

John Fritz, University of Maryland, Baltimore County (UMBC)

Overview

In 2003, then-Provost Arthur Johnson asked me a simple question I couldn't answer: Is Blackboard making a difference? University of Maryland, Baltimore County (UMBC) had been using Blackboard (Bb) since Spring 2000, and our adoption had grown by about 10–15% each year. I said our Blackboard usage had grown from 600 to 750 courses over the previous year, but that clearly didn't get at the heart of the question: How do we know whether instructional technology improves learning?

Part of the problem is the lure of technology's potential that can mask the rigor required to assess its impact. Despite extensive research, the way that individuals learn in various contexts is not fully understood, complicating the matter of assessing the tools and practices of teaching. What we do know is that student engagement is associated with academic success, and the growing field of learning analytics aims to investigate and understand the relationships between certain activities and student outcomes.

This research bulletin describes UMBC's efforts in understanding and applying learner analytics. Work done at California State University, Chico,¹ Purdue University,² and the University of Georgia,³ among others, has shown that learning management system (LMS) activity data can be predictive of student success. At UMBC, we began by looking for correlations between LMS data and student final grades. From there, we examined interventions, trying to answer the question of what an institution might do with predictive information about the likelihood of academic success for large numbers of students. Beyond these questions, we also wondered whether examining student activity might help identify effective teaching practices and practitioners and thereby influence the design of future courses.

Correlation as a Beginning

When we started pursuing learning analytics, we didn't have perfect analysis or even a prediction we could test. But we did have a very intriguing correlation that persisted over time: Since 2007, UMBC students earning a final grade of D or F have used Bb about 40% less than students earning a C or higher.⁴ These data suggest that on some level, activity in the LMS might serve as a proxy for student engagement in a course, which contributes to better outcomes as measured by final grade.

Of course, correlation does not equal causation, and simply using the LMS doesn't make someone a good student. Still, the correlation involves population data, not just sample data, and our intention is to understand how good students use the LMS and what difference, if any,

sharing these patterns with all students might have on raising awareness, increasing motivation, and improving performance. Correlating LMS activity with student final grade provides a foundation for refining predictions about other student outcomes. To this end, we are exploring if and how learning analytics can help underperforming students by scaling peer-related feedback as an intervention strategy that prompts a change in awareness and motivation necessary not only to improve academic performance but also to sustain their success as lifelong learners.

The key question that remains is one John Campbell et al. have rightly asked: “What is an institution’s ethical obligation of knowing?”⁵ How any institution answers this question will say a lot about its culture, values, and conceptualization of the problem to be solved, but I believe we have to attempt an answer. That said, as much as we might want to directly intervene with students we identify as being “at risk,” questions arise over institutional capability and capacity to do so. Intrusive advising has been shown to be very effective, but at some cost.

Options for Intervention

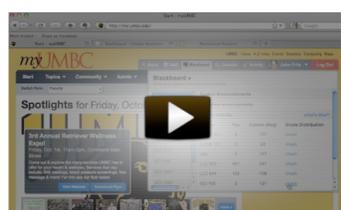
Rightly or wrongly, based on the correlations we found in our LMS data, we decided to share this information with students. We believe that students must take responsibility for their learning, and one of our approaches to intervention was to try to raise student awareness—particularly among underperforming students—by comparing their activity with higher-performing peers. In 2008, we launched a feedback tool called Check My Activity (CMA)⁶ that lets all students compare their own activity—any hit, click, or access of any tool or content in Bb—with an anonymous summary showing the average activity for all course peers (see Figure 1). If instructors post grades online, the CMA will also compare a student’s activity with the average activity of his or her course peers earning the same, higher, or lower grade for any assignment.

Check My Activity

- Hits are in no way representative of the grade you will earn.
- Attempting to game the system will not result in a higher course grade.
- This tool is for personal use only.
- Tip: [Improving Your Engagement In a Class](#)

Blackboard Course*	Hits		Sessions		Grade Report
	You	Average	You	Average	
Spring 2013					
BIOL 302	67	309	5	40	No
Fall 2010					
CMPE 321	14	240	5	43	Yes
LLC 644	458	300	64	45	No
SCI 100Y	29	144	2	25	Yes
Spring 2010					
LLC 600	1014	823	115	76	No
Summer 2007					
CRAB 101	15	81	11	12	Yes
Additional Courses					
collab	51	74	5	5	Yes
quiz	3	31	2	2	Yes
test	3	23	1	3	No

* Note: This list only includes [active Blackboard courses](#).



[Video Demo of UMBC's Check My Activity Tool for Students](#)

Definitions

- **Hits** - Every time you view a file, post to a discussion, or read an announcement, that is considered a hit.
- **Sessions** - Every time you log in to a Blackboard course, that is considered a new session.
- **Grade Distribution Report** - If your instructor uses the Bb gradebook, this report will show how your own activity compares with those who earned the same, higher or lower grade on any assignment.
- [More info...](#)

Figure 1. UMBC Check My Activity

In academic year 2010–11, UMBC had 12,888 students (10,210 undergraduate, 2,678 graduate), 2,779 of whom were undergraduate freshmen (1,499) or transfers (1,280). Recent analysis of our Spring 2011 semester LMS activity data shows that 2,567 distinct freshmen or transfer students (92%) used Bb. Of these, 2,350 (or 91.5%) used the CMA at least one time (mean = 10.01, SE = .523, SD = 26.51).⁷ Controlling for other variables, students who used the CMA were 1.92 times more likely to earn a C or higher compared to those students who didn't use the CMA at all, and the relationship was statistically significant ($p < .006$).

As part of UMBC's First Year Intervention (FYI) program, every semester at midterm, our Learning Resources Center (LRC) asks faculty to identify students who would be in jeopardy of receiving a D or F "if the semester were to end tomorrow." The LRC then alerts these FYI students and provides a list of a dozen or so "help resources" (<http://www.umbc.edu/lrc/alert.htm>). The FYI program has been in place for more than 20 years, but in February 2013, UMBC conducted a first-ever survey of students who had received an FYI alert in Fall 2012 to evaluate their help-seeking behaviors. The survey was sent to 1,106 students; of the 130 students who responded (12% response rate), 30% used the CMA, which tied for third among help-seeking behaviors with "visiting the LRC," behind "academic advising" (35%) and "talking with my instructor" (42%).

Perhaps not surprisingly, students rated talking with a person as more important than the CMA, but 63% of the students who used the CMA reported earning a final grade of C or higher, compared to 62% for all help resources used. This includes talking with an academic advisor (used most, and resulting in a 46% C or better pass rate), talking with an instructor (used second most, and an 81% pass rate), or visiting the LRC (tied for third most used, and a 50% pass rate). Other help behaviors had slightly higher pass rates than the CMA but were used much less frequently by students. The survey response rate is too low for significance testing, but it is intriguing that many in the sample used computer feedback nearly as often as talking to a human being and that it was effective in terms of final grade, despite its lowered importance among students using it.

Identifying Effective Course Design Practices

Learning analytics is not just about students. As we use data to shine light on and hopefully influence student engagement, we might also identify course designs that help them do so. These are complementary processes: The CMA can do what courses cannot (provide an overall picture of student engagement based on peer activity in all of one's courses in near real time), while courses can do what the CMA does not (customize instruction and remediate student deficits). Students need both macro (system-level) and micro (pedagogical) feedback to help them "see" and "own" what they should learn to know, understand, and do.

Research consistently shows that students use and value the LMS. Data from multiple years of the ECAR study of students and information technology shows that students value checking grades and having access to practice quizzes and exams far more than other LMS functions.⁸ The most recent version of this annual ECAR study reported substantial growth in the number of students who said they use the LMS: 2010 (67%), 2011 (73%), and 2012 (96%). In 2012, 86% of students also said that the LMS was very or extremely important to their academic success. Moreover, 53% of students said they want instructors to use the LMS more as a form of communication.⁹

At UMBC, we have found that simply using the grade book is an important course design practice associated with higher student Bb activity (see Figure 2). Despite our finding that use of the Bb grade center impacts student activity and ECAR findings that students value checking grades, instructors tend not to use the grade book tool as much as we might expect. Since we started tracking and promoting grade center usage, the proportion of Bb courses using the grade book has increased from 46% (Fall 2006) to 60% (Spring 2012). Given students' value of this feedback and its impact on their activity, we make every effort to document, demonstrate, and support faculty use of the grade center and related activities that leverage it.

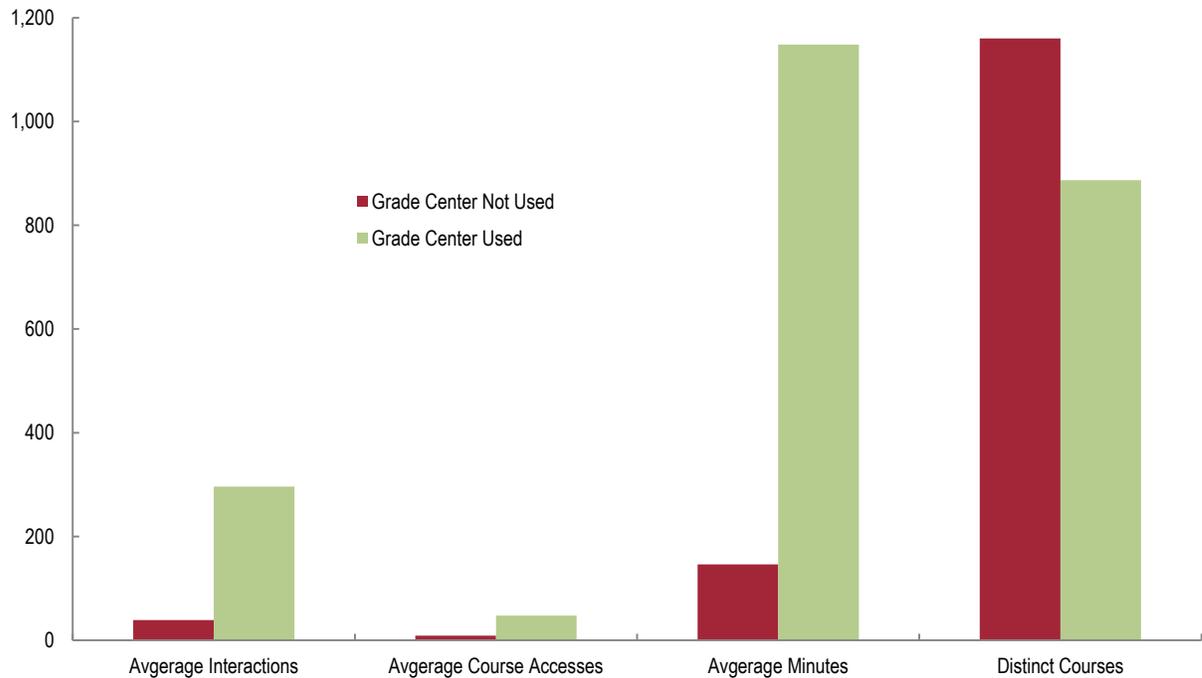


Figure 2. Student Activity in Bb When Grade Center Is Used and Not Used (Fall 2012)

Moving beyond the amount of LMS activity, we find important differences—which can have a considerable impact on course design—in the quality of various kinds of activities. We’ve found that student and faculty LMS usage typically falls into three areas:

- **User and Document Management (most common):** Includes automatic course creation and enrollment, class and group meetings in a password-protected space, and distribution of course documents
- **Communications (moderately common):** Includes announcements, e-mail and other messages, and discussion and chat
- **Assessments (least common):** Includes electronic assignment delivery and collection, quizzing and surveys, and “adaptive release” of content (described below) based on prior student action or grades

Dawson identified a similar framework for LMS usage (engagement with content, learning community, and assessment), while adding a fourth element (administrative tasks), which could be collapsed into “user management” category noted above.¹⁰ Also, in developing its own

learning analytics infrastructure—known as Bb Analytics for Learn (BA4L)—Blackboard created a “course design index” that similarly weights student activity data in terms of content, interactive tools, and assessments.

All of these frameworks share a common assumption: Some clicks are different from others. Simply downloading content does not constitute the same quality of student activity as using a course’s interactive communication tools, such as discussion boards, or using assessment functions, such as quizzes and adaptive learning. Students may be engaging with content, but not with others in the course, nor are they using the course to self-assess and (perhaps) become more self-aware of what they do or don’t know or understand.

In order to explore the relationship of student final grades to specific types of LMS activity, we looked at our LMS usage logs and, in doing so, became aware of an adjunct instructor who was not on our radar until his course’s student LMS activity put him there.

Case Studies: Course Design in Practice

In 2009, Tim Hardy attended a UMBC workshop on hybrid course redesign. Following that workshop, he redesigned his ECON 122 (Principles of Accounting II) course, incorporating activities intended to increase student activity, and Bb activity in his course changed dramatically (see Figure 3). Since Spring 2010, Hardy’s ECON 122 class has been UMBC’s most-active Bb course among all courses (undergraduate and graduate) in terms of student use, with the exception of Spring 2012 when it was second overall (but still first among undergraduate courses).¹¹

Tim Hardy and ECON 122

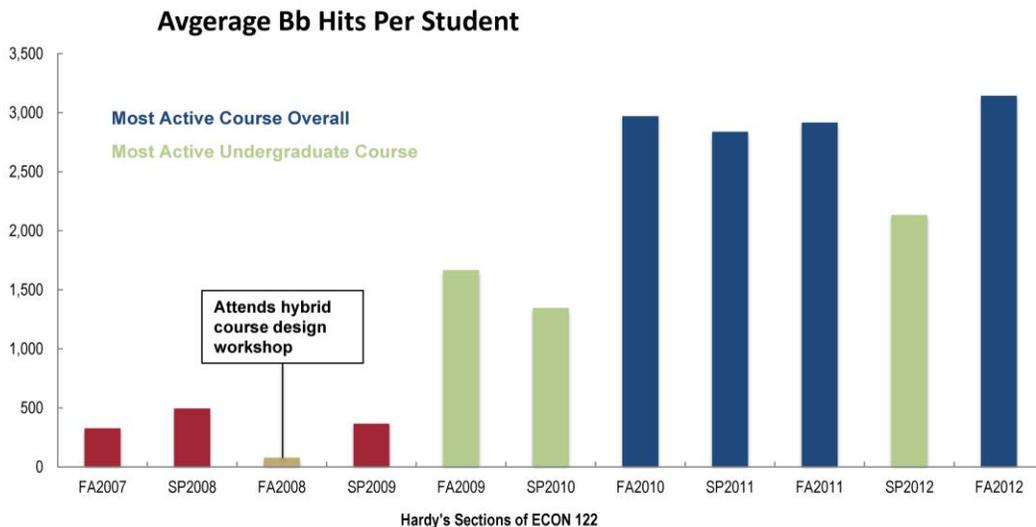
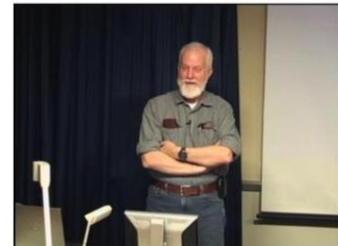


Figure 3. Bb Course Activity for ECON 122

During the 2009 workshop and follow-up consultations, Hardy became interested in our recommendation of a little-known Bb feature called “adaptive release,” which allows an instructor to create preconditions students must meet before they can access course content. For example, before they can even see—let alone submit—the first assignment for credit, students must take and pass a quiz about the syllabus. Similarly, students must take and pass a short quiz based on a video Hardy created about how he wants students to use Excel pivot tables before they can access the assignment that uses pivot tables.

Hardy went on to redesign his entire course to leverage adaptive release. He reports that since redesigning his course, students in his sections of ECON 122 typically earn final scores that are 20% higher than students from other sections on the department’s common final exam, which he does not develop or administer and which is required to pass ECON 122.¹²

Perhaps more importantly, since Spring 2010, his ECON 122 students have been earning higher GPAs in the next course—ECON 301 (Intermediate Accounting)—than students who did not take ECON 122 from Hardy. Prior to Hardy’s redesign of his ECON 122 course, his students earned higher average GPAs in ECON 301 than students from other sections (2.88 versus 2.52), but after Hardy implemented adaptive release, the GPA gap between his students and those of other instructors (3.37 versus 2.76) nearly doubled, increasing from .36 to .61 (see Figure 4). The sample size is small for testing statistical significance, and it includes transfer students who did not have the opportunity to take ECON 122 at UMBC. Still, the success of Hardy’s ECON 122 students in 301 appears to support UMBC President Freeman Hrabowski’s definition of student success: “Not just passing one course, but also passing the next one that requires it.”

ECON 122 Students in Next Course?

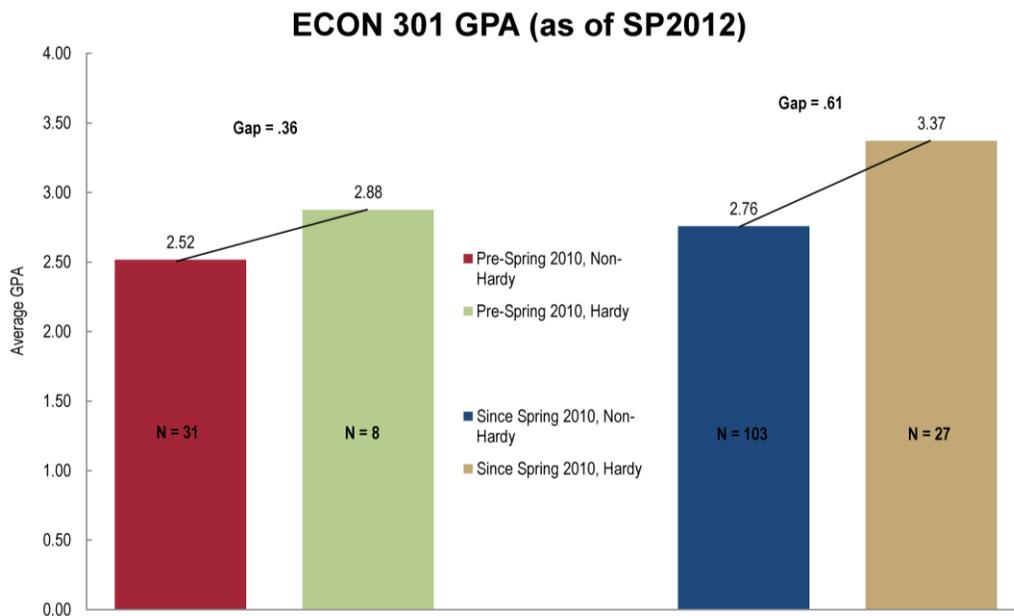


Figure 4. Average GPA for ECON 301 Students

To be sure, Hardy puts a lot of upfront development effort into his course. He is a retired accountant, part-time teacher, and near full-time tinkerer. Despite his considerable initial effort, however, Hardy claims not only to spend less time running his ECON 122 course now but also to have changed his role in it. Instead of lecturing, he is serving more as a coach and facilitator. This rings true of lessons learned from others: Effective hybrid or blended courses require students to take more responsibility for their own learning. A necessary corollary means that instructors have to let them, in part by designing opportunities to do so.

After seeing what Hardy had done in his Bb course with adaptive release, we started exploring how other courses with high overall Bb student activity were designed. Many of our most active Bb courses are graduate courses in one of UMBC's four online masters programs, which makes sense because online is the only way these courses can "meet." However, we began to notice that some traditional, face-to-face undergraduate courses were also starting to appear among the 50 most active Bb courses each semester.

In Spring 2012, "English Word Roots from Latin and Greek" was the second most active undergraduate Bb course (after Hardy's) and eleventh overall. This was a three-credit, general education course with 113 students and no TA, and it was offered as a hybrid course that met one day a week. The instructor, Anna Peterson, used a lot of mini podcast lectures, as well as Bb's adaptive release to control when students could access them and related assignments. She had heard a brief mention of adaptive release during a late Fall 2011 information session and then incorporated it into her course in Spring 2012. She used adaptive release to regulate student acquisition of Latin and Greek, to absorb and apply her mini podcasts.

Other UMBC faculty saw similar results using adaptive release, indicating that certain kinds of course designs do seem to result in greater levels of LMS activity among students.¹³ The evidence from Hardy's course and others supports the contention that LMS activity—or, at least certain *kinds* of LMS activity—can serve as a barometer of student engagement, which is correlated with greater student achievement, as measured by final grades in a course. In this way, we have begun to demonstrate the potential value of learning analytics, not only to identify at-risk students and conduct effective interventions but also to inform course design in ways that could benefit all students.

What It Means to Higher Education

As UMBC continues to develop analytical models and broaden our understanding of how technology can impact learning, we offer several lessons learned so far.

Don't wait for perfect prediction before trying a good intervention.

As ECAR research over several years indicates, most institutions remain in the early stages of adoption and maturity, focusing primarily on assembling the infrastructure and expertise to predict factors that impact student success. In 2005, ECAR reported that 70% of institutions were at the most basic level of academic analytics, and four years later, just under 60% were still at the initial stage of analytics.¹⁴ One factor contributing to this slow adoption is often the difficulty of accessing the relevant LMS activity, demographic, and student academic data necessary for predictions. Typically, even administrators for each of these systems aren't very familiar with how they all interrelate, except perhaps to carry out basic operations like course creation and autoenrollment of students to start the semester. The task of analysis—making

sense of the data, identifying key variables, developing hypotheses about critical factors that impact development and evaluation of interventions—is even more challenging. It requires intentionality as well as the infrastructure and expertise to do so.

This is one reason why we've supported Blackboard's efforts to develop a learning analytics platform that can help other institutions in this effort. We've learned a lot from our experience, but we lack the resources to fully scale it up, whether to further our own analysis or to help others begin theirs. For this reason, we are in the process of transitioning our homegrown analytics infrastructure—the platform on which CMA relies to provide its functions—to BA4L. As learning analytics in higher education matures, Blackboard understandably would like to see more evidence of the CMA's effectiveness as an intervention strategy to facilitate student engagement. For this reason, we continue to develop and support CMA, but we do so now based largely on our new BA4L infrastructure. Our work on the CMA might develop into a building block other clients can use; in the meantime, we are working in parallel to see what happens next.

Use analytics to nudge improvement in student responsibility for learning.

In *Leaving College*, Vincent Tinto offers a focus on student responsibilities that has influenced our development of the CMA and the role course design might play in student activity, attention, engagement, and (we hope) success. Specifically, he says “effective education requires that individuals take responsibility for their own learning.”¹⁵ Similarly, in their research on self-regulated learning, Zimmerman and Schunk identify two key changes that must occur for underperforming students to be successful:

- They must take responsibility for their weaknesses—they must own them.
- They must have specific opportunities to identify, correct, and improve upon those weaknesses.¹⁶

As we use analytics to understand more about our students, these insights and the tools that technology provides could be used to reimagine what institutional interventions might look like and to influence how faculty might design their courses so that students can take more responsibility for their learning. Thaler and Sunstein call this “nudge” a form of “choice architecture” that helps users make more informed decisions, and it is not unlike the course design decisions faculty make that define what students can know, understand, and do in their course sites.¹⁷ The University of Washington Tacoma is exploring similar forms of “nudge analytics” to improve student retention and success.¹⁸

To be sure, some students (and faculty) may “underrespond” to the system-generated feedback they are given about their Bb usage compared to peers. Engaging such students is challenging, and if they simply don't login enough to compare how active they are with peers, then an LMS-based analytics intervention won't likely help them. The same may be true of faculty who are not particularly active or interested in how their colleagues are using the LMS. While this lack of engagement (or “right to refuse education,” as Tinto says) is not something systems or policies can control, institutions have an opportunity (and perhaps a responsibility) to develop tools that can be tremendously beneficial to those students and faculty who take advantage of them.

Instructional technologies receiving institutional support should be formally assessed.

The LMS is an appropriate place to begin a learning analytics initiative because it is perhaps the most common instructional technology in higher education. To varying degrees, numerous

other instructional technologies are in use on college campuses, and many of these could also provide data that would be valuable to an analytics program. Penn State has been correlating activity with student grades in its Confluence wikis and Movable Type blogs and finds that students with higher GPAs tend to make more wiki edits, blog posts, and comments in each tool.¹⁹ At UMBC, we hope to do the same with data from our clicker system.

One area of concern, particularly for the LMS, is that when the platform for the tool changes, an analytics program built on the outgoing platform could be suspended or scaled back. The LMS market has experienced considerable volatility, and at many campuses, the effort and cost of switching might leave few resources to also transition a learning analytics program. In theory, an analytics program can be developed using any LMS, and so institutions need to decide how important this kind of analysis is to their support strategy, particularly if they move to a different LMS platform. At the same time, analytics should not be a barrier to innovation by discouraging an institution from exploring alternative platforms (vendor-based or homegrown). By sharing what UMBC and many others are doing with learning analytics, we hope to *broaden* what innovation means and redefine how analysis can inform and improve instructional technology support.

Conclusion

LMS-based learning analytics have been criticized as simplistic, reducing the learning process to “clickometry”—counting the number of clicks needed to earn a particular grade. Some even question the use of final grades for an initial correlation of reasonably conceptualized variables. Indeed, an institution could spend considerable time and effort on analytics, only to find the insights are not heeded—as indicated by the telling title of a recent article from the journal *Educational Technology & Society*: “Numbers Are Not Enough. Why e-Learning Analytics Failed to Inform an Institutional Strategic Plan.”²⁰

Despite the resistance to analytics from some quarters, higher education faces some real and growing challenges. Large numbers of students fail to graduate, which is costly both for those students and the institutions that serve them. Forces of accountability require us to intervene on their behalf, not just predict their likelihood of success or failure, and analytics can be a central part of that effort while also providing a means of evaluating the impact of investments in instructional technology.

Given all that institutions are doing already, it may be tempting to overlook—or even dismiss—what students can and should do as well. Using instructional technology to facilitate student self-awareness can also serve as good way to assess its impact. Learning analytics can only *inform* an institutional decision-making process, not substitute for it. In these still-early days, it is important for more institutions to attempt good interventions and not wait for perfect ones, if only so we can learn from each other.

Key Questions to Ask

- Does any instructional technology make a difference? To whom? How do we know?
- What are institutions doing to actively mine and correlate LMS data with student grades, demographics, and faculty course designs?
- If institutions consider switching their LMS, to what extent is new or continued exploration of learner analytics a factor in the decision?

- What is the appropriate role for students in their success? How might institutions support instructional technology to facilitate student “ownership” of learning?
- How do faculty beliefs about teaching inform their understanding of what’s possible with any instructional technology?
- How do we assess the impact of instructional technology without also assessing the teaching and learning it supports?
- How are institutional culture, values, and will revealed in our analytics-based interventions?

Where to Learn More

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- *Journal of Educational Technology & Society*, “Learning and Knowledge Analytics” Special Issue (2012), <http://www.ifets.info/index.php?http://www.ifets.info/issues.php?id=56>.
- Society for Learning Analytics Research (SoLAR), <http://www.solaresearch.org/>.

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Citation for This Work

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3. Libby V. Morris, Catherine Finnegan, and Sz-Shyan Wu, “Tracking Student Behavior, Persistence, and Achievement in Online Courses,” *The Internet and Higher Education* 8, no. 3 (2005): 221–231, doi:10.1016/j.iheduc.2005.06.009.
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5. Campbell, DeBlois, and Oblinger, "Academic Analytics."
6. John Fritz, "Video Demo of UMBC's 'Check My Activity' Tool for Students," *EDUCAUSE Quarterly*, 2010, <http://www.educause.edu/library/EQM1049>.
7. The CMA is becoming increasingly popular among all students, as evidenced by complaints we got when it was down during a transition from our homegrown analytics approach to Blackboard's in Summer 2012. I also receive anecdotal evidence of its importance all the time. After speaking about the CMA for a CIO roundtable at EDUCAUSE 2011, one CIO stood up and said: "John doesn't know this, but my son recently transferred to UMBC. He'd struggled at his previous institution and is not always as on top of things as much as I would like. But he told me that when he logs into Blackboard he can see how active he is compared to other students and that it really helps him: 'Yeah, I can see that I need to log in more and get active on the discussion board.' As a parent, I can tell you it's working with my son."
8. Gail Salaway and Judith Caruso, *The ECAR Study of Undergraduate Students and Information Technology, 2008—Key Findings* (Boulder, CO: EDUCAUSE Center for Applied Research, October 2008), <http://www.educause.edu/ECAR/TheECARStudyofUndergraduateStu/163286>; Judith Caruso and Gail Salaway, *The ECAR Study of Undergraduate Students and Information Technology, 2007—Key Findings* (EDUCAUSE Center for Applied Research, September 2007), <http://www.educause.edu/ers0706>.
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