

Original Research Paper

Learning Analytics and Teaching Analytics: The Similarities and Differences

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Abstract: Analytics in education which constitutes of Learning Analytics and Teaching Analytics arouses great attention among researchers and practitioners in the current climate. The use of analytics in education enables educational data to be collected and analysed to serve the needs of all stakeholders to improve the educational process. The present paper gives an overview of Learning Analytics and Teaching Analytics and explores its similarities and differences, as well as the confusion that has been raised between the two defined terms. Alongside, the analytics selection flowchart presented in this paper provides a breakdown on the analytics research direction for Learning Analytics and Teaching Analytics. A deeper and varied understanding of Learning Analytics and Teaching Analytics is imperative for establishing effective and accurate analytical tools alongside with recommendations for improvement in the future.

Keyword: Learning Analytics, Teaching Analytics, Education.



1. Introduction

As economic pressures continuously demand that graduate students at universities perform academically well, the use of analytics in education has grown increasingly vital [1], [2]. Moreover the easily available educational data from educational software and online learning dashboards has helped accelerate the growth of analytics in education. Hence, a variety of terms have been adopted to describe the concepts and processes of analysis and delivery, with Learning Analytics and Teaching Analytics as the most common terms used in education. According to Siemens and Long [3], Learning Analytics was first introduced in 2011 at the Learning Analytics and Knowledge (LAK) Conference and they defined Learning Analytics as:

“the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and environment in which it occurs.”

The idea is to draw learners' data from demographics to learning progress and characteristic in order to gain insight into the teaching and learning environment for interventions and decision-making. Whereas Teaching Analytics refers to the methods and digital tools to help educators to analyse and improve the educational designs prior to the delivery [4]. Learning Analytics and Teaching Analytics are defined differently but they share a similar end goal which is to effectively improve the educational process. But the growth in studies within this field has raised some confusion between the areas that each term covers and focuses on. As many studies are categorized under Learning Analytics even though it records and caters improvement for educators, it seems that Learning Analytics has become a simple one stop label for all analytics related work in education.

As institutions begin to adopt Learning Analytics and Teaching Analytics into their core management and administration processes, it is important to recognize the unique attributes of each term. This paper details the similarities between both terms Learning Analytics and Teaching Analytics in the next section, and followed by the differences that sets them apart. Lastly, the final section is devoted to discussion and conclusion of future direction for Learning Analytics and Teaching Analytics.

2. Methodology

As it is impossible to include all related studies, henceforth a set of criteria is defined in the selection process. A search of peer-reviewed articles was conducted through 2011 to 2018, based on a range of keywords which includes, “Learning Analytics”, “Teaching Analytics” and the use of Boolean operators (OR, AND) among the keywords was also performed in order to extend the coverage of the search results. The search was conducted in a wide variety of databases including ACM Digital Library, IEEE Xplore, ScienceDirect, ERIC, Google Scholar and the main publication for Learning Analytics articles, Journal of Learning Analytics.

Additionally, the any relevant references cited in the articles found was also included. The selected articles was analysed based on the subject area, objectives, target audience of the study, accountability and educational data used, to identify the similarities and differences between Learning Analytics and Teaching Analytics. Lastly, duplicate articles and articles that do not meet the selection criteria were removed from the pool. The search process led to 51 articles.

3. Results

Based on recent studies, the field of Teaching Analytics is considerably new and has been heavily reliant on exploiting the existing Learning Analytics methods and tools available to gather and analyse data. For example, the current research works on Teaching Analytics are scarce [5] and mostly based on Learning Analytics tools, when data is collected from Learning Analytics tools and later presented to educators after learning sessions as a mode of teaching analysis, it gives way to the problem of data overload and the context of the data is not translated to highlight the reasons it was initially collected and its purposes [6]. Keeping in mind that the target audiences are different, Learning Analytics focuses on learners whereas Teaching Analytics focuses on educators, yet much work of Teaching Analytics is designed based on Learning Analytics framework, creating confusion or ‘grey area’ in the field of Learning Analytics and Teaching Analytics.

With the growing interest in analytics, it is important for researchers to identify the unique attributes of both Learning Analytics and Teaching Analytics. This allows them to be addressed differently instead of looking at it as a single entity. Thus, giving researchers a more definitive roadmap in classifying future work.

3.1. Similarities

Learning Analytics and Teaching Analytics are defined differently. However both of terms share the same goal of analysing educational data to improve the teaching and learning environment. In other words both work as an educational tool for assessment, improvement and supports decision-making.

In recent years, both Learning Analytics and Teaching Analytics have gained popularity among researchers, mainly because of it practices towards better education [7] by merging information collected from the learners and educators in advance. Traditionally such information is only stored in a database with limited further analysis done to deliver meaningful information which can be converted into actions or interventions in time to improve the situation as a whole. However with the help of Learning Analytics and Teaching Analytics, such information from learning progress and performance can be extracted to identify students at risk, so suitable intervention or suggestions can be applied to help those students before it is too late [8], [9], [10] and eventually improving the retention rate of educational institutions.

Also with the help of analytics tools learners and educators can better comprehend how the learning process is carried out and as well as the problems that exists within. It creates a starting point for helpful conversations between both learners and educators rather than having a broad idea that is unable to target the problems specifically.

Analytics not only creates a point of reference for both educators and learners to move forward it enhances the learning and teaching practices to betterment which is depicted in various studies (e.g. Prieto et al., [11], Vatrappu et al. [12], Verbert et al. [13]). However at the end of the day, what is important is the interventions that can be derived from Learning Analytics and Teaching Analytics [14] regardless whether it is from the point of view of the student or educator in order to close the process loop of improving educational practices.

3.2. Differences

Both analytics terms although with many similarities are different which raises confusion among the usage of both. Table 1 shows some of the key differences between the Learning Analytics and Teaching Analytics.

Table 1. Differences between Learning Analytics and Teaching Analytics

	Learning Analytics	Teaching Analytics
Target Audience	Students	Educators
Accountable	Learners action	Educational design and delivery
Educational Data	Focus on students' learning progress.	Focus on teacher's physical action data during the delivery of educational contents.
Example of Educational Data	Engagement with educational resources, students' academic performance and demographics.	Frequency of teacher's participation and engagement in discussion activities in class.
Objectives	To maximize the learning potential and behaviours making it more closely aligned with learner's needs and preferences.	To support educators to conduct easier analysis as compared to traditional tabular formats, supporting them in better assessing the effectiveness of the course design for further action and refinement.

One key difference that distinguishes Learning Analytics from Teaching Analytics is the target audience. Learning Analytics is learner-centric by reporting of data about learners and with the

purpose of understanding and optimizing the learning and environment; whereas Teaching Analytics is targeted to help educators analyse and improve educational designs before and after delivery, making its target audience to be educator-centric. Although the target audience are different for both, with much more research efforts focused at Learning Analytics rather than Teaching Analytics hence most Teaching Analytics research works, such as Prieto et al. [11] and Dyckhoff et al. [15] rely heavily on exploiting the existing Learning Analytics methods and tools available instead of having research works focused and designed specifically from an educator's point of view. With that in mind Teaching Analytics data often are not converted to meaningful reports for educators to understand and take action upon it.

Secondly, the context that Learning Analytics and Teaching Analytics are accountable to are different such as Learning Analytics accounts for learners actions; while Teaching Analytics accounts for the educational design and delivery [4]. For example, Learning Analytics gathers and processes data related to learners learning progress and performance. It does not put into account of how the content is being delivered.

By contrast, Teaching Analytics processes educational data with the main purpose of supporting educators' reflection to improve their delivery process [16]. Hence, different educational data will be collected and processed for both Learning Analytics and Teaching Analytics, making it another point that sets them apart.

As mentioned above another considerable difference is the educational data collected. In conventional Learning Analytics tools educational data that is collected is focused on learners, mainly their engagement with educational resources or tools, engagement in discussion activities, demographics which includes the learners past competences and attendance. On the other hand Teaching Analytics tools is designed for educators and will consider information such as the frequency of educator participation, educator engagement in discussion activities, level of engagement in teaching process, analysis of their teaching approach and any points of modification. The misperception between Learning Analytics and Teaching Analytics always revolves around the educational data that they use. It is a general impression that Teaching Analytics is a subset of Learning Analytics instead of a different field by itself that shares some common educational data points with Learning Analytics.

Identifying what educational data which is used for Learning Analytics and Teaching Analytics is key to prevent confusion and allow researchers to understand the main direction and how each field should be addressed differently. Another difference that can be identified is their specific purposes. Although Learning Analytics and Teaching Analytics share the common end objectives of improving educational practices as a whole, but Learning Analytics's specific purpose is to maximize the learning potential and behaviours making it more closely aligned with learner's needs and preferences; whereas Teaching Analytics is to assist educators to conduct easier analysis as compared to traditional tabular formats, supporting them in better assessing the effectiveness of the course design for further action and refinement.

4. Discussion

The paper so far has highlighted some of the similarities between Learning Analytics and Teaching Analytics, such as having the same end objective, much research works on Teaching Analytics are predominantly based on or defined as part of Learning Analytics, even though these two terms have many point of differences, in particular, they have a different target audience, the context that they are accountable to varies, the types of educational data that is used and its specific purposes also diverges. Each of these highlighted differences are crucial for future research work in both fields, especially in Teaching Analytics, as the voice of educators are equally important in improving education practices as a whole.

Also future work for Learning Analytics and Teaching Analytics should not heavily rely rigidly on each other. As mentioned above, Teaching Analytics research efforts and tools are mostly designed based on Learning Analytics.

Data collected from Learning Analytics is deployed into Teaching Analytics for educators, such efforts will not be able to support educators in decision-making, as data and methods in Learning Analytics are specifically designed to cater to improve learners' learning progress and behaviours, instead of supporting educators in reflecting their teaching approaches.

Other than that, data which is extracted and presented to educators are often faced with information overload with its context not being translated into meaningful information for educators [1], making it unusable for Teaching Analytics. For instance, to maximize a student's learning potential, their attendance and past competence level data is important to Learning Analytics to analyse their learning potential and challenges, so his/her success or failure in the course can be determined in advance [17], while such data may not be relevant to a college lecturer in assisting them to assess the effectiveness of their teaching technique. This is because each subject in a university or college are taught by different lecturers with varying personalities and styles. Intervention can only be done based on the current subject that the lecturer is conducting, making much of Learning Analytics data irrelevant.

Instead, data that is relevant to Teaching Analytics to support lecturers in reflection are teaching approaches and their engagement with the activities and etc. Hence, in order to improve the current situation, it is crucial to highlight the reasons in collecting the data, understanding the context of how the data should be used in creating a better frame of references for educators [18] and support educators with insights on how to improve their teaching practices [19].

Most importantly, Teaching Analytics has to be addressed as a field by itself that has overlapping similarities with Learning Analytics instead of a subcategory of Learning Analytics. With that in mind, the requirements and needs from an educator has to be taken into consideration in Teaching Analytics research work, so the design can be aligned to meet the needs of educators [20] instead of focusing solely from a learner's point of view in improving the education process.

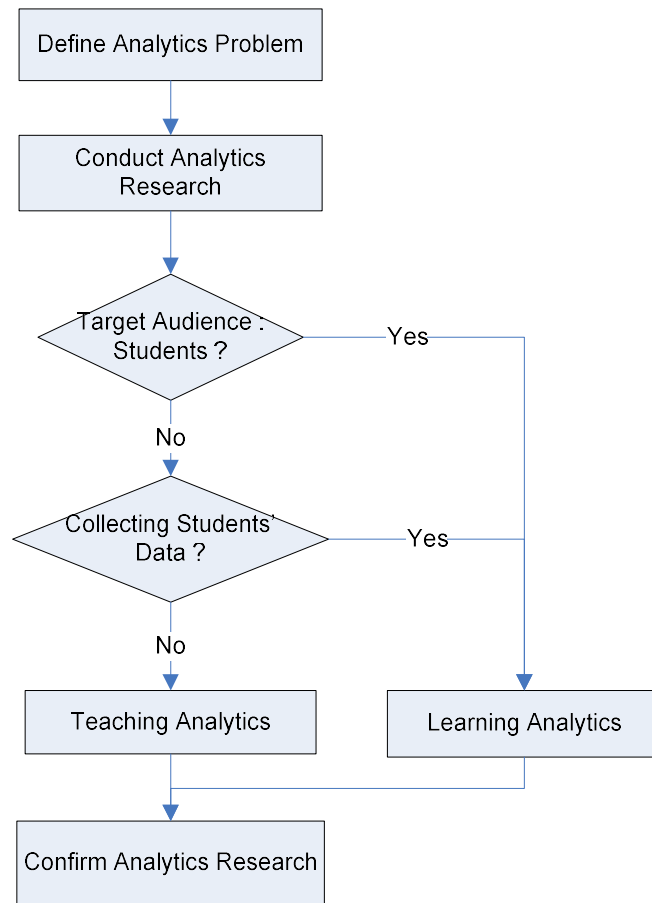


Figure 1. Analytics Selection Flowchart

Figure 1 presents a flowchart that offers guidance for future researchers and practitioners in planning their research works for analytics in education. In order to confirm the direction of the research, there are two determining questions. The first question is “Is your target audience – students?”. Researchers have to decide if the target audience of their research is to benefit students or educators. If the target audience is students, then it is categorized under Learning Analytics research. This is because Learning Analytics analyse and report data about learners and their context in learning. Whereas if the target audience is not students, it will lead to the next question, “Are you collecting students’ data?”. During the collection of the data, if the research are measuring students’ data such as their demographics, engagement level and academic performance, then the research goes under Learning Analytics. Research that do not collect and measure students’ data, in other words it focuses on educators’ data such as an educator’s physical engagement in class and frequency of participation, it is then categorized as Teaching Analytics research. Following the flowchart, research works for analytics in education whether it is Learning Analytics or Teaching Analytics can be conducted compliant with the purposes of its study.

5. Conclusion

It is known, that analytics in education is an emerging research field because it supports stakeholders whether it’s learners, educators, institutions or investors to justify their decisions both academically and financially. Literature has also revealed that a well-designed dashboard in presenting data may guide viewers towards an effective decision making process. Therefore, in order to ensure an effective deployment of Learning Analytics and Teaching Analytics in education, it’s important to understand their similarities and differences beforehand. For instance, Learning Analytics and Teaching Analytics have different target audience, so it should always be addressed differently. More specifically, Teaching Analytics supports educators in improving the teaching and learning environment, hence the direction of Teaching Analytics research has to be conducted from an educators’ perspective instead of relying on the data from Learning Analytics research.

In summation, in order to ensure an effective deployment of analytics in education for both learners and educators, a different narrative on what the educational data means to Teaching Analytics is vital to drive forward this research effort. Learning Analytics and Teaching Analytics are connected with some core similarities, but have very distinct differences, a deeper and varied understanding of Learning Analytics and Teaching Analytics is imperative for establishing effective and accurate analytical tools alongside with recommendations for improvement in the future.

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