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Niemi, D., Pea, R. D., Saxberg, B., & Clark, R. P. (Eds.). (2018). *Learning analytics in education*. Charlotte, NC: Information Age Publishing.

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Recently, I attended my 12 year old son's Parent-Teacher Interviews at the secondary school he attends. These consisted of a series of five minute meetings with individual Subject Teachers where evidence of my son's learning was presented in the form of test results, samples of his work and his teacher's opinion of his performance. While useful, I found myself wanting more information on my son's strengths and weaknesses, his motivation, level of persistence, classroom interactions and learning style. Moreover, some evidence-based advice on what actions he could take to improve his learning would have been valuable. Further, I could not help but observe the extent to which Teachers relied upon their own frame(s) of reference when providing advice.

My son attends a modern international secondary school in Singapore that prides itself on the strong academic performance of its students, a number of whom are able to articulate to well-ranked Universities around the world. Over the last few years, the School has introduced more technology into the curricula. Students use tablet computers to access a range of educational apps that invariably use gamified methodologies to enhance students' learning in everything from Mathematics and English to Science and Languages. Apps such as 'Seesaw' also capture key learning moments in which Teachers record student learning achievements in video which are shared with parents, while 3D printers and Lasers dominate the 'Design and Technology' curricula. This is a School which Behrens, Piety, DiCerbo and Mislevy (in their chapter in *Learning Analytics in Education*) would describe as standing at the 'shore front of an ocean of data', and this certainly came through in the Parent-Teacher Interviews.

The promise of the emerging field of Learning Analytics (LA) is that the additional information I sought for my son will not only be regularly captured by the increasing multi-modal array of 'electronic sensors' in and outside of the classroom but that higher quality learning data will inform improved learning strategies or provide a 'deep dive into an ocean of data'. Thus a key theme that emerges from *Learning Analytics in Education* concerns the necessity of putting into service data that records learning experiences, transactions, achievements and deficits. As the book presents, the field of LA therefore, is defined as "the measurement, collection,

analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (xii).

This edited collection offers an impressive introduction to the inter-disciplinary field of Learning Analytics (LA). The editors claim that the field of LA can be traced to a symposium held at MIT in 1956 which brought together computer scientists, psychologists, linguists and others to consider the operation of the human mind. This meeting led to new developments in cognitive science and learning theories. However, as the book explains, the field of LA was given a significant boost when a Learning Analytics Workgroup was established in 2012 through funding made available from the Gates and MacArthur Foundations.

This edited collection articulates the benefits and applications of Learning Analytics in great detail. For instance, it is suggested, that LA could be used to develop highly personalised learning approaches that are tailored to the individual's dispositions, cognitive abilities and psychological states. LA can also be used to monitor learning motivation and engagement and suggest strategies for improvement. Advanced data mining and artificial intelligence can be used as a decision-making tool for Education policy makers and help direct resources to improve equitable outcomes in learning attainment. Multiple data streams can also guide teacher-student interactions and provide clear evidence for modifying pedagogical approaches. What is to be admired about this book is that these advantages are explored in a critical way with the editors noting that the biggest challenge for the field of LA is demonstrating its utility and positive impact on learning and instruction. They argue that there is a risk that LA could remain an 'unfocused conglomeration of disconnected research and analytics groups' unless the contributing disciplines are able to unify their approaches and demonstrate that LA can make a positive difference.

The book is organised around nine chapters contributed by internationally renowned experts with each demonstrating the complex, multidisciplinary nature of Learning Analytics. It is also interesting to note that the authors come to the field of LA from a variety of occupations and public and private organisations. Some are leading academics, others

education technologists or luminaries from the private sector.

In the first chapter by Behrens, Piety, DiCerbo and Mislevy, the authors confront the notion of the 'digital ocean' in which the challenge of LA experts is to make sense of multiple streams of abundant data. Their chapter outlines three theoretical frameworks in which questions regarding how and why learning data will be explored and to what end can be considered. The second chapter, 'Towards Demonstrating the Value of Learning Analytics for K-12 Education' by Baker and Koedinger, outlines two powerful examples of the value of LA. The first concerns assessing student mastery and the structure of student knowledge in online learning. The second example focuses on automatic assessment of student engagement in online learning. These examples offer fascinating insight into how algorithms can be used to reshape and personalise the student learning experience.

The third chapter by Niemi, Clark and Saxberg, examines how LA can be used to improve a critical attribute in learners – persistence. By analysing data around the attributes of those with persistence, the goal is to try to improve the level of persistence in others. The fourth chapter by Bilkstein & Worsey examines the prospect of 'high frequency, multimodal data collection techniques' to develop new insights into the learning process. These new techniques include text, speech, handwriting, sketch, action and affective analysis which the authors explain could become the basis of novel assessment processes and help to discover new elements of otherwise opaque learning processes. The fifth chapter by Bienkowski explores the way in which LA could be used to involve learners as the active participants in their own learning. This is fascinating since it holds the possibility of students using LA to direct their own learning. Discourse analysis is the subject of the sixth chapter by Clarke, Resnick and Penstein Rose. Here four case studies are used to illustrate the utility of new technological approaches to discourse analysis in learning.

The seventh chapter will most likely only be of interest to those education professionals in the United States, although some of the discussion could also be applicable to policy makers elsewhere. The author, Hammer, focuses

on Institutional Review Boards (IRBs) which are required by United States federal regulations and the role they could play in fostering LA. The penultimate chapter by Wolf, Jones, Hall and Wise continues the discussion of the importance of policy. In this chapter, the authors review the current status of data and analytics policies in different States. Again, their chapter will be of value for policy makers keen on removing barriers to LA and enabling the responsible use of LA in education systems in different jurisdictions. The final Chapter by Piety and Pea, seeks to demonstrate the utility of LA in operating at a macro level to address large scale learning problems and deficits, and also at a micro level to capture and address individual deficits. In this way, Piety and Pea's objective is to distinguish LA from other ways in which education data have been historically used.

A particular strength of the book is its acknowledgement that while LA offers a remarkable opportunity to educators, students and policy makers, there are also substantial risks. Capturing ever growing quantities of data raises a range of privacy questions – what if, for instance, data was accessed and issued by prospective employers to make judgements on the cognitive skills of employees? What if, as Bror Saxberg asks, learning data led to the labelling of some children as 'unlikely to succeed'? Moreover, LA could be used to reduce social inequalities by tackling the underlying educational deficits that are often the cause of inequality, or LA could inadvertently exacerbate existing inequalities. It is not beyond imagination for policymakers to use LA to direct increased funding to already privileged schools if the data suggests that the return on investment would be more worthwhile. Thus as is so often the case with novel technologies, the promise of LA very much depends on the morality of its users.

This is a book that satisfies in a number of ways. It is scholarly and regularly deploys theory, but also demonstrates a keen understanding of the practical. It addresses novel technologies and considers policy implications. It illustrates the power of Learning Analytics while also cautioning about its inherent risks. It will undoubtedly prove to be of enduring value to educational professionals and all those with an interest in this exciting field.