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Guest Editorial - Learning and Knowledge Analytics

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The early stages of the internet and world wide web drew attention to the communication and connective capacities of global networks. The ability to collaborate and interact with colleagues from around the world provided academics with new models of teaching and learning. Today, online education is a fast growing segment of the education sector. A side effect, to date not well explored, of digital learning is the collection of data and analytics in order to understand and inform teaching and learning. As learners engage in online or mobile learning, data trails are created. These data trails indicate social networks, learning dispositions, and how different learners come to understand core course concepts. Aggregate and large-scale data can also provide predictive value about the types of learning patterns and activity that might indicate risk of failure or drop out.

The Society for Learning Analytics Research defines learning analytics as the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs (http://www.solaresearch.org/mission/about/). As numerous papers in this issue reference, data analytics has drawn the attention of academics and academic leaders. High expectations exist for learning analytics to provide new insights into educational practices and ways to improve teaching, learning, and decision-making. The appropriateness of these expectations is the subject of researchers in the young but rapidly growing learning analytics field.

Learning analytics currently sits at a crossroads between technical and social learning theory fields. On the one hand, the algorithms that form recommender systems, personalization models, and network analysis require deep technical expertise. The impact of these algorithms, however, is felt in the social system of learning. As a consequence, researchers in learning analytics have devoted significant attention to bridging these gaps and bringing these communities in contact with each other through conversations and conferences. The LAK12 conference in Vancouver, for example, included invited panels and presentations from the educational data mining community. The SoLAR steering committee also includes representation from the International Educational Data mining Society (http://www.educationaldatamining.org).

This issue reflects the rapid maturation of learning analytics as a domain of research. The papers in this issue indicate LA as a field with potential for improving teaching and learning. Less clear, currently, is the long-term trajectory of LA as a discipline. LA borrows from numerous fields including computer science, sociology, learning sciences, machine learning, statistics, and “big data”. Coalescing as a field will require leadership, openness, collaboration, and a willingness for researchers to approach learning analytics as a holistic process that includes both technical and social domains.

This issue includes ten articles:

Buckingham Shum and Fergusson describe social learning analytics (SLA) as a subset of learning analytics. SLA is concerned with the process of learning, instead of heavily favoring summative assessment. SLA emphasizes that “new skills and ideas are not solely individual achievements, but are developed, carried forward, and passed on through interaction and collaboration”. As a consequence, analytics in social systems must account for connected and distributed interaction activity.

Hung, Hsu, and Rice explore the role of data mining in K-12 online education program reviews, providing educators with institutional decision-making support, in addition to identifying the characteristics of successful and at-risk students.

Greller and Drachsler propose a generic framework for learning analytics, intended to serve as a guide in setting up LA services within an educational institution. In particular, they emphasize the challenges of the soft dimensions of learning analytics such as ethics and the need for educators to develop competence (literacies) in interacting with data.

Dyckhoff et al. detail eLAT (exploratory learning analytics toolkit). eLAT is intended to give educators access to tools for visualizing teaching and learning activity with a primary benefit being the ability of teachers to self-reflect.

Abdous, He, and Yen discuss the results of hybrid analysis (educational data mining and regression analysis) in order to analyze student's activity in live video sessions and their course performance. They conclude that educational data mining can convert "untapped LMS and EPR data into critical decision-making information which has the capability of enhancing students' learning experiences".

Kim and Lee suggest that the prominent analytics techniques function in isolation and, as a consequence, are one-dimensional. In response, they propose the Multidimensional Interaction Analysis Tool (MIAT). Multidimensional analysis can provide "more in-depth information about the learning process and the structure of online interactions".

Xu and Recker share the results of a clustering study on how educators use a digital library tool called Instructional Architect. Their findings indicate three clusters of educators - *key brokers*, *insular classroom practitioners*, and *inactive islanders* – and suggest that analytics can be used to "predict which kinds of teachers are more likely to adapt technology tools such as digital libraries, and more importantly, how to help teachers become more effective digital libraries users".

Zheng, Yen, and Huang evaluate the role of analytics in understanding information flows. Their Interactional Information Set (IIS) model seeks to explain the collaborative process and information activation that occurs through interaction between learners.

Verbert et al. identify the challenges that researchers face with regards to the availability of open data sets. These data sets are important in order for researchers to test new algorithms and compare results with the results of other researchers. To address this challenge, Verbert et al. present a framework for analyzing educational data sets and present future challenges around collection and sharing of data sets.

Macfadyen and Dawson consider resistance to institutional adoption of learning analytics from the perspective of change management theories, arguing "research must also delve into the socio-technical sphere to ensure that learning analytics data are presented to those involved in strategic institutional planning in ways that have the power to motivate organizational adoption and cultural change". As learning institutions begin to deploy learning analytics, careful consideration of resistance factors can help to increase successful outcomes of enterprise-level analytics strategies.

During the Learning Analytics and Knowledge 2012 conference in Vancouver, a keynote speaker – Barry Wellman – described his experiences in the early 1970's in helping to establish the field of social network analysis. Wellman stated that the activity and energy that he felt within the learning analytics field were comparable to those within social network analysis several decades ago. In putting together this special issue, we hope to provide a small, but meaningful, contribution to the growing numbers of researchers and academics who are turning their attention to data and analytics as a means to become better teachers and help learners become better learners.