Big Data & Analytics in Higher Education

“Big data is BIG!”

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The interest in big data and learning analytics revealed itself in the responses I received to the tweet “Big Data is BIG!” that I sent earlier this year. On my way to a smart education conference in China and in an attempt at humor, I hit send on this tweet, and almost immediately, the likes and retweets started pouring in. This exchange illustrated the popularity of big data—and learning analytics—among my few and newly found followers.

A quick Google search for images related to big data and learning analytics also illustrates the currency of these terms; the results page is a colorful myriad of infographic after infographic. The use of big data and learning analytics has the opportunity to transform the field of education. The same has been said about blackboards, filmstrips, overhead projectors, radio, television, and, yes, even computers. Education researchers have been conducting media studies for decades, comparing television instruction to teachers, teachers to computers, and most recently online instruction to face-to-face instruction. For the most part, the conclusion has been the same: When it comes to media impact on learning, there is no significant difference. In the ever-evolving world of technology, it’s imperative that education professionals stay conversant on the current trends.

There’s a lot of data out there. Forbes magazine states that more data has been created in the past two years than in the entire history of the human race. Virtually everything we do in our modern society generates some form of data. We produce data on social media and networks. Scientific instruments collect all sorts of data. Mobile devices ubiquitously track all information, all the time. Sensor technologies and networks constantly measure an assortment of data.

Data are collected through the Web through searches, game consoles, entertainment networks, e-commerce, purchases at department and grocery stores, bank and credit card transactions, social networks, and yes, even colleges and universities.

Data in Education

Student data generated through the education system can be sorted into two broad categories: institutional data and instructional data. Institutional data include admissions statistics (high school class rank, admissions test scores), instructional records (past grades, program information), and accessed support services (library, help desk, counseling). Instructional data, on the other hand, consists of information related to grading (quizzes, assignments, participation and attendance) and learning management system and engagement (online discussions, content viewed, interaction with students and instructors, time spent online). Both categories of student-generated data can be processed via analytics. To harness this data and properly use it in teaching and learning, educators must understand learning analytics.

About the Author

Dr. Marcus D. Childress is Dean of the School of Education at Baker University (Kansas, USA). He earned his Ph.D. in Instructional Design and Technology from Virginia Tech. Dr. Childress’ research interests include instructional design, online learning, using virtual worlds for training and education, and the future of learning technologies. His research has been documented in publications such as Distance Education, Journal of Research on Computers in Education, International Journal of Educational Telecommunications, EDUCAUSE Quarterly, and Academic Leadership Journal. He is co-editor of the AECT/Springer online major reference work Learning, Design, and Technology: An International Compendium of Theory, Research, Practice and Policy, with J. Michael Spector and Barbara J. Locke.

In addition to his higher education experience, Dr. Childress’ training involvement includes consulting with the Intel Corporation (senior trainer, Intel Teach to the Future); the People’s Bank of China Training Center; Virginia Modeling, Analysis and Simulation Center; and the United States Joint Training Analysis and Simulation Center. He is a past-president (2012-2013) of the Association for Educational Communications and Technology (AECT) and has served on the AECT executive committee and board of directors.
Learning analytics focuses on students and their behaviors, with the primary audience being learners and instructors. Learning analytics support learning goals by targeting instructional, curricular, and support resources. EDUCAUSE, a nonprofit association dedicated to advancing higher education through information technology, defines learning analytics as “the use of data and models to predict student progress and performance, and the ability to act on that information.”

Learning analytics has the potential to help answer the following questions:

- What assessments (quizzes, tests) in a course are the most important predictors of a student’s success?
- When is a student at risk of failing a course?
- What prerequisite courses are most critical to a student’s success in a course?
- When should a student receive tutoring or counseling?
- How many times should a student access an online course during the week?
- What are the not-to-be-missed activities in a course that predict student success or failure?

Being able to answer these questions drives me to make my bold statement: Learning analytics is a true game-changer. Online learning and improved processing power have provided an opportunity to gather and analyze student data like never before.

**Ethical Concerns**

There are, however, some ethical concerns, because using student data for learning analytics raises important issues about student data privacy and how colleges and universities use and share that data. In addition, how a college or university acts on these findings may come under scrutiny. What happens when learning algorithms go awry and unintentionally steer students in the wrong direction? What about students who do not “fit” into the algorithm? Will their academic future be jeopardized? As promising as learning analytics appears to be, it would be smart for colleges and universities to think deeper and create policies and procedures that prioritize students’ best interests. Numerous other concerns will surely arise as we make our learning analytics journey.

**Conclusion**

Will learning analytics transform education or will it find itself relegated to the dusty shelf with the audience-response systems—both underused and oversold? Time will tell. If I were a betting man, however, I would go all-in on learning analytics because I believe it truly is a game-changer in the world of teaching and learning.

And here is one final bold prediction: The ease with which we can gather data and analytics through online instruction and our ability to take action to support student learning may soon make online instruction superior to face-to-face instruction, at least until we discover how to collect such data in a face-to-face instructional environment. Alas, that is a debate for another time and place.