Student-centric Learning Analytics: Putting analytics into the hands of students

Craig Banyard[0000−0002−0589−3894] and Ismini Vasileiou[0000−0001−6174−3586]

University of Plymouth, Drake Circus, Plymouth PL4 8AA, United Kingdom
craig.banyard@plymouth.ac.uk ismini.vasileiou@plymouth.ac.uk
https://www.cscan.org/

Abstract. Learning Analytics is growing rapidly across Higher Education institutions across the globe. There are some software solutions to learning analytics which are mainly focusing on intervention, retention and resource allocation, driving institutions to collect and analyse data at an institutional level. Such data only provides a small window into a student and how they spend their time learning. Institutions link progression to specific interactions and neglect students' self-study, any social factors and any individual learning needs. Therefore, this paper is looking at Learning Analytics and how data can help each student individually. To achieve this, the data should examine and analyse a student providing intuitive data that can be used to reflect and alter learning behaviour. The proposed solution is more than just contributing to a data-driven education system allowing students to add learning activities, set personal targets and interact with members of staff during sessions; this enhances students self-regulated learning skills and their engagement while providing a clearer picture of a student's learning behaviour.

Keywords: Learning Analytics · Student Engagement · Higher Education · Big Data · Analytics

1 Introduction

In recent years various learning pedagogies have emerged and suggested that there are changes in the way students learn. Personalised learning is becoming core amongst Institutional Education Strategies, and the use of technologies spreads rather fast. Learning, whether it takes place online, face to face, or as flipped classroom approach, changes the group dynamics and puts the learner in the heart of the education system. For a student, engaging in the process of learning has been an area of research at the University of Plymouth. With aims and goals around student motivation, student engagement and participation, learning becomes more profound, the learner becomes a collaborator, and the institution needs to participate in instructional planning. With Learning Analytics, institutions can enhance their reputation by increasing student learning retention and success. By using Learning Analytics, institutions value their

learners, and the latter can shape their experiences and learn according to their goals and ambitions.

Learning Analytics refers to those applications that analyse educational data in an attempt to provide both the learner and the tutor with patterns of behaviour to improve learning and its related activities. The UK Higher Education sector is trying to respond to forces and changes that either stakeholders or the government is pushing and introducing. Moreover, there are great opportunities that are arising where current practices can be examined and new solutions to emerge.

Kolb's traditional experiential learning cycle[1] which was based on Piaget and Dewey theories[2,3], which has been there as a foundation for all recent developments of teaching and learning. In addition Lewin's suggestions of how a student can learn via the route of feedback[4], making a stronger case of visualising the student data, and the need for generating data that will be able to measure and guide any intervention needed. Being open and transparent with the Institutional data, we develop greater social acceptability[5]. By seeing the students as partners, by understanding what student engagement means for each individual, we understand better as educators the challenges we are facing[6,7]. This, of course, is undoubtedly not a straightforward scenario and it can be affected by data protection legislation. Using personal data is becoming more sensitive nowadays. In this research, Learning Analytics were used fundamentally to try and bridge the gap between student data, measuring student engagement and institutional policies. The research, is proposing strategies on understanding the student data, how the data can be used at the local level and proposes a conceptual framework for achieving such strategies to improve desired outcomes.

2 Student Engagement in Higher Education

Student Engagement is becoming a core area of research across many UK Institutions. Gradually students are invited to suggest views and often make changes to the curriculum and/or research. The growth of roles, responsibilities and opportunities that arise from such potential collaborations, increase the student involvement but at the same time it creates a lack of clarity over the definition of "Student Engagement". Common questions we often hear at conferences, policy and curriculum meetings are "when is a student engaged?", "how do we measure student engagement?", and "what stops students from engaging?".

In 2016 the UK Higher Education faced the introduction of the Teaching Excellence Framework (TEF)[8]. This framework aims to measure the retention rates of each institution, student satisfaction and employability. The UK HE sector is making an attempt to analyse and understand the various data that it is holding and extract common patterns for which policies can be implemented. In order, though to achieve this, the HE sector needs to fund the area of learning and data analytics in order to understand the complex nature of the data already

collected but also the future data. The figure below shows how student experience is being influenced these days and the main areas students can affect.

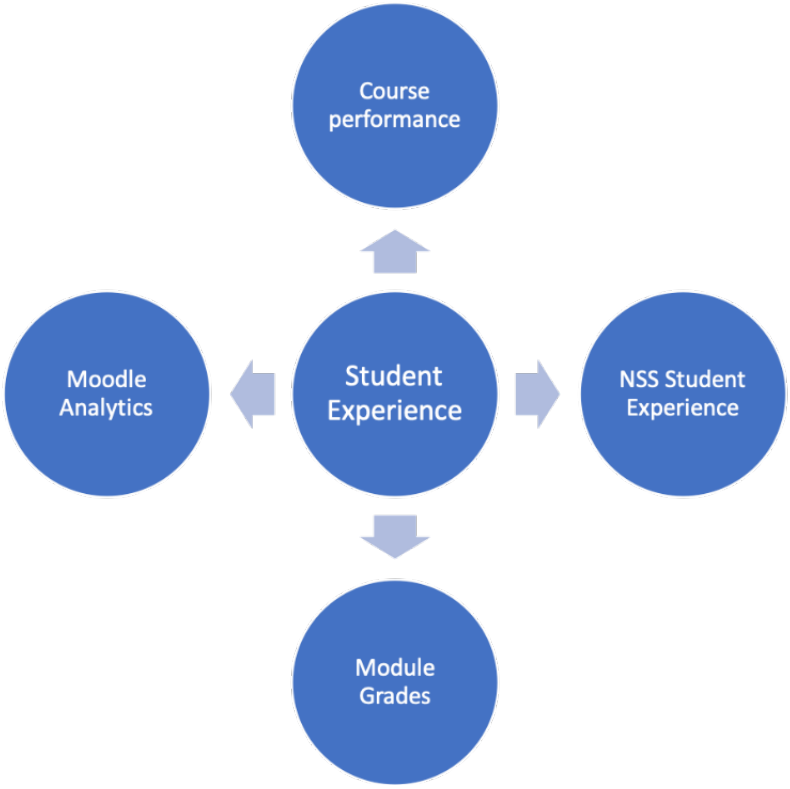

Fig. 1. The student experience that influences institutional NSS result and ranking.

The authors, reinvestigated the current UK Higher Education climate, analysing the current Learning Analytics process and it was apparent that the institutional focus across the UK was mainly on data collected by the establishment and what the latter can do with such data. For the purpose of this study, the authors approached the data from the student perspective. Thus, the data collected and analysed had to tell a story where the student can use the data for their continuous personal development and reinforcing their learning. The questions that started formulating were around attendance, module grades, overall course grade and of course how all these define student engagement. Some argue that when face to face interaction is present, then the students perform better.

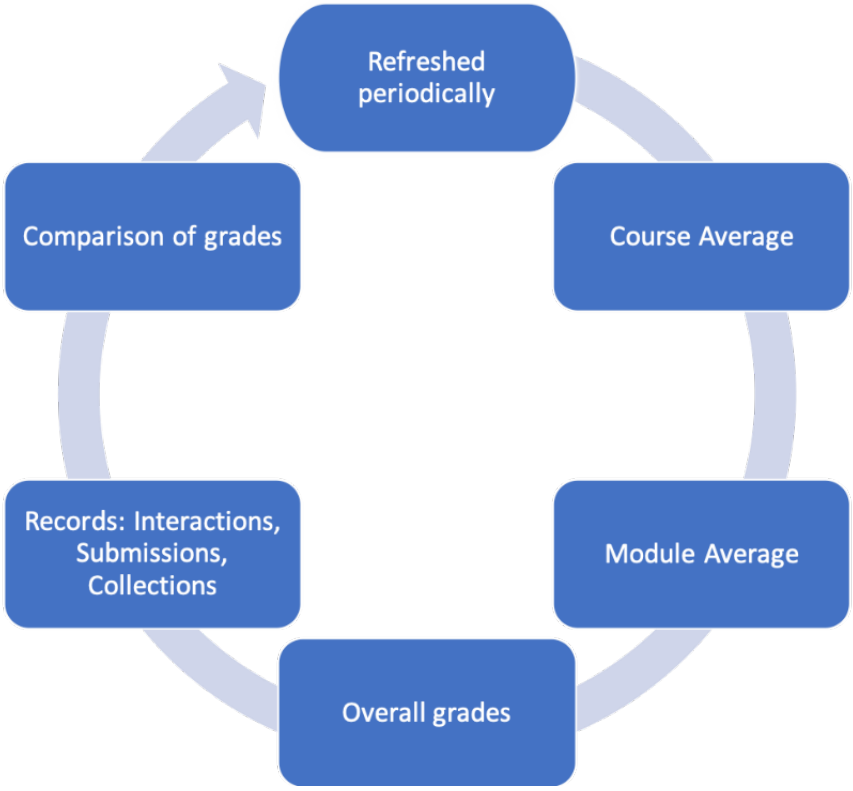

Fig. 2. Learning Analytics application cycle.

3 The Case Study

Higher education institutions are collecting vast quantities of data; however, the data collected only shows a narrow insight into students learning and development. The institutions can only analyse the data that has been produced on university systems or while a student is on campus, this can produce a bias in the data which during analysis can lead to misinterpretation. The literature suggests that student engagement is closely linked to the students' desired outcomes from university and can attribute to students persistence, educational attainment and their learning and development [9].

The authors designed an application to provide students with a broad picture of their learning behaviours while fostering student engagement. It was identified that student participation is essential to gain a comprehensive view as there are many learning activities for example "Writing up Notes" that without participation from the students it would be impossible for universities to collect and analyse. Ifenthaler and Schumacher[10] conducted a study on "Students perceptions of privacy principles for learning analytics". The results show students are more willing to share their data with a learning analytics solution that also provides them with detailed and meaningful information. The aim of the application was not merely to get students to add data without anything in return; the application provides students with intuitive data that can be used in self-evaluation.

The application has three main components; the first allows the student to view and add learning activities, giving the student the ability to monitor how long they are spending on each learning activity they are also able to compare themselves with the average of his or her peers. The second component of the application allows users to set personal targets for learning activities and modules which can keep them on track or to push themselves to spend more time on a particular activity. The final component of the application facilitates interaction with a member of staff during sessions. Students can ask anonymous questions which the lecturer can see in real time, giving students the ability to engage in a dialogue without fear of asking a question that might seem irrelevant to their peers. The lecturer is also able to poll the room they can define the question and what each of the three responses are, allowing them to quickly gauge students' understanding of the material and make their sessions more interactive.

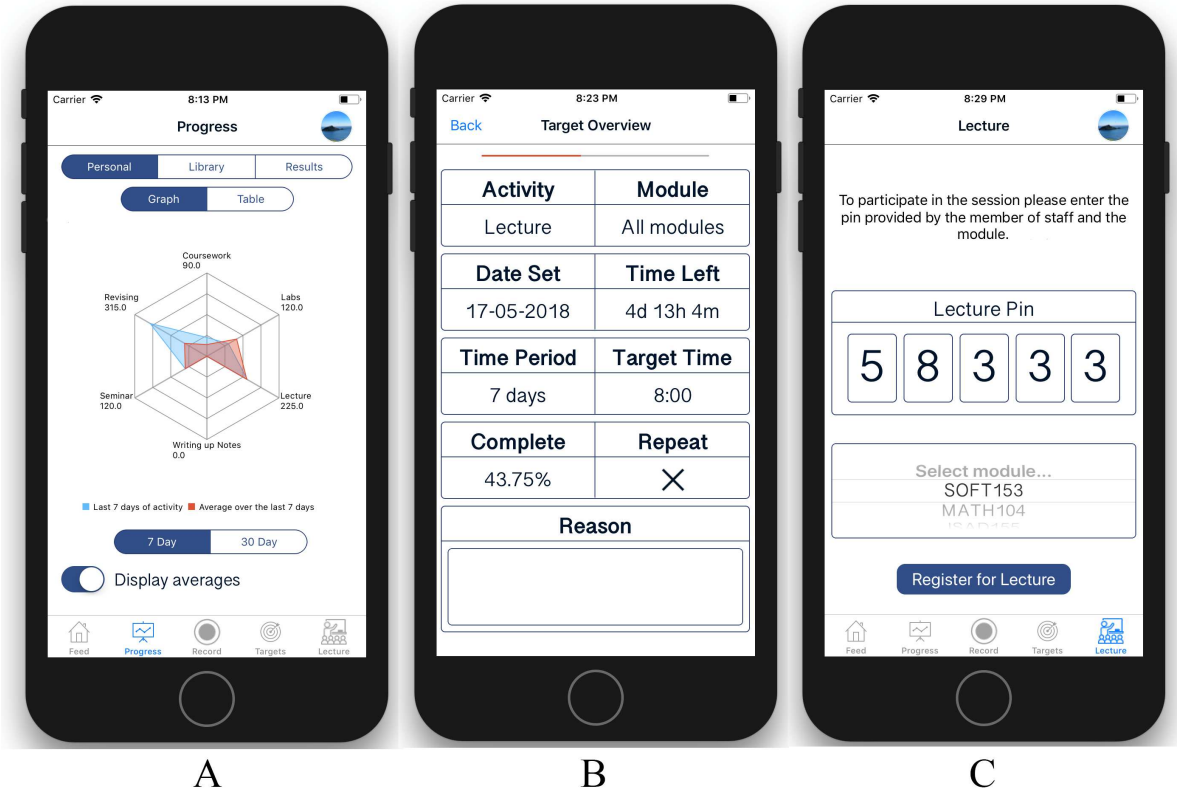

Fig. 3. User interface of proposed application: A: Overview of students progress, B: Detailed overview of a target and C: Lecture registration

4 Discussion

As the authors reflected on the outcomes of the app, it was evident that there is a high need to use the available institutional data not only for the benefit of improving HE policies, but also to offer the students direct access to their profiles, give them the opportunity to identify areas of development and self

awareness. Big Data is becoming increasingly important research across the society. In Education, the collection of data over the years has been massive, but it has not been used in an attempt to provide definitions and terminology that will be useful to both educators and students. During this research, by reversing the focus of data and the outcome of them we have defined the below definitions of Learning Analytics[11].

Table 1. Definitions of various types of Analytics suitable in HE

Term	Definition
Academic Analytics	This is where the focus lies with processing the analysis of assessment and perform comparisons across individuals, institutions and programme/courses. This helps Schools and Faculties to define the career pathways they are offering and the development of them. In addition, it helps to evaluate teaching and learning approaches and identify areas where intervention is needed.
Learning Analytics	Interpreting the data that are being gathered on behalf of the students and identifying their learning objectives and how that feeds back to the module and its allocated assessed element is an aspect that at least UK establishments are not implementing fully. The desire though to produce and predict student progress is vital; this can be achieved by observing learning behaviours and data associated with it.
Predictive Analytics	In this category the need to identify patterns of reliable conclusions in order to lead to actions that demonstrate impact and change across one or more educational establishments.
Action Analytics	Recognising the high need for academic productivity can be achieved by focusing on encompassing practices, and measuring the innovation and performance by cultivating and shifting behaviours and cultures.

The development of the proposed app has led the authors to propose a conceptual framework of how an establishment can use the data collected to support students' personal and continuous development. Since it is acknowledged that data are collected at different levels and for different needs, it is proposed that Higher Education should start focusing on using Learning Analytics for the benefit of the individual learner and not just for benefiting the institution's goals[12]. The figure below shows how decision making can be influenced, informed and reinforced by the process of applying analytics to a Higher Education establishment.

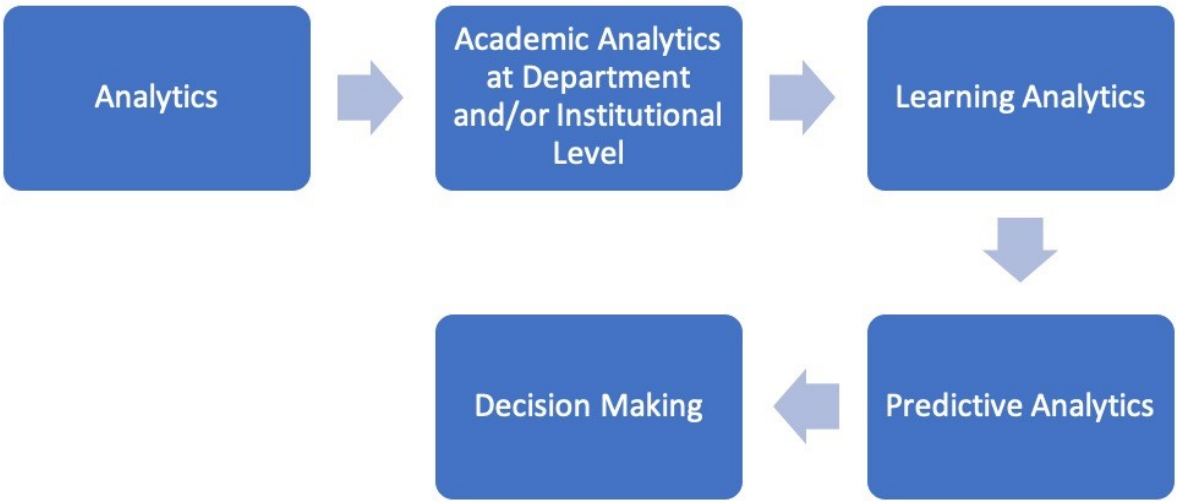

Fig. 4. Conceptual framework of Learning Analytics and Decision Making in Higher Education

5 Conclusion

Learning in Higher Education is increasingly becoming a large area of research. It is mostly common that Institutions develop and research this field for the benefit of the tutor. However, in our research we have placed the focus on the student and it is aiming at developing such an approach where learning analytics will be used by the students. This is the beginning of our research and case study and we intend to investigate in a variety of future research questions such as what institutional resources do we need? How can we integrate analytics and learning to design teacher inquiry? What is the technical, financial, social and cultural impact on institutions?

Data can change everything. Learning Analytics in Higher Education is an evolving process, with no clear start point and no clear end point. Predictive analytics should help not only individual students, but in the bigger picture, it could help institutions to identify recommendations around realities and implications. Analytics is becoming an important part not only for Higher Education, but also businesses. It is an emerging technology and the interactions behind it can lead to successful summarised reports and displays. Business intelligence techniques assist the analytics techniques to continue to grow and to enable better decision making. The responsibility of the researchers investigating and manipulating such data is great and this is an area that still lacks guidance in the modern world. With the 4th Industrial revolution the philosophical approach and personal beliefs of the researchers can impact on efficacy. Researchers often focus mostly on exploring the various dimensions of learning analytics. What it tends to be missing is the analysis of learning outcomes, how those are measured, what patterns can be formulated and how the latter can enforce and reinforce decisions. Transparency is a key aspect of any form of analytics and especially

when it comes to education, institutions and their direct relationship to the students and the student experience.

Social conditions change rapidly. Social networks, forms of communication, the Internet of Things and so many other things influence but at the same time inspire every individual and in this case the students. Student demand is growing. There is emerging evidence that students wish to be provoked, challenged and pushed in their learning. Moreover, they want to be more informed about their learning progress. The possibilities of expanding the Learning Analytics process for every Higher Education establishment are huge. Institutional decisions should be carefully informed by using Learning Analytics in such a way that is a collaborative approach between the educators and the students. This way, Higher Education will be in a good position to deliver but also to enable success.

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