Preface

Determining the effectiveness of the learning experience within Higher Education is a critical issue that institutions must address. The changing context of a university education has promoted a requirement to not only ensure that students are progressing through programmes academically, but that they are also developing a much broader range of skills that will enhance their employability following graduation. This is, in no small way, exemplified by the developing environment within the United Kingdom in which changes to government funding and student support in the sector have driven a view of students as “consumers” whereby performance factors are not only analysed by those within institutions, but also by external stakeholders such as funding bodies, employers and potential students. With this in mind, the beneficial outcomes that can be delivered through the adoption of learning analytics within an institution far outweigh the cost implications, both financially and temporally, of implementing strategies that place learning analytics as a focal point of institutional data capture.

Learning analytics have been adopted by educational institutions as a means of determining the effectiveness and quality of the learning experience for students (Brown, 2012; Groller & Drachsler, 2012). Derived from the analytic processes that underpin much commercial activity (Larose, 2005; Han & Kamber, 2006; Cooper, 2012), higher education establishments quickly identified that mining and understanding the data that is collected through the breadth of university systems could facilitate the improvement in delivery of courses, particularly with the pervasive adoption of online systems to support teaching and learning that facilitated non-intrusive data collection (Savage & Burrows, 2007; Long & Siemens, 2011). Implementing learning analytic initiatives is not without its issues (Buerk & Mudigonda, 2014), but the importance of implementing and enhancing such processes cannot be underestimated.

Key to adopting Learning Analytics is the growing use of Technology Enhanced Learning (TEL) within Higher Education. Alongside the often cited benefits of facilitating access to course materials for students, and supporting personalised learning experiences, the use of TEL also allows the learner journey to be captured and understood. Drawing upon experiences gained through e-commerce and the related customer journey to enhance the retail experience, educational establishments can gain a much richer understanding of the patterns of engagement. This leads not only to an understanding of how students are progressing, but can also determine points of intervention when students may stop engaging and be considered a risk in relation to retention.

Associated to the field of Learning Analytics is the related study of Academic Analytics [Long and Siemens, 2011]. A clear distinction can be drawn between the two fields: learning analytics focuses on the study of data to benefits tutors and learners, whereas academic analytics maintains a focus on supporting the administrative bodies related to institutions. Learning analytics is therefore more fine-grained in approach, treating courses and departments as central objects to a study, and is therefore more appropriate
to consider in the context of this book. It is equally important that one group of stakeholders in relation to the implementation of learning analytics are the students themselves. It is crucial to recognise that a student-centric approach should be adopted in any implementation strategy for learning analytics; an approach that recognises that students are not just conduits to data capture, but undertake an integral role to the successful adoption and implementation of a strategy. Indeed, should students also realise the benefits from such toolkits being implemented then a truly holistic strategy embodying a community approach can be realised.

However, gathering the data is the first stage of the analytic process. Understanding the data, and subsequently acting upon the findings or predictions, form a key stage in the successful implementation of any learning analytics solution. It is therefore a critical requirement that the lecturing staff who are to interact with a learning analytics environment are both conversant and adaptive to the additional tools and facilities that they have access to. Without attaining the support of academics in establishing appropriate strategies for adopting learning analytics as a solution to deliver improved student learning experience, then the implementation of systems to support such strategies becomes challenging if not impossible. The subject of staff engagement, and the means by which academics can be assisted in proactively utilising learning analytics to enhance both engagement and retention, are areas that this book seeks to address.

Interpreting the large amounts of data that can be collected through a learning analytics strategy also provides opportunity for research and development. Drawing from existing fields, such as data mining and visualisation, the evaluation of data that has been collected and determining predictions based on such data sets. Indeed, predictive analytics is a hugely important area in relation to the educational environment. Implementing such strategies and tools facilitates earlier intervention to enhance both retention and also programme outcomes as emerging patterns in collecting data can indicate impending issues prior to their occurrence.

This book will explore the fields of Learning Analytics and Academic Analytics. Both areas are rapidly emerging as topics of great interest to the Higher Education community, both for programme managers and course tutors. Both topics concentrate of understanding the learning journey for students, and the outcomes that module cohorts attain through study. However, Learning Analytics approaches the analysis process from the learner perspective, often relying on data input by learners through virtual learning environments and online questionnaires to determine the effectiveness of the student experience. Academic Analytics, on the other hand, collates data from management systems related to Higher Education Institutions to understand the student journey.

The role that this book will play will be to inform the academic community of the opportunities that exist when the rich data sets collated through university online systems are mined and visualised to understand the impact of student experience on the outcomes of programmes. Equally, neither field should be considered in isolation. In this respect, the proposed publication shall explore cases where both Learning and Academic Analytics techniques have been employed to understand their impact.

A further area that shall be explored is the relevance of Learning and Academic Analytics to educational practices. There has been little research to understand how different pedagogical approaches affect the impact of Learning Analytics and/or Academic Analytics. This is a significant area that the proposed publication shall explore.
Target Audience

With respect to the applicability of learning analytics within the education sector this book has been designed to engage a wide audience of experts from a multi-disciplinary background. The primary audience for this publication are considered to be researchers who are working within this field. As the book draws upon projects that address concerns from a global perspective it is the intention that this would offer a significant resource for researchers in the field to develop and thereby enhance their contribution towards this emergent subject area.

In adopting learning analytics, institutions must engage key groups of practitioners in order to successfully implement strategies and solutions. These groups consist of those who determine effective strategy for embedding best practice; delivering senior management influence relating to the applicability of tools and techniques within the institutional context. Equally the academics who develop and deliver courses must understand the implications of effective data capture and its impact in determining the delivering successful programmes to students. The rationale being that by delivering the desired outcomes identified through analytics will result in an enhanced student experience leading to improved results and retention. The book aims to provide a useful resource to these key groups operating within the sector to aid understanding of successful design and deployment of analytic toolkits. As such, both the human and technology challenges are presented through case studies with a view to assist policy-makers and academics develop a positive relationship with analytics as a beneficial tool.

As the adoption of learning analytics toolkits gathers momentum, the focus turns towards the development of enhanced tools that are both usable and feature-rich. Usability is a critical concern in the design of the interface as this promotes easier accessibility to processing functions and the presentation of outcomes or predictions based upon the data collected. Also, the toolkits must facilitate easy integration with existing educational support systems such as register, timetable, library systems and most significantly virtual learning environments. The book, therefore, provides a resource for systems developers and integrators to assist in identifying the challenges faced when deploying learning analytics systems with the aim of inspiring the design of solutions that ease installation and enhance functionality.

Book Organization

This book is organized into 12 chapters that deal with the impact and experiences that institutions can encounter through the design, implementation and evaluation of learning analytics strategies. A brief description of each chapter follows.

Chapter 1 considers the impact that Visual Learning Analytic Tools (VLATs) can demonstrate when they are applied to interpretation of learning analytics. The chapter evaluates the growing field of VLAT and discusses the future for the implementation and application of these systems.

Chapter 2 explores the issues surrounding class imbalance when collating large data sets and developing prediction models. Class imbalance is a significant factor in the field of learning analytics as it can lead to groups within a domain set becoming over-represented or under-represented and thereby impacting upon the predictive outcomes as the data set is analysed.
Chapter 3 presents a case study with the aim of sharing the experience gained by an Australian institution when introducing a learning analytics strategy. The case study explores the development of a strategy with a holistic viewpoint; encompassing technology, governance and culture change factors.

Chapter 4 focuses on a case study in which learning analytic techniques have been applied to understand the effectiveness of introducing new pedagogical approaches to teach a computing module in a university. The data captured for the evaluation was collated throughout the period of the class and thereby gives an excellent insight into the student experience as was captured and evaluated using an analytic and visualisation approach.

Chapter 5 explores the current impact of learning analytics in higher education and the different strategies that can be adopted for visualising data within a learning analytics context. This chapter also discusses and observes the current opportunities in which a framework enabled to function with data visualisation could be utilised. This framework will combine the theory and scientific action of predictive analytics with a comparison of the most suitable data visualisation toolsets that are currently available in open-source software to initialise the implementation of visualisation solutions for learning analytic systems.

Chapter 6 evaluates the perspective shifts that have taken place in e-learning in the past 25 years. The development of e-learning strategies is explored in the context of data collection, which has risen at an incredible rate, and is aligned with a changing viewpoint of learners towards self-regulated learners. The chapter also presents a study that explores the changing learning strategy subscales.

Chapter 7 focuses on the role of students in the successful implementation of learning analytics. In doing so, this chapter challenges the often adopted viewpoint that the student role is merely as a data source to provide institutions with intelligence in relation to performance and engagement. Rather, the chapter argues, students should be encouraged to have a more pro-active and inclusive role; in other words, the chapter proposes a student-centric approach to learning analytics.

Chapter 8 presents a case study that utilises learning analytics as a means of evaluating a changing pedagogical paradigm; one in which the academic is considered as a learning facilitator rather than a teacher. The analytics not only demonstrated the effectiveness of a changed approach, but also uncovered additional benefits to groups of students. In this context, the impact of adopting learning analytics using a range of approaches is demonstrated.

Chapter 9 explores bridging the gap that exists between the technical and educational domains through the integration and deployment of analytic tools. Whilst big data sets can be built using learning analytic tools, the timeframe between collecting the data and then acting upon the findings needs to be reduced in order to ensure that interventions are timely. The chapter explores the strategies that can be employed to ensure that use of the analytics is proactive rather than reactive.

Chapter 10 considers the challenges that are faced when implementing learning analytics in relation to the training of teaching staff to make use of the analytic findings. Whilst learning analytics can yield large amounts of highly relevant and useful data, without understanding the means by which this can be processed and interpreted then the data collection becomes a largely redundant process. This chapter presents one approach to address this issue and affect the impact on change of a course.

Chapter 11 draws upon experiences that have been reported from the commercial world in relation to data analytics. The aim is to identify areas of good practice that can be transposed onto learning analytics systems. Equally strategies that have been adopted for successful implementation may inform implementation of analytics systems within an educational environment. The purpose of this evaluation is to assist policymakers in determining the strengths that an analytic solution can bring to an educational
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establishment, and to identify the key strategic points that need to be addressed when implementing a learning analytics solution.

Chapter 12 explores the reported experiences in literature and critically evaluates and develops a holistic view of this emergent field. The chapter considers the range of implementations that have been reported upon and considers the functional applications of learning analytics in relation to the scope of implementation. In doing so, the chapter aims to determine strategies that will deliver high-impact implementations of learning analytics in the context of system requirements.

Book Objectives

The field of Learning Analytics, and the associated field of Academic Analytics, has recently emerged as a key field to assist understanding of the student learning experience within Higher Education. The mission for this publication is to collate the latest research in the field from around the globe and assist researchers to understand, and ultimately resolve, the challenges that exist within the field currently. Equally the book seeks to establish the links that can be made between learning analytics and other related fields, and potential challenges that may lie ahead as the field reaches maturity.

As an emergent area of research and development, Learning Analytics is developing rapidly and is thereby attracting a great deal of interest in both the academic and commercial environments. Suppliers of online education systems are actively pursuing opportunities to integrate their platforms with the tools necessary for supporting learning analytics. Aiding the promotion of learning analytics as a powerful tool for understanding student experience and engagement has been a drive to make effective use of Technology Enhanced Learning (TEL) within the sector. For a number of years, TEL has promised to offer a more flexible delivery pattern and enable students to access course materials in different ways to support their own learning styles. The argument also exists that TEL allows students to access materials “on-demand” and so students can adopt a more pro-active approach to enhancing their own learning. The challenge exists for providers of all online systems used by higher education institutions to consider the impact and challenges of integrating analytics tools to capture meaningful data as students progress through their courses.

Academic institutions are equally driving forwards the development of analytic platforms as the benefits of utilising diagnostic strategies are starting to be realised. As a result, there is an active community of researchers working within the field. One of the objectives of this book, therefore, is to collate research output in the area which encapsulates current thinking in all aspects of learning and academic analytics.

In addressing this objective, the book contains a number of case studies with the aim of presenting the experiences and outcomes that have been achieved at Higher Education establishments around the world. Capturing a global context for the case studies has been an important factor when compiling this book. There are a number of nations who are at a more advanced stage of implementing learning analytics within their education systems, and it is imperative that the experiences and strategies of practitioners in these countries are shared to disseminate best practice. It is therefore an aspiration of this book to explore case studies and explore the outcomes of studies within the context of Higher Education.

It is important to acknowledge that the impact realised by adopting learning analytics tools is not only related to the national context of the locale in which related research has taken place, but also the cultural context within the academic department or subject area that may be the focus of an impact case study. Academics who are technology agnostic may benefit from an environment in which greater care has been taken to engage staff with a strategy that is designed to leverage maximum advantage from
learning analytic toolkits. Equally, the selection of the most relevant tools to support a strategy becomes a key decision. In particular, the development of visualisation techniques appropriate to the prism of deployment is a critical factor. The role of visualisation is to aid the interpretation of data collected, and ultimately derive predictions drawn from that data. However an inappropriate visualisation technique could hinder rather than assist in the adoption of the techniques for the benefit of the institution and its students. With this in mind, the book draws together research that encompasses the full lifecycle of implementation for learning analytics systems.

Attracting interest from researchers and practitioners around the world, each chapter in the book identifies different aspects or contexts of learning analytics as a field in its entirety. The book serves as an introduction to those looking to adopt learning analytics into their modules or programmes. For those within management in the higher education sector, the book provides a contextual overview of learning analytic systems and the key issues that may be encountered when implementing strategies to embrace such systems within an institution. Equally the book will also serve as a reference for those undertaking further research in the field; considering both the technical and the human factors. The book thereby offers a platform for future research in the field.

REFERENCES


