.4018/978-1-5225-1759-7.ch018

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INTRODUCTION

The use of discussions forums for online learning gives the learners a chance to collaborate online, critique one another, share knowledge and compare new concepts with one another. Discussion forums create a platform where learners can learn on their own with the opportunity of sharing experiences and construct knowledge based on their cognitive level (Corich, S., Kinshuk & Hunt, L., 2004). By introducing e-discussion forums it becomes possible to have social affective and cognitive benefits of face to face situations realized (Hiltz, 1990). In a normal learning environment such as a classroom, learners are encouraged to engage in discussions, form groups, participate in group activities and debate on topics presented in classrooms. This forms the collaborative process in class which is supported by the teacher who can address the specific needs that arise during their group discussion.

In an e-learning environment collaborative software tool can allow learners to work on separate computers but engage in a collaborative process by communicating in synchronous or asynchronous manner. This lacks the teacher support making the collaborative process to be static rather than adaptive. With the scarcity of instructors and continuing increase in the numbers of students enrolled online, there is a need to explore artificial intelligent techniques such as Machine Learning (ML) which can analyze students' interaction data in an online group activity and provide data which can be used to reinforce the collaboration process. This provides an active learning environment within the existing collaboration tools in a Course Management Systems (CMS), hence improving the collaboration process with minimal support from the instructor. This will in turn support the social constructivist theory in an online learning environment which has gained popularity.

The primary objective of this chapter is to discuss a model which can improve online collaborative learning process with minimal support from the instructor by incorporating the following techniques in the existing models:

1. Intelligent techniques for analyzing discussion data in a discussion forum and creating learners collaborative competence levels.
2. An intelligent technique for creating heterogeneous groups based on collaborative competence levels.
3. A platform which can provide immediate feedback to reinforce the student level of collaboration.

BACKGROUND

With the increased demand for education, distance learning has gained popularity and therefore teaching online is no longer a new event. Use of online technologies to supplement face-to face instruction has yielded a blended learning (Ganzel, 2001; Mantyla, 2001) which has changed the traditional learning that is based on a classroom environment. Constructivist psychology advocates the use of collaborative tools such as discussion forums in e-learning as they argue cognitive development is as result of social interaction (Vygoskty, 1978; Siemens, 2004). Other researchers have also explored how constructivism and connectivism learning theories can be adequately used in education technology for the digital age (Mattar, 2010).

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