

# Learning Analytics and its challenges in Education Sector a Survey

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## ABSTRACT

Analytics is a field of research and practice that aims to reveal new patterns of information through the collection of large sets of data held in previously distinct sources. Growing interest in data and analytics in education, teaching, and learning raises the priority for increased, high-quality research into the models, methods, technologies, and impact of analytics. The challenges of applying analytics on academic and ethical reliability to control over data. The other challenge is that the educational landscape is extremely turbulent at present, and key challenge is the appropriate collection, protection and use of large data sets. This paper brings out challenges of multi various pertaining to the domain by offering a big data model for higher education system.

## Keywords

Learning Analytics, Learning Management System (LMS), Educational Data Mining (EDM), Big Data, Special issue, Society for Learning Analytics Research.

## 1. INTRODUCTION

Learning Analytics is latest and fast growing area of Technology Enhanced Learning research and practice that aim to provide results to big queries by revealing new patterns of information through the aggregation of large sets of data held in previously distinct sources. It draws on a number of informing disciplines. Its roots are in the disciplines of information systems and computer science, where it is known as data mining and process mining. Analytics applied to the collection and analysis of data sets in educational institutions, is often known as institutional research.

In this context of this Journal, interested in how analytics can be used proactively to create and manage the institutional conditions that promote learning engagement, to make a significant contribution to future research by using these findings to identify the challenges that learning analytics must now address. In particular, how learning analytics can be used to enhance the education.

## 2. LITRETURE SURVEY

Learning analytics is defined 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” [1]. Learning analytics deals the promise for predicting and improving student success and retention in part because it allows faculty, institutions, and students to make data-driven decisions about student success and retention. Data-driven decision making involves making use of data, such as the sort provided in Learning Management Systems (LMS), to inform educator’s judgments [6][1].

In education field, the learning analytics is analyzing the data of the learners and there different context to improve learning among the learners and it is referred

as learning analytics. Analytics slowly acquiring the field of education like other fields. That has taken initiative towards emerging technology. Management identifies the value of data in improving not only teaching and learning, but the entire education sector [2].

The emerging field is seen to be one of the fastest growing areas of research related to education and technology. Its purpose revolves around managing and using data patterns to make endorsements for refining learning. To achieve this, learning analytics questions learner-based data interaction (using techniques such as predictive modeling, user profiling, adaptive learning, social network analysis, and metacognition) to inform prompt actions or decisions based on the results. Such decisions could include identifying the necessity for involvement, personalizing support or promoting self-regulation of learning [3]. The purpose of this study was to develop an analytics maturity model through which institutions can assess their own progress in the use of academic and learning analytics. Most of the educational organizations surveyed, they are actively engaging in activities like data analytics in the areas of enrollment, retention, institutional resource optimization, and financial management [16] etc.

Nevertheless, the study found that institutional leaders who aim analytics are an investment for the institutional progress and they are more likely to use data proactively to drive specific interventions or other actions. Since analytics is the latest emerging area [17], all fields must adopt to be measured and progressed in there respective domain.

The learning analytics provides a new model for college and university front-runners to improve teaching, learning, organizational competence, and decision making and, as a consequence, serve as groundwork for systemic change. But using analytics requires that think carefully about what is needed to know and what data is most likely to retrieved, what need to know [18].

In colleges and universities, the data focus is increasingly expressed using the term learning analytics. Though still a young concept in education, learning analytics already suffers from term collapse. The ubiquity of the term analytics partly contributes to the breadth of meanings attached to it. According to the 1st International Conference on Learning Analytics and Knowledge, “learning analytics is 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”.

This learning analytics brief informs policy makers and administrators how higher education institutions are using analytics to improve student services, grades, retention, and learning outcomes, consistent with the U.S. Department of Education’s National Education Technology Plan for 21st century learning. Data mining and analytics, including user modeling, user profiling and clustering, domain modeling, relationship mining and data visualization promise to disclose

outcome-oriented actionable visions from specific learning behaviors. [19]

#### 4. THEROTICAL BACKGROUND

In Technology enabled learning, many data can be collected from different kinds of student actions, such as solving assignments, taking up exams, social interaction, participating in discussion forums, and extracurricular activities. This data can be used for Learning Analytics to extract valuable information, which might be supportive for teachers to reflect on their instructional design and management of their courses. Usable Educational Data Mining and Learning Analytics tools for teachers that support cyclical research activities are still missing in learning analytics [11].

Data mining tools are normally designed more for power and flexibility than for simplicity. Most of The current data mining tools are too complex for educators to use and their features go well beyond the scope of what an educator might require” [12].

Process can be presented as a widget, which might be integrated into a VLE, a dashboard, or a PLE. Based on suitable graphical visualizations of the analyzed data, teachers are supposed to be able to more quickly interpret the visualized information, reflect on the impact of their teaching method on the learning behavior and performance of their students, and draw first conclusions about the effectiveness of A typical Learning Analytics process is depicted in the below figure 1. The process initiates with the gathering data, in this stage, data is gathered from different learners’ activities when they interact with learning elements within a VLE (Visualized Learning Environment), LMS or a personal learning environment (PLE). Examples of these activities comprise participation in collective exercises, writing a forum post or reading a document. During the data collection, it is critical to address data privacy issues. Often the output of the data extraction and preprocessing is transferred into a separate database. The Learning Analytics process is the mining of the preprocessed data, based on different mining techniques, such as clustering, classification, association rule mining, and social network analysis. Thereafter, the results of the mining their teaching, i.e., consider if their goals have been reached. Furthermore, unpredicted findings should motivate them to iteratively progress their teaching involvements. However, having a graphical visualization does not promise that teachers will be able to deduce the information represented appropriately. Indicators must be designed and evaluated carefully. Also, the system should provide instructions for interpretation. Figure1. Results of this study showed that teachers already have various questions about their instructional design and the utilization of learning materials, the students’ learning behaviors and correlations between objects of teaching and learning as well as outcomes. Their objectives can be example to find out how well the overall instructional design is appreciated, to learn more about the needs of all or a specific group of students, or to better understand learning processes in general [11].

The study specified above was that Learning Analytics tools should support teachers by gathering, integrating, and analyzing data of different sources as well as by providing a step-by-step guidance including semi-automated processes, instead of just presenting large tables of data [13].

#### Main Approaches:

There are few methods suitable amongst many methods for educational data mining. These methods are: prediction, clustering, relationship mining [19].

Tables: [19]

Category of Method	Goal of Method	Key applications
Prediction	Develop a model which can infer a single aspect of the data (predicted variable) from some combination of other aspects of the data (predictor variables)	Detecting student behaviors Predicting and understanding student educational outcomes
Clustering	Find data points that naturally group together, splitting the full dataset into a set of categories	Investigating new student patterns. Investigating similarities and differences between schools.
Relationship Mining	Discover relationships between variables	Discovering which pedagogical strategies lead to more effective/robust learning

#### 5. OBJECTIVES

Objectives of this paper are to find out the challenges and issues of learning analytics using data mining techniques. Big data is “datasets whose size is beyond the ability of typical database software tools to capture, store, manage and analyze.” In response to the limitations of existing data-management techniques, a new breed of technologies like Hadoop, databases, and techniques like data-mining or knowledge discovery in databases has been introduced to overcome the issues and challenges. Among numerous possible objectives of Learning Analytics are monitoring, analysis, prediction, intervention, tutoring/mentoring, assessment, feedback, adaptation, personalization, recommendation, and reflection. Reflection is self-evaluation on all the levels of the hierarchy of information flow between the stakeholders. Prediction: predicting and modeling learner activities which can be helpful for involvements [14]. Objectives are distinguished: predicting learner performance and modeling learners, suggesting relevant learning resources, increasing reflection and awareness, enhancing social learning environments, detecting undesirable learner behaviors, and detecting effects of learners using potential abilities of big data.

Figure 1. The Learning Analytics Process

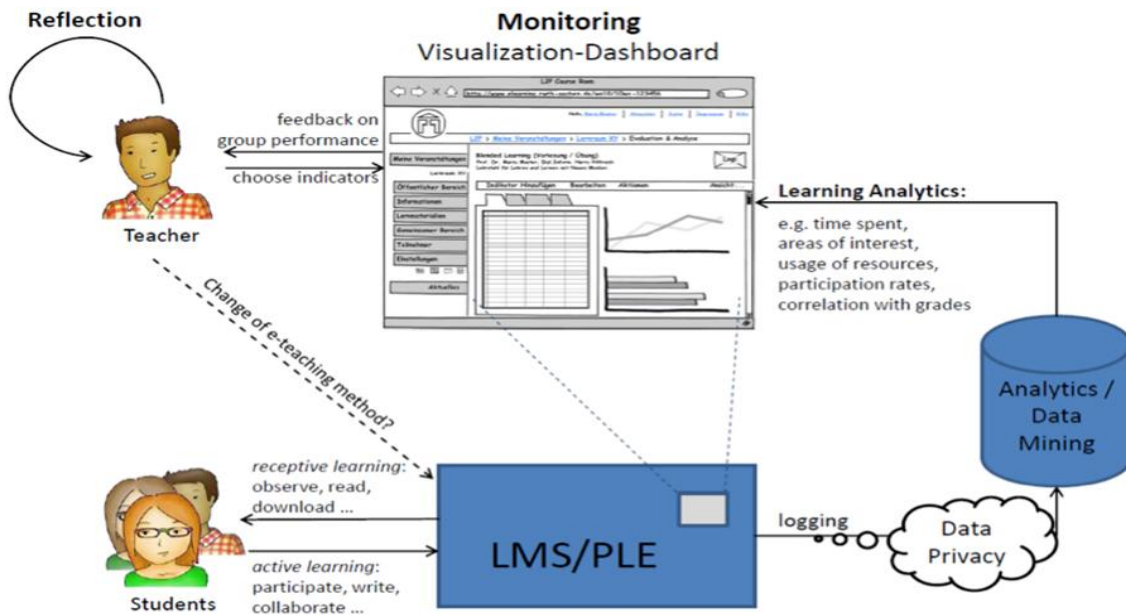


Fig 1: If necessary, the images can be extended both columns

## 6. CHALLENGES OF LEARNING ANALYTICS

This paper identifies challenges of learning analytics from the literature review

The enthusiasm surrounding this emerging field is involved by debates about its purpose, impact, validity and ethics. The debates in the field are core questions about the purpose of learning analytics and its relationship to learner support and control.

A key challenge is the appropriate collection, protection and use of large data sets. Learning analytics can focus too strongly on the technological specifics of collecting and analyzing information, rather than reflecting on how such data should be used, leading to major debate within the learning analytics field on what data should be collected and analyzed – and for what purpose [3].

Issues of data protection, ownership and privacy are also entirely relevant to this field and can cause learners and teachers to question both the immediate security of their data and who may eventually access information about their knowledge or competencies.

An institution's capacity to maintain a learning analytics system and design effective interventions is critical. An essential element of this is data literacy, or the ability to make use data effectively. The analysis of educational data must be aligned with a pedagogically-based plan for effective and relevant action resulting from that analysis.

Furthermore challenge is the instructional models used in learning analytics tend to reflect current educational priorities – such as mastering the curriculum and passing the course – and this emphasis ignores the complexity of learners' relationships to education and risks isolating learners who are not disposed to learn [3].

Is learning analytics is feasible to achieve greater embedding and consolidation of current methods and models? There's a slow adoption process and institutions are struggling with how to tie together the data from the disparate learning systems [3].

So build strong connections with the learning sciences

Understanding and optimizing learning requires a good understanding of how learning takes place, how it can be supported, and the importance of factors such as identity, reputation and affect how it effects to learning. Researchers will need to build strong connections with the learning [10]. Here concerned with developing methods for exploring the unique types of data that come from educational settings, using methods to better understand students, and the settings which they learn in.

Develop methods of working with a wide range of datasets in order to optimize learning environments and to improve the learner's performance

Learners will be looking for support from learning analytics outside the LMS, as involved in lifelong learning in open, informal or blended settings. This will require a shift towards more challenging datasets and combinations of datasets, including mobile data, biometric data and mood data. In order to solve the problems faced by learners in different environments, researchers will need to investigate what those problems are and attempt for how to improve the performance and success looks perspective of learners [10].

Develop and apply a clear set of ethical guidelines

Ethical guidelines are the major challenges will require decisions regarding the rights and stewardship of data. There is no fixed method for researchers to obtain informed and ongoing consent to the use of data, and there are no standard policies allowing learners to opt out or to have their analytic record cleared. As nevertheless, these issues have been identified as problems, but no detailed ethical framework has been developed for learning analytics. This is a demanding need for the educational field.

Failed to predicting those students who will most likely withdraw from or fail a particular course, our methods for analyzing are out pacing our reasons for analyzing and there are ethics and privacy issues that needs to be addressed [4].

Learner is weakening and is unable to figure out why, and then it becomes difficult for the learner to complete the course successfully. However, big data can fill up this gap by showing not just his/her demographics but also other learners who have been through the same phase. This method could assist the learner in two ways- either they understand where the problem is or they use the same to effort and succeed again [9].

## 7. INFERENCE

So this paper analyses the difficulty of learning analytics using data mining and the potential of big data solving learning analytics problems in urban areas. And rural area would be considered in the later part. Nowadays big data analytics attracted more and more attention which is required to manage immense amount of data which assists to enhance the student performance and increases the student success rate, retention, completion and graduation rate. Tracking a student's learning graph in course is mandatory in order to improve the learning system. With the traces that are left behind of each learner, it becomes easy to trace down their entire learning experience throughout the course module [8]. Big data concepts and analytics can be applied to a variety of education administrative and instructional applications, including recruitment and admissions processing, financial planning, donor tracking, and student performance monitoring.

Big data can save hours of effort in evaluating next future move. People working in different departments at times need to get together to evaluate, collaborate and cooperate work together for better functioning of Learning Management System. This is forced more by big data [9]. Big data will be future technology to enhance effective learning and teaching Skills, the most valuable educational application of metacognition is "Cognitive-and-Metacognitive Strategy for Learning and teaching that use an observing and improving process of design, with evaluative Quality Checks for learning strategies and Quality Controls for applications of learning strategies that help to improve the quality of learning, thinking, and performance. Learning Strategies are a major part of an overall Strategy Education."

## 8. CONCLUSION

The issues and challenges identified and expressed in this feature have provided with an opportunity to consider learning analytics in the context of the education. Clearly the issues and challenges of learning analytics transcend interests in education, however, the potential for making a real difference to students, and those who educate them, is surely the greatest during their education. Learning analytics is mainly ethical and educational practice, serving better and more successful learning. Learning analytics are prominent by their concern for providing value to learners, whether in formal, informal or blended settings. They are employed to understand and optimize both learning and the environments within which it takes place. Although this is latest area of research, it draws on extensive work in related areas, and has already developed a range of tools and methods that offer exciting potential. This review has identified few major challenges that this field must now address: integrating experience from the learning sciences, working with a wider range of datasets, engaging with learner perspectives and developing a set of ethical guidelines.

The natural threat and promise of having access to, and analyzing "big data" [7] dictates a careful consideration of the ethical dimensions and challenges of learning analytics in

the urban area. The inferential techniques being used on Big Data can offer great insight into many complicated issues of learning analytics, in many instances with remarkable accuracy and timeliness. The prediction about the business, problem solving, decision-making, government administration and many things else could possibly be improved by analyzing data in better techniques [7].

In educational organizations, introducing the "big data" through new broad learning media, combined with advances in working out holds promise for improving learning processes in formal education for urban area, and beyond as well[5].

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