Chapter 86

Indicators for Cooperative, Online-Based Learning and Their Role in Quality Management of Online Learning

Elske Ammenwerth

University for Health Sciences, Medical Informatics, and Technology, Austria

Werner O. Hackl

University for Health Sciences, Medical Informatics, and Technology, Austria

Alexander Hoerbst

University for Health Sciences, Medical Informatics, and Technology, Austria

Michael Felderer

University of Innsbruck, Austria

ABSTRACT

Learning is a constructive and social process that works best in interaction with others. From this perspective, interaction and cooperation are seen as essential for learning especially in online-based learning environments. The objective of this chapter is to propose and test indicators for cooperative online-based learning. The indicators focus on three areas: presence of participants (indicators: access index, access pattern index), participation of participants (reading index, contribution index, completion index), and interaction of participants (answer contribution index, connectivity index, reciprocity index). The indicators can be applied both to students and instructors. The indicators were applied to three online-based courses in higher education. Log data from the learning management system was used. Also, success rates, student evaluations, and workload analysis were conducted. Results show that the indicators can be calculated automatically and can provide meaningful information for students' and instructors' dashboards. The presented indicators are tailored to cooperative online-based learning environments, where interaction and cooperation are means of fostering higher levels of learning.

INTRODUCTION

Learning is a constructive and social process that works best in interaction with other persons (Vygotzky, 1978). Through interaction and cooperation, students gradually construct systems of shared meanings (Mercer, 1995). Interaction and cooperation are seen as essential for learning in general (John-Steiner & Mahn, 1996), but especially for successful learning in online-based learning environments (Chou, 2002; Dixson, 2010; Lenning & Ebbers, 1999; Zhao, Lei, Yan, Lai, & Tan, 2005). Online teaching should thus be built on a thoughtful instructional design to facilitate interaction and cooperation among students.

Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning. Different types of cooperative learning can be distinguished, such as formal cooperative learning where students work together to jointly complete specific tasks and assignments; informal cooperative learning where students work together in ad-hoc groups; and cooperative based groups that are long-term, heterogeneous learning groups whose primary responsibilities are to provide support, encouragement, and assistance (Johnson & Johnson, 2013).

To see whether the chosen instructional design is successful in achieving interaction and cooperation, instructors in online-based environments need to carefully monitor students' interaction and cooperation. Monitoring allows them to detect situations where they must adjust their instructional strategy or where they need to support less active or struggling students. To do this, well-defined indicators allowing a quantitative monitoring of interaction and cooperation may be of help to support this task.

Learning analytics is the collection and analysis of data about learning and learning context. The objective of learning analytics is to better understand and improve learning (SoLAR, 2011). With the shift to blended and online learning, and the increasing amount of data available from learning management systems, learning analytics has found its place in education and is increasingly considered as an enabler to transform teaching and learning (Jacqueleen, 2015). In pure face-to-face settings where no learning management system is in place, learning analytics is seldom used as only few data sources (such as information on library use or classroom attendance of a student) are available.

Learning analytics in blended or online-based environments is often based on quantitative indicators of student activity and student engagement collected from learning management systems (Saar, Fors, & Tedre, 2017), such as number of student posts, lengths of posts, continuity of participation, or number of answers (Coll, Engel, & Bustos, 2009; Hrastinski, 2008). These indicators can be easily derived from the learning management system. Yet these indicators may not directly give evidence on the quality of learning (Hrastinski, 2008). Besides quantitative indicators, also qualitative indicators may be used that focus on the content of student posts using content analysis (Chou, 2002; Wen, Yang, & Penstein Rosé, 2014). This is, however, quite time-consuming and cannot be fully automated. This approach is thus not feasible when learning processes must be analyzed in a timely manner. Another approach focuses on describing social interaction patterns of students, for example, in the form of network diagrams (Coll, Engel & Bustos, 2009) and through social network analysis. Typical indicators in this type of analysis are intensity, cohesion, and density of interaction (Saz, Engel, & Coll, 2016; Stepanyan, Mather, & Dalrymple, 2014).

Our approach concentrates on quantitative indicators, as they can be extracted easily and automatically from the log files of the learning management system. This allows a timely feedback to the instructor while the course is still running and also allows immediate feedback to the students. These quantitative indicators could populate student and instructor dashboards, as proposed by the Society for Learning Analytics Research (SoLAR, 2011). Also, these indicators could be an important part of an overall

Related Content

A New Churn Prediction Model Based on Deep Insight Features Transformation for Convolution Neural Network Architecture and Stacknet
Jalal Rabbah, Mohammed Ridouaniand Larbi Hassouni (2022). *International Journal of Web-Based Learning and Teaching Technologies (pp. 1-18).*
www.irma-international.org/article/a-new-churn-prediction-model-based-on-deep-insight-features-transformation-for-convolution-neural-network-architecture-and-stacknet/300342

Determining the Trends of Motivation Research in Distance Education
Hakan Altinpulluk (2021). *Motivation, Volition, and Engagement in Online Distance Learning (pp. 77-99).*
www.irma-international.org/chapter/determining-the-trends-of-motivation-research-in-distance-education/285220

Re-Examining the Socioeconomic Factors Affecting Technology Use in Mathematics Classroom Practices
Emiel Owens, Holim Songand Terry T. Kidd (2007). *International Journal of Web-Based Learning and Teaching Technologies (pp. 72-87).*
www.irma-international.org/article/examining-socioeconomic-factors-affecting-technology/2994

Accommodating New Challenges: EFL Student Teacher and Teacher Trainer Attitudes Towards Transferring Teacher-Training Online
Georgios Neokleous (2022). *Transferring Language Learning and Teaching From Face-to-Face to Online Settings (pp. 203-226).*
www.irma-international.org/chapter/accommodating-new-challenges/296862

Exploring the Teaching Path of Visual Communication in the Digital Era
Kun Zhao, Cong Pengand Yue Wu (2024). *International Journal of Web-Based Learning and Teaching Technologies (pp. 1-17).*
www.irma-international.org/article/exploring-the-teaching-path-of-visual-communication-in-the-digital-era/340937