LEARNING ANALYTICS: ASSESSMENT OF MASS DATA IN DISTANCE EDUCATION

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ABSTRACT

The e-learning environment and its instruments have diversified with computer and internet technologies and provided new opportunities for open and distance educational researchers. As a result of the widespread use of the electronic environment in education, learner interactions were also transferred into the electronic environment. One of the important advantages of this new environment is being able to record learner interactions in considerable detail. In the electronic environment, the frequently of access of a learner to content, the duration and times of such access, the user's progress, the diversity of sources the user accesses, the subjects the user shares, the times, quantity, and party the user engages in sharing can be recorded utilizing a computer and information technologies. Analysis of all such data led to appearance of learning analytics as a new field. Learning analytics was defined as a due field aiming to access trends or structures utilizing large educational data in order to move customized higher education forward in the report of New Media Consortium (NMC) on higher education published in 2014. This study presents a theoretical starting point of learning analytics, definitions made in related literature, scope and structure of the field, research environments and tools as well as suggestions for studies to be conducted in the field.

Keywords: Learning Analytics, distance education, data mining, massive data analyze, mass data in education.

INTRODUCTION

Developments in computer and internet technologies paved the way for the common use of electronic environments and instruments such as Web 2.0 tools, online surveys, e-mails, packages such as SPSS, NVivo, LISREL for scientific research. The e-learning environment and instruments diversified by fast-growing computer and internet technologies and provided new opportunities to educational researchers. Accordingly, efforts for processing massive data gained speed in the fields of Web analytics, data mining, social network analytics, and advanced statistics. It is possible to follow and evaluate traces left by learners in the electronic environment by utilizing all these fields. Therefore, computer and internet technologies not only expand scientific research opportunities or study areas but also allow the appearance of new research fields such as Learning Analytics.

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Purpose

The purpose of the study is to present a theoretical starting point of Learning Analytics as a new field in educational studies, definitions made in related literature, the scope and structure of the field, research environments and tools as well as suggestions for studies to be conducted in the field.

LEARNING ANALYTICS

As an umbrella concept, analysis is about benefiting from data, statistical analyses, and explanatory and predictive models in order to gain a point of view on complicated issues and act accordingly (Brown, 2012). Learning analytics as a type of analysis aims to reach a better success in student learning using these methods.

Learning can be defined basically as a product of interaction. Interaction of the learner with the teacher, content, and other learners can be diversified depending on the approach utilized even in traditional learning environments. Opinions of a teacher, scores achieved by students in exams, and scores achieved by students in orals exams are used for the assessment of learning while student opinions at the end of the lesson are also used for more advanced assessments. However, as a result of progress in educational technologies, educational resources were computerized quickly. Accordingly, learner interactions were also transferred to the electronic environment. One of the important advantages of this new environment is that learner interactions can be recorded in considerable detail.

In the electronic environment, the frequently of access of a learner to content, the duration and times of such access, the user's progress, the diversity of sources the user accesses, the subjects the user shares, the times, quantity, and party the user engages in sharing can be recorded utilizing a computer and information technologies. Transfer of learning interactions to the electronic environment led to the appearance of learning analytics as a new field in educational studies.

Definitions

Learning analytics was defined as a field aiming to access trends or structures via big data or datasets in education related to students in order to move the supportive and customized higher education system forward in the report of New Media Consortium (NMC) on higher education published in 2014 (Johnson et al. 2014). According to the definition of Society for Learning Analytics Research (SoLAR), learning analytics is the collection, measurement, analysis and reporting of data about learners and their contexts (SoLAR, 2014). According to another definition, learning analytics is an emerging field in which sophisticated data analysis tools are used to improve learning and education (Elias, 2011).

Scope and Structure

Learning analytics can be seen as an extremely complicated and onerous field of research. There are different application areas of the method. Examination of massive data is the leading one. It is possibly an effective approach, particularly in studies to be made in open sources and institutions having a high number of attendants. In order to apply this new approach effectively, there are some fields that researcher should possess, be familiar with, and even be specialized in. Nine of these fields are given in Figure 1 below.

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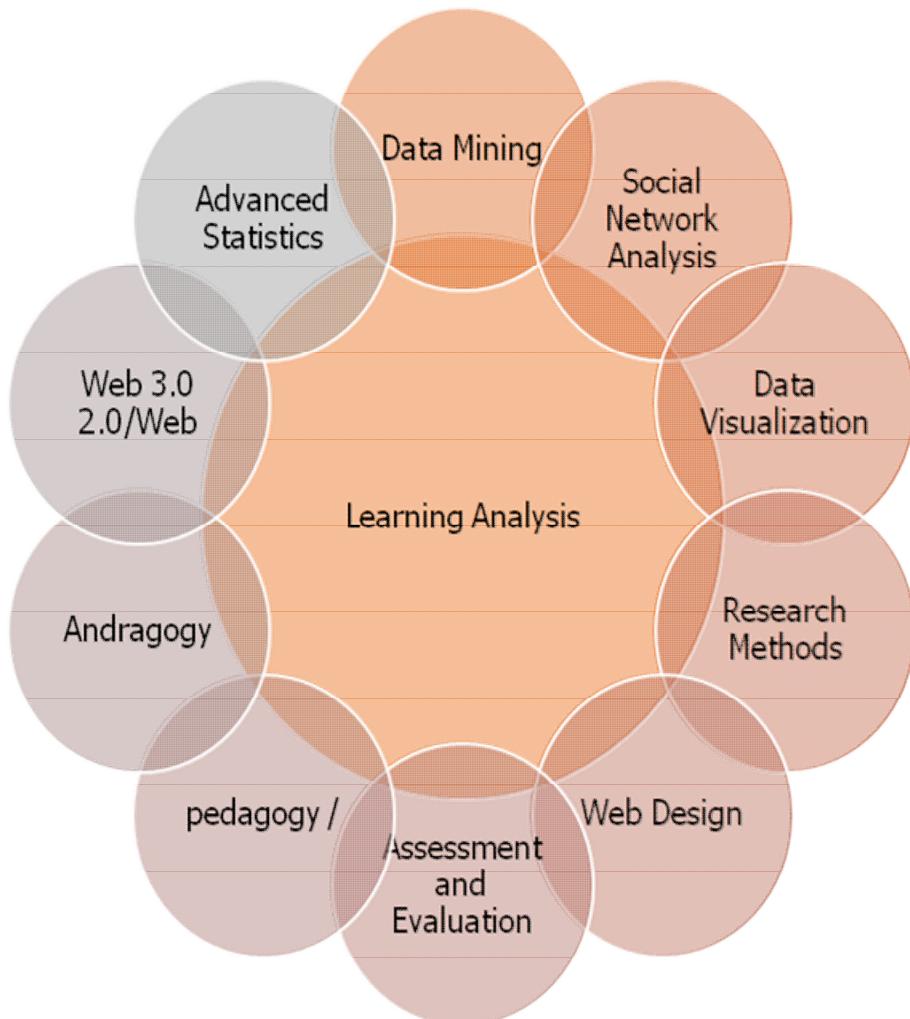
Figure 1: Required fields for learning analytics

As can be seen in Figure 1 many skills are required for learning analytics ranging from data analysis to methodology and advanced web software languages. Good assessment should contribute to understanding and improvement of learning processes (Alexander et al. 1992). Thus, a sufficient number of researchers for traditional researches will not be adequate for LA. Instead of that, forming a more extensive team of experts in their own fields can be required. In other words, LA can be considered as an interdisciplinary scientific field focused on education because of its nature.

According to Elias (2011), learning analytics is closely tied to fields such as Web analytics, academic analytics, educational data mining, action analytics and business intelligence (entire processes of taking strategic decision for the institution utilizing data analyses or algorithms). Relationship between these areas are summarized in Figure 2 below.

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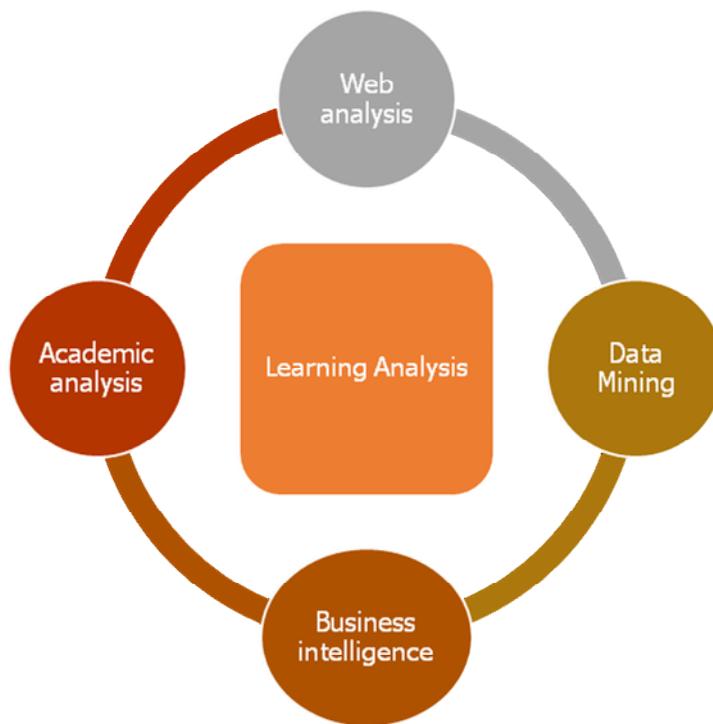
Figure 2: Learning analytics related fields

As can be seen in Figure 2 business intelligence refers to entire processes of taking a strategic decision for the institution utilizing the data analyses or algorithms, data collection, analysis and reporting of Web site usage by visitors, customers or learners. Academic analytics is related to the transfer of application principles and tools of business intelligence to academia (Goldstein and Katz, 2005). Data mining refers to collection, analysis, interpretation and record of large data in a broad sense. Unlike educational data mining, decision making processes are attempted to be improved by statistical predictive models in academic analyses.

Research Environments and Tools
Use of the electronic environment and its instruments in scientific studies is limited to online surveys, e-mails, packages like SPSS, NVivo, LISREL. This is because; collection, interpretation, assessment, and visualization of electronic data records were a work needing expertise a few years ago. However, such data are processed so as to allow students, teachers, analysts and managers to utilize them easily through different graphs, tables, and other visuals now (Shum, 2012). Some prominent research environments about learning analytics are given below.

Learning Management Systems (LMS) such as the Blackboard, Moodle, Edmodo and ConnectEDU, and Content Management Systems' (CMS) analysis board are leading environments in which effective studies can be made in the field of learning analytics. Comprehensive analysis boards for the interaction of the learner with the content, teacher and other learners are seen in these environments which are commonly used by many educational institutions, including especially universities. As a result of studies to be made using these data, not only defective aspects of the lesson or course can be determined but also student learning can be assessed.

Social network applications such as Facebook, Twitter, Forums, Blogs, Wikis, etc. are leading social network applications. Social network applications are a leading electronic environment in which learners are active the most. Therefore, the learner interacts with other learners and is affected by these interactions, mostly in these environments. Network analysis tools appeared using interactions of learners in Social network environments. SNAPP that provides interactive visualization for determining learning networks is a good example of such tools. A learning network is given in Graph 1 was generated in SNAPP.
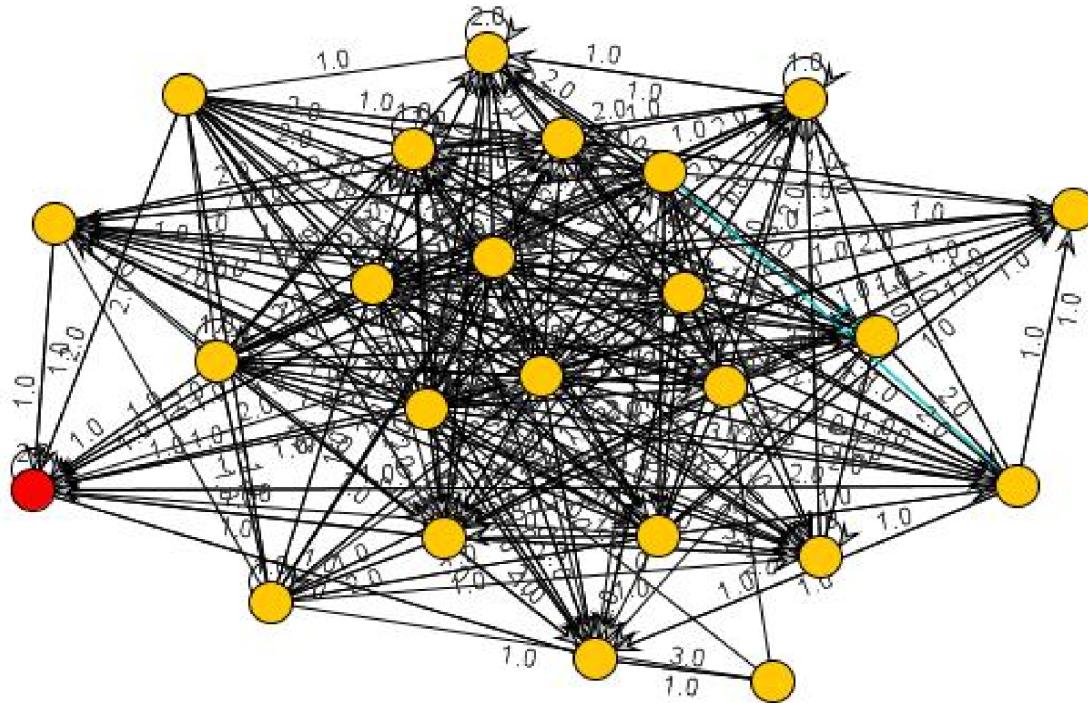
Graph 1: SNAPP network example

The field of learning analytics has a wide range of application and environment providing scientific research opportunities. In addition to Social Network Applications, some other important environments that can be used for scientific researches in Learning Analytics can be listed as follows:

- Computer and software logs: records of personal computers and all kinds of software,
- Games and simulations: all kinds of games, including 3D and video games, and simulations,
- Video Sharing Platforms: Video sharing platforms such as Youtube, Dailymotion, Google Video, Yahoo Video, Vimeo, and
- Search engines: Search engine services like Google Analytics providing detailed search analyses.

In Practice
Learning Analytics has specific techniques and strategies for analyzing massive data of learners. Obtained massive data are converted into graphs, visuals, network structures and figures supported by descriptive statistics. After massive data are visualized for better understanding, detailed analysis is performed. After analysis, decision-making process is entered by statistical techniques and predictive models.

There are a number of Web analytic systems keeping records of Web site usage by users primarily. Alexa, Google Analytics and Google Trends are the most prominent ones. In order to create comprehensive analytics in research, other tools such as Wolfram, Tableau and MaxMind that are still being developed for web analytics will be utilized with the aforementioned tools. The leading environments in which effective research can be done in the field of Learning Analytics are analysis boards of environments such as Blackboard, Moodle, Edmodo and ConnectEDU related to the LMS and CMS analytics. Besides, learning analytics can be performed examining analytic information related to analytic information going beyond traditional LMSs by both Google analytics services and institutional Web records (log).

Comprehensive analysis boards for the interaction of the learner with the content, teachers and other learners are seen in the LMC environments which are commonly used by many education institutions including especially open educational institutions and other universities. As a result of studies to be conducted using these data, not only defective aspects of the lesson or course can be determined but also student learning can

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be assessed. Social network applications are leading electronic environments in which learners are active the most. Therefore, the learner interacts with other learners and is affected by these interactions, mostly in these environments. Network analysis tools appeared using interactions of learners in Social network environments. NodeXL, SNAPP, SVAT, InMap and Facebook Insights are the leading of them.

CONCLUSIONS AND SUGGESTIONS

One of the important requirements for shaping the future of higher education is not being able to analyze massive data in electronic environments scientifically (Siemens and Long, 2011). At this point, Learning Analytics which has remained on the agenda of educational studies for 3 years are considered as an important solution suggestion. Although Learning Analytics which allows to research massive and multi-dimensional data scientifically are an approach being developed, the LA is explained in the NMC Horizon 2014 Higher Education Report as a due approach that requires adaptation within a year or shorter period (Johnson, Adams Becker, Estrada & Freeman, 2014). Required areas of expertise for learning analytics given below in Figure 3.
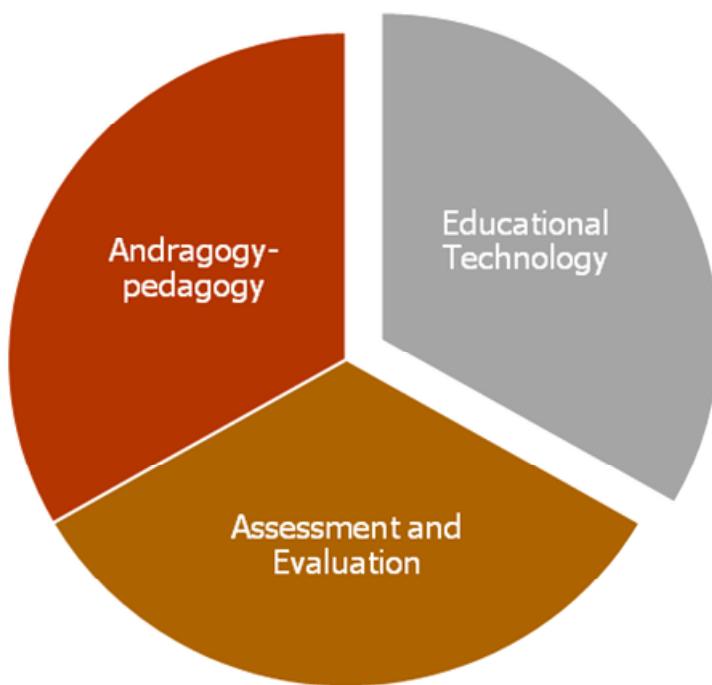
Figure 3: Required areas of expertise for learning analytics

Necessary proficiencies such as data mining, social network analytics, data visualization, research methods, Web design, measurement and assessment, Pedagogy/Andragogy, Web 2.0/Web 3.0, and advanced statistics should be met in studies to be conducted in the field of learning analytics. Considering these proficiencies carefully, it can be said that a team for studies to be conducted in the field of Learning Analytics should be formed by experts in at least 3 fields.

Expertise fields required for the LA are constantly in mutual communication and interaction. Therefore, the team should learn to cooperate in LA studies. Booth, (2012) suggested the following three strategies for enabling the LA team to cooperate and sustain the work:
- Providing cooperation training to the LA team,
- Raising awareness for important items that should be measured in learning processes and technologies to be used for measuring, and
- Eliminating factors that prevent the LA team from working together.

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Considering strategies of Booth (2012), it is seen that everyone in the LA team learns working together and focuses on sustaining the cooperation. Preventive factors mentioned in the third strategy can be all kinds of institutional, environmental, and individual obstacles. For example, individual working habits of one or some of experts in the LA research team may be a preventive factor. Therefore, it may be necessary to give cooperation training to the team and conduct awareness raising activities. Researches to be made in the field of Learning Analytics (Brown, 2012; Booth, 2012):

- can be a warning to the teacher or instructor, student, and director when an intervention is necessary for educational institutions,
- can provide output for designing, constant improving, and publishing lessons,
- can contribute to individualization of learning environments,
- can include the student in the learning processes,
- can provide informative and supportive feedbacks to all shareholders of learning and teaching processes,
- can assign duty and give responsibility to students in the assessment of learning processes, and
- can contribute to the development and improvement of the curriculum or lessons significantly.

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