EDUCATION GROWTH

•ADVISORS•

LEARNING TO ADAPT:

A Case for Accelerating Adaptive Learning in Higher Education

TABLE OF CONTENTS

A PERSONAL EDUCATION STORY

It is a warm and sunny morning at the start of the fall semester and Cathy, a college student, walks into a chemistry laboratory for the first time. Although she has never taken a course in such a well-equipped lab before, she feels remarkably at home.

The night before, Cathy spent an hour exploring a virtual lab online, performing tasks that had been assigned to her previously by her instructor. She mixed chemicals and learned how to use the tools in the lab properly – all by clicking on objects on the screen and moving them with her mouse, or by typing responses to questions that appeared as she proceeded through her tasks. When she performed a task correctly, the system praised her and invited her to try something a little more challenging. When Cathy performed a procedure incorrectly, however, the virtual lab would not allow her to proceed until the error had been corrected. To that end, she received an onscreen message drawing her attention to the error and inviting her to repeat the earlier steps in the procedure to achieve a different result. After completing the tour of the lab and mastering the tasks assigned to her – and overcoming a number of missteps along the way – Cathy felt ready for the next day's class.

In fact, Cathy found the experience of moving through the virtual lab more engaging than she had expected. Being able to move at her own pace and, if necessary, retrace her steps through a given procedure allowed her a freedom to experiment and problem solve that she didn't often find in the classroom; there, everything seemed to move so fast and other students sometimes caught on more quickly, making her feel that she might fall behind the group – a stressful feeling that she knew didn't help matters. But this morning, thanks to her work in the virtual lab, she feels ready and is eager to test the skills she developed online the night before in the real world.

Across town, another college student, James, is boarding a train for the 15-minute commute to campus. He is studying Mandarin with the aid of an app on his tablet. After taking his seat, he opens the tablet, clicks on the app, and asks the system to assign him 10 minutes of work. The app, already knowing how far through the course material he has progressed, as well as his areas of strength and weakness in the material covered so far, draws on the data gathered during his previous sessions and the time parameters James has established to generate a new assignment that will focus his attention on those areas he has yet to master. And so he gets to work. No sooner has he completed the brief assignment than the train arrives at his station, where he disembarks and heads off to class.

Elsewhere on campus, 20 math students meet with their instructor, Mrs. Franks, for the first of two weekly class sessions. After examining the students' progress through their online course materials over the preceding few days via a dashboard on her laptop, Mrs. Franks is able to quickly assess the individual performance of each student. She places those who have been moving through the curriculum faster than anticipated at a table to one side of the classroom. At another table, she places those half dozen students who have demonstrated difficulty completing the tasks assigned so far. At a third table, she places the remaining students who are currently on track with the curriculum.

Each group is assigned a different set of problems to tackle, based upon their current levels of competence. Mrs. Franks has each group's students work together on their assigned problems, as those problems have been specifically designed to advance them to the next stage in the curriculum. Working in their peer groups, the students focus on the problems that are most relevant to their own progress through the course. They get to work, talking with one another about the problems they had encountered in the online curriculum earlier in the week, and describing the various ways they had attempted to solve them. Then they begin collaborating to solve the new problems that have just been assigned to them in class.

Welcome to the world of adaptive learning – a more personalized, technology-enabled, and data-driven approach to learning that has the potential to deepen student engagement with learning materials, customize students' pathways through curriculum, and permit instructors to use class time in more focused and productive ways. In this fashion, adaptive learning promises to make a significant contribution to improving retention, measuring student learning, aiding the achievement of better outcomes, and improving pedagogy. No small feat, you'd surely agree.

It may sound futuristic or even fantastic, but the scenarios described above are all real – and so is the potential for adaptive learning to transform higher education.

ADAPTIVE LEARNING PROMISES TO MAKE A SIGNIFICANT CONTRIBUTION TO IMPROVING RETENTION, MEASURING STUDENT LEARNING, AIDING THE ACHIEVEMENT OF BETTER OUTCOMES, AND IMPROVING PEDAGOGY.

Anyone who has ever been in a classroom – whether as a student or instructor – knows that not all students proceed at the same pace. And yet, for centuries, our model for higher education has required all of us to attempt just that – to keep up or risk falling behind, sometimes hopelessly so.

Intuition tells us this model cannot be the most effective approach to instruction, and it isn't hard to recognize that a one-size-fits-all approach to learning has serious limitations. By and large, however, we persist with just such a model, bringing together students with widely diverse skill levels and attempting to keep them on pace with the arbitrary yet traditional 15-week semester. We place one instructor in front of a classroom of 20, 40, 100 or more students, and know that she cannot possibly customize the curriculum for each individual learner.

For well over a decade now, however, we have been hearing other voices talking about an alternative and more personalized approach to teaching. Gradually, these voices have been growing in number and volume as new technologies have appeared on the scene. These technologies increasingly enable us to not only deliver richer and more interactive learning materials online, but do so in ways that allow us to gather vast quantities of data on students' interactions with that material. On the basis of that data, we can then provide real-time remediation when students encounter challenges they cannot overcome with a single effort.

Today, technologies offered by companies as diverse as U.S.-based Knewton, CogBooks, from Scotland, Smart Sparrow, founded in Australia, and Cerego, first launched in Japan, as well as numerous other organizations are delivering solutions based on the science of cognition and learning. These solutions can support individualized educational experiences at a scale that is genuinely "adaptive."

It may go without saying, but if you've already heard of more than two of these companies, you're part of a very small coterie of adaptive learning enthusiasts. Indeed, in the era of MOOC mania (massive open online courses), newfangled competency-based credentials, and complicated policy debates about how best to increase access to higher education while simultaneously reducing costs and maintaining quality – well, adaptive learning is in some respects higher education's best-kept secret.

But that could well be about to change.

Indeed, as we attempt to free ourselves from the bondage of the so-called "Iron Triangle" of cost, access, and quality[1] – where attempting to increase access threatens to raise costs and reduce quality, attempting to contain costs while maintaining quality must necessarily reduce access, and focusing on quality while increasing access must seemingly drive up costs – adaptive learning may provide one key capable of unlocking the clasp that binds us as we seek to maintain a balance among these competing forces.

If adaptive learning solutions are implemented at scale, then they have the potential – at least theoretically – to produce a higher-quality learning experience (as measured by student engagement, persistence, and outcomes) at potentially reduced cost by making high-quality instruction more scalable. In addition, this solution holds out the promise of increasing access. Again, no small feat.

1. "The Iron Triangle: College Presidents Talk about Costs, Access, and Quality." By John Immerwahr, Jean Johnson, Paul Gasbarra. October 2008. The National Center for Public Policy and Higher Education and Public Agenda. *http://www.highereducation.org/reports/iron_triangle/index.shtml*

Encouragingly, a recent poll of college and university presidents conducted by Inside Higher Ed and the Gallup organization shows that the survey's respondents see more potential in adaptive learning (66 percent) to make a "positive impact on higher education" than they do MOOCs (42 percent).[2] This suggests that a new opportunity is emerging to experiment with adaptive learning on a far broader and deeper basis so that we can better test its promise and potential in the real world.

> ADAPTIVE LEARNING MAY PROVIDE ONE KEY CAPABLE OF UNLOCKING THE CLASP THAT BINDS US AS WE SEEK TO MAINTAIN A BALANCE AMONG THESE COMPETING FORCES.

REALIZING THE POTENTIAL OF ADAPTIVE LEARNING

Notwithstanding its futuristic character, the concept of adaptive learning, like the related but more generalized concept of personalized learning, is not difficult to grasp.

At a simple level, personalization involves moving beyond a one-size-fits-all approach to instruction. This can be achieved in a variety of ways – some of them sophisticated, others less so, some involving technology, others not. Challenging high-performing students with "extra credit" work, for example, is a modest form of personalization, as is assigning additional reading or problems to students who need more exposure to or practice with course materials in order to keep up with their classmates. While these strategies are targeted to the needs of individual or small groups of students, they are neither very powerful nor effective strategies, nor are they particularly scalable.

A more sophisticated version of personalization might take the form of computer-based tutoring, in which students engage with course materials via computer and respond to quizzes testing their knowledge of the material covered. If students answer particular questions incorrectly, they may be directed back to appropriate points in the materials to better acquaint themselves with the relevant concepts or facts. While still somewhat rudimentary, this form of computer-based personalization has much greater potential for scale than do other approaches.

Adaptivity is different from personalization in that it takes a more sophisticated, data-driven, and, in some cases, non-linear approach to remediation. At a simple level, an adaptive learning system behaves differently based on how the learner interacts with it – the system goes beyond providing binary responses (i.e., right / wrong) to student interactions, and can do more than simply point the learner back to appropriate materials at an earlier stage in the linear learning sequence. An adaptive learning system will adjust to what the learner's interactions with the material suggest about his or her mastery of the materials over time and, based on the learner profile it develops, will begin to anticipate things about the learner and serve up content based on knowledge of that profile. As a result, one learner might be challenged, for example, to better master verb tenses while studying a foreign language, whereas another learner working with the same material might be challenged to more rapidly build up a functioning vocabulary.

2. The 2013 Insider Higher Ed Survey of College and University Presidents. Conducted by Gallup. Scott Jaschik and Doug Lederman, eds. March 2013. *http://insidehighered.com/news/survey/affirmative-action-innovation-and-financial-future-survey-presidents*

ADAPTIVITY IS DIFFERENT FROM PERSONALIZATION IN THAT IT TAKES A MORE SOPHISTICATED, DATA-DRIVEN, AND, IN SOME CASES, NON-LINEAR APPROACH TO REMEDIATION.

Different types of adaptive learning solutions aid the effort to improve learning in different ways. Some companies, for example, offer technology platforms within which instructors can design and deliver their own courses, while other companies provide wholly developed and self-contained courses across a variety of disciplines. Some of these tools use a rules-based approach and focus on moving students down a linear path through a given curriculum, whereas others rely on complex algorithms to allow for multiple pathways through a collection of learning objects. Some applications focus on optimizing memory, whereas others focus on problem-based learning in context, for example, within the context of a simulation.

Insofar as these are still early days in higher education's experimentation with adaptive learning, these solutions are primarily being utilized at the course level. But if you consider the potential for developing an ever-larger data set of learner interactions, and forming an ever-richer learner profile as a result, the full promise of adaptive learning resides not in its use at the course level but at the level of the learner himself. The power of these systems will increase as they follow the learner across a range of courses covering a particular domain of knowledge or a range of related skill sets.

The burgeoning interest among consumers in data feedback tools such as the fitness wristbands offered by Nike, Jawbone, and Fitbit – which can calculate calories consumed and burned, steps taken, and hours of deep and shallow sleep per day, in addition to many other metrics– points to the power of feedback itself as an aid to achieving goals. If we turn from the objective of improving health to one of increasing learning, the power of continuous, personalized feedback drawn from adaptive learning solutions has the potential to be just as immediate and transformative.

THE FULL PROMISE OF ADAPTIVE LEARNING RESIDES NOT IN ITS USE AT THE COURSE LEVEL BUT AT THE LEVEL OF THE LEARNER HIMSELF.

ADAPTIVE SOLUTIONS TAKING ROOT

Among the opening scenarios presented, the first illustrates how a student might engage with a simulation in the context of a rules-based approach to progressing linearly through a curriculum. The second scenario, in which a student attempts to master a new language, represents how memory optimization can bring the right learning material to the student at appropriate moments in time to ensure that key concepts have not been forgotten. The third scenario illustrates how an adaptive learning platform can be put to use by an instructor to monitor student progress and subsequently customize her approaches to remediating students moving through the curriculum at varying speeds.

The differences between these approaches can reflect distinct philosophical positions on learning theory as well as variations regarding the ideal role of an instructor. In addition, they are also in many respects a consequence of the divergent origin stories of the companies delivering them. We still have much to learn before we can judge which approaches are best, or which might work successfully in combination, but these will be important questions to answer in the years ahead.

Today, the higher education marketplace is thick with companies and organizations claiming to have "personalized learning" or "adaptive learning" capabilities. Companies are using this language fairly loosely in their sales and marketing efforts, creating a fair degree of confusion. As in most emergent markets, it's helpful to establish a lens or framework through which prospective customers can distinguish – and potentially evaluate – suppliers.

Within the adaptive learning landscape, institutions generally have choices between ***adaptive platform*** and authoring tools businesses and various ***publishers*** who marry instructional content with technology delivery models that incorporate adaptivity.

THE PLATFORMS

These platform- and tools-oriented companies deliver infrastructure and services that enable adaptive learning models. Examples of notable platform providers include aNewSpring, Cerego, CogBooks, Knewton, LoudCloud, and Smart Sparrow. While companies' solutions are content agnostic and can be applied across a broad range of disciplines, individual firms may target certain subjects. For example, early implementations have tended to focus on highly structured/sequential subject areas (e.g., mathematics and engineering for institutional customers; language learning and exam review/test prep services for consumers).

The adaptive platform players are generally earlier-stage businesses, and many are actively pursuing partnership opportunities with leading publishers, service providers, and institutions. Simultaneously, established companies are tracking the progress of these players, and this segment will likely see considerable investment and M&A activity over the next 12-18 months.

THE PUBLISHERS

This segment includes both publishing incumbents (seeking to shift away from dependence on the traditional textbook model) and newer digital publishing and content service providers that deliver exclusively online resources and tools. The "incumbents" are aggressively pursuing personalized learning models that leverage adaptivity to provide more solution-oriented approaches on behalf of their college and university customers. To date, their efforts have tended to represent extensions of the textbook model, whereby adaptive resources and tools are bundled with print and digital texts. Companies in this area include Cengage, Jones & Bartlett Learning, Macmillan, McGraw-Hill, Pearson, and Wiley.

The “emergent” digital publishers are unencumbered by a print-based legacy and are developing native online solutions that draw on rich media, immersive environments, gamification, and other instructional design trends to improve student motivation and engagement in support of learning outcomes. Sample providers include Adapt Courseware and Open Learning Initiative.

These suppliers offer a variety of solution models with varying degrees of adaptivity, and many will evolve from providing instructional supplements (e.g., simulations and labs, rich-media tutorials) to comprehensive courseware solutions. The born-digital publishers, however, face a significant market-entry hurdle in that they are simultaneously challenging established content and instructional paradigms while also partially relying on the incumbent publishers – and others – to access college and university decision-makers with some degree of scale.

In addition to thinking about the benefits of “platforms” vs. “publishers” in the adaptive arena, institutional decision-makers should consider whether they are trying to innovate with these solutions within their existing course paradigm or are seeking to more dramatically transform it. In the latter camp – i.e., “transform” – are solutions that facilitate fundamental rethinking and redesign of the complete course experience for instructors and students and include both platform and publisher models. In the former camp – i.e., “tweak” – are adaptive solutions deployed against discrete elements of the course experience, which may include an independent practice and review environment, a homework tool, interactive labs and simulations, or targeted test prep resource. Solutions in both the “tweak” and “transform” categories can deployed in site-based, online, or hybrid scenarios. **The following table** highlights a set of companies and organizations with currently available adaptive solutions.

	BUSINESS MODEL		INSTRUCTIONAL MODEL	
ORGANIZATION	PLATFORM	PUBLISHER	SUPPLEMENTAL INSTRUCTIONAL RESOURCE	WHOLE COURSE DELIVERY
ADAPT COURSEWARE		■		■
ANEWSPRING	■			■
CEREGO GLOBAL	■		■	
COGBOOKS	■			■
JONES & BARTLETT LEARNING (NAVIGATE PAL)		■	■	
KNEWTON	■			■
LOUDCLOUD SYSTEMS	■			■
MCGRAW-HILL EDUCATION (LEARNSMART ADVANTAGE SUITE)		■	■	
OPEN LEARNING INITIATIVE		■		■
QUANTUM SIMULATIONS		■	■	
SMART SPARROW	■		■	

Companies and organizations are also employing one or more strands of academic research in areas such as intelligent tutoring systems, machine learning, knowledge space theory, memory, and cognitive load theory, among others, to underpin their solutions' approach to adaptivity. For some solutions, adaptivity is driven by frequent assessment and evaluation activities that result in nearly real-time adjustments in the instructional content, learning resources, and courses pathways presented to students. More sophisticated systems also aggregate cognitive and non-cognitive student data to support development of a learner profile; this profile may inform not only the sequencing and instructional content presented, but also its modality (e.g., text, video, simulation, audio), duration, frequency, timing, etc. to best align with individual learners' prior knowledge, cognitive ability, pace of learning, and motivation.

In another scenario, professors and instructors are furnished with robust student performance profiles (i.e., "dashboards") that allow them to adapt and differentiate instruction for students. In this latter case, adaptivity is *enabled* by technology through rich learner analytics and effective presentation of student data; the actual application occurs through decisions made by professors and instructors. Moreover, in most cases, solutions are, to varying degrees, employing both approaches to personalize the instructional experience for learners.

INSTITUTIONAL DECISION-MAKERS SHOULD CONSIDER WHETHER THEY ARE TRYING TO INNOVATE WITH THESE SOLUTIONS WITHIN THEIR EXISTING COURSE PARADIGM OR ARE SEEKING TO MORE DRAMATICALLY TRANSFORM IT.

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Today, the only certainty about the adaptive learning marketplace is that it will remain in flux for the foreseeable future. Companies and organizations will continue to deliver an increasingly diverse array of adaptive solutions for institutional decision-makers' consideration. Where, how, and why colleges and universities, as well as faculty and instructors, consider deploying these solutions is context-specific and will vary tremendously. In the near-term, creating a sustainable pathway for maturing this market will require clear and non-hyperbolic supplier marketing and communications efforts; a reasonable investment of institutional time in preliminary investigations of prospective solutions; and thoughtful market discourse in the sector press, analyst reports and company coverage, and industry blogosphere.

ADAPTIVE ADOPTION ON CAMPUS

Ultimately, adoption of adaptive learning solutions by colleges, universities, and faculty will be driven by the ability of those solutions to deliver meaningful outcomes in terms of student learning goals and completion objectives, at both course and program levels. To that end, a key input for institutional and faculty consideration necessarily revolves around evidence and case examples that credibly demonstrate student learning

impact. Recognizing that need, companies and organizations are actively conducting investigations into the impact of their solutions. The result is that a body of evidence, albeit still relatively limited in size and the scale of implementation, is beginning to emerge. For example:

- Preliminary findings from ***Arizona State University's*** partnership with ***Knewton*** on re-designed emporium and mastery-based math courses have revealed an 18 percent increase in pass rates and 47 percent drop in student withdrawals. ASU leadership estimates that the institution has retained $12,000,000 in what would have been lost tuition revenue to date.[3]

- A study consisting of nearly 700 students across ***two state universities*** and ***four community colleges*** indicated that the community college students using ***McGraw-Hill Education's LearnSmart***, as compared to those using end-of-chapter testbank questions, achieved higher course pass rates across all students – i.e., 7 percent average increase – and an average increase of 8 percent in retention rates.[4]

- ***Six public universities*** participated in a randomized controlled study, with statistically reliable control and treatment groups, in which students enrolled in ***Open Learning Initiative's*** introductory statistics course. The study found that students completed the OLI course 25 percent faster than students in a face-to-face version of the course while achieving similar performance levels, findings that remained consistent irrespective of the demographic, gender, or Pell-eligible status of the students.[5]

- At the ***University of New South Wales***, the introduction of online adaptive tutorials, enabled by ***Smart Sparrow***, in a foundational first-year Engineering Mechanics course led to a decline in the course drop-out rate from 31 percent to 14 percent, even as course enrollments increased by nearly 30 percent to more than 350 students.[6]

This evidence highlights the potential that adaptive learning solutions – implemented with fidelity and care – may have to positively impact the "Iron Triangle" of cost, quality, and access with which colleges and universities are dealing. At the same time, unless and until there is broader adoption and evaluation of these types of solutions, critics will likely point to the available body of evidence as inconclusive. Thus, a greater number of institutions and their key stakeholders must be willing to rigorously experiment with and assess the opportunity for adaptive learning solutions to show the way for the broader market. The following section highlights key considerations for those colleges and universities interested in blazing this trail.

3. Data provided by Arizona State University and Knewton, February 2013.
4. McGraw-Hill Education, *http://learnsmart.prod.customer.mcgraw-hill.com/for-educators/success-stories*
5. "Interactive Learning Online at Public Universities: Evidence from Randomized Trials." William G. Bowen, Matthew M. Chingos, Kelly A. Lack, Thomas I. Nygren. Ithaka S+R. May 2012. http://www.sr.ithaka.org/research-publications/interactive-learning-online-public-universities-evidence-randomized-trials
6. Data provided by University of New South Wales and Smart Sparrow, March 2013.

REAPING THE REWARDS, MANAGING THE RISKS

If colleges and universities are able to realize the full promise and potential of these adaptive learning solutions, they will have achieved something that is the hallmark of true innovation – enhancing value for all participants in the higher education community, including students, faculty, administrators, employers, taxpayers, and the suppliers of these solutions.

Of course, these are still early days in the deployment of many of these solutions. And along with the promise and potential, the adoption of adaptive learning solutions brings with it certain risks – a number of which are by no means small.

Foremost among those risks, perhaps, is the fact that the pedagogical model implied by one or another type of adaptive learning may well conflict with the prevailing teaching paradigm at a given institution. The difficulty in achieving the culture change necessary to accommodate this new approach to teaching could well undermine implementation, particularly if faculty are not meaningfully engaged as stakeholders in the deployment of these solutions. Poorly conceived and executed implementations will likely yield underwhelming results; thus, there is always the potential that an already skeptical faculty would seize upon poor results to resist this approach to instruction even more forcefully.

ADOPTION OF ADAPTIVE LEARNING SOLUTIONS BY COLLEGES, UNIVERSITIES, AND FACULTY WILL BE DRIVEN BY THE ABILITY OF THOSE SOLUTIONS TO DELIVER MEANINGFUL OUTCOMES IN TERMS OF STUDENT LEARNING GOALS AND COMPLETION OBJECTIVES.

The long-term potential for these solutions could also be undermined if they are relegated solely to use in entry-level courses. The presumption here would be that adaptive learning solutions, if appropriate at all, are so only for lower-level courses that can suffer automation. However, these presumptions need to be examined rigorously, lest adaptive learning find itself relegated to a kind of intellectual ghetto.

Another risk to be considered is that not all students will take to learning models that represent such a significant break with their past experience. For some students, adaptive learning approaches to instruction may well increase disengagement rather than foster deeper engagement, particularly if those students feel uncomfortable in a learning context that is not characterized by close oversight, continual monitoring, and frequent feedback from a trusted instructor.

THE PEDAGOGICAL MODEL IMPLIED BY ONE OR ANOTHER TYPE OF ADAPTIVE LEARNING MAY WELL CONFLICT WITH THE PREVAILING TEACHING PARADIGM AT A GIVEN INSTITUTION.

Additionally, because the suppliers of adaptive learning solutions have achieved limited scale thus far, evidence of their effectiveness in improving student learning outcomes is limited. This makes the work of those seeking to champion the use of these tools internally more difficult. Likewise, because many suppliers are early-stage businesses, their long-term sustainability is itself uncertain, and this fact could undoubtedly give many a university business officer or academic leader pause before entering into a relationship with such suppliers.

While risks of this sort are inherent in any emerging, immature market, they can be managed if institutional leaders are guided by prudent management practices.

It is, at the outset, important for institutional leaders to calibrate their risk tolerance with the proposed implementation's overall degree of difficulty. The objectives they set should be accompanied by a clear statement of purpose and should take the form of SMART goals –specific, measurable, attainable, realistic, and time-bound.[7] Insofar as one of the chief benefits of adaptive learning resides in its capacity to inform a more scientific approach to pedagogy, rigorous evaluation of implementations will be necessary to achieve that benefit.

Those overseeing the implementation of adaptive learning initiatives must anticipate the organizational structures that will prove necessary to support decision-making within and across the academic units and organizational functions involved in a given project. This necessarily includes establishing structures for involving supplier partners in key decision-making, as well. Indeed, for the long-term success of the initiative, institutional leaders should work closely with their supplier partners to anticipate how these adaptive learning tools are likely to evolve over time and thereby impact the scope and scale of future projects.

INSOFAR AS ONE OF THE CHIEF BENEFITS OF ADAPTIVE LEARNING RESIDES IN ITS CAPACITY TO INFORM A MORE SCIENTIFIC APPROACH TO PEDAGOGY, RIGOROUS EVALUATION OF IMPLEMENTATIONS WILL BE NECESSARY TO ACHIEVE THAT BENEFIT.

Additionally, institutions must simultaneously avoid over-reach yet plan for extensibility. This balance requires defining a roadmap for adaptive learning projects that identifies key milestones from inception to maturity. Pilot initiatives that produce meaningful outcomes can provide critical support for more significant investments; however, even at early stages, institutional leaders should make sure that pathways for future progress and expansion have been cleared. If this path-clearing work is left until later, the pilot's success as a proof of concept may languish as structural, political, and cultural challenges are encountered.

7. [Source Wikipedia] Doran, G. T. (1981). There's a S.M.A.R.T. way to write management's goals and objectives. Management Review, Volume 70, Issue 11(AMA FORUM), pp. 35-36

It is also important, of course, that institutional leaders keep an open mind when evaluating their initiatives' outcomes. The core value proposition of adaptive learning is that it will produce better results. If those results don't materialize, it would be wise to reassess the effort and diagnose the problems encountered along the way before proceeding any further.

Implicit in these recommendations is the necessity for approaching an adaptive learning implementation in a collaborative fashion – collaborating with other institutions who have engaged in similar efforts, with suppliers whose solutions a given institution is relying upon, and, perhaps most importantly, with the internal stakeholders whose expertise in educational technology, pedagogy, professional development, and assessment will be required to design and execute a successful project.

Because adaptive learning is conducted at the very core of the institution's mission – instruction and assessment – the culture change challenges should not be underestimated. Before proceeding with an adaptive learning initiative, institutional leaders should make a concerted attempt to accurately estimate both the degree of project complexity and the probable impact of the effort on the organizational culture, thereby calibrating their risk tolerance to that degree of complexity. Developing answers to the following questions can aid institutions in this effort:

- Will the pilot initiative involve participation of a single academic or administrative unit or work across diverse units and functions?
- What are the institution's core pedagogical values (e.g., learning styles, experiential education, competency-based assessment) and how do they align with the pedagogical values of its adaptive learning supplier?
- What kinds of assessment and evaluation will map to those pedagogical values (e.g., competency testing, portfolio assessment, lab work), and how far is the institution willing to go in re-imagining instructional roles and the function of class time in pursuit of its objectives?
- What delivery methods offer the best opportunity for deployment and evaluation – classroom, online, or hybrid; class-paced or self-paced?
- What is the proper unit of analysis for measuring the success of the institution's pilot initiative – the course, the program, the student?
- What professional development will be required to motivate key contributors and facilitate collaboration across units and functions?

BECAUSE ADAPTIVE LEARNING IS CONDUCTED AT THE VERY CORE OF THE INSTITUTION'S MISSION – INSTRUCTION AND ASSESSMENT – THE CULTURE CHANGE CHALLENGES SHOULD NOT BE UNDERESTIMATED.

Transforming higher education is no small task, nor is breaking free of the binding constraints of the iron triangle of cost, access, and quality pressures. Adaptive learning brings with it great promise, but must be accompanied by significant culture and business process change. While it may be easier in some respects for an institution to simply step to the side and allow the adaptive learning movement to pass it by, thereby avoiding the risks it may pose, in the end such an institution will simply have opted to continue to struggle with the problems it is already experiencing, and one promising avenue toward a solution will have been foreclosed.

If, as some college and university presidents apparently believe, adaptive learning has greater potential to transform higher education in a positive way than the latest fad in online learning – the omnipresent MOOCs – then this may well be the right time to get involved in adaptive learning.

ADAPTIVE LEARNING BRINGS WITH IT GREAT PROMISE, BUT MUST BE ACCOMPANIED BY SIGNIFICANT CULTURE AND BUSINESS PROCESS CHANGE.

PUTTING THE SCIENCE OF LEARNING TO WORK

While a deepening body of work on the science of learning has been accumulating over many years, the vast majority of classrooms and other learning contexts remain largely uninformed by this progress – a consequence of the fact that those who most often design courses, while experts in the subject matter of their disciplines, are rarely also subject matter experts in the science of learning.

In a sense, adaptive learning has the potential to make this learning science itself more scalable by taking on the responsibility of putting that science to work. If institutions and instructors can become comfortable with this form of educational collaboration, then the potential for adaptive learning is significant. Students will be able to progress through learning materials down more personalized and relevant pathways, increasing their engagement with the tasks before them, and ultimately realizing improved outcomes. If these gains can be achieved, then adaptive learning will provide an important occasion for us to rethink how we drive the greatest benefit from online delivery tools, class time, faculty expertise, instructional designers, assessment specialists, career services offices, and more.

The pressures on higher education to become more cost efficient, more accessible, and more impactful are real, and the forces driving those pressures are global in character; there is little chance of these pressures diminishing, much less simply vanishing. The stakes are simply too high, especially given the fact that our system of higher education plays such a critical role in strengthening and sustaining our nation's global economic competitiveness. Adaptive learning represents a particular opportunity to better manage those competing pressures and potentially strengthen the distinctiveness of our approach to higher education.

If this newer approach produces better results, then it will be worth pursuing. The way for us to test that potential is to put these tools to work in the context of closely monitored experiments complemented by rigorous evaluation.

While it will be necessary to engage in relatively small-scale experimentation at present, we should also consider what higher education is likely to look like in the decades ahead and anticipate the role that adaptive learning might play, particularly as learning continues to become more mobile and untethered from the classroom. Just as we have witnessed a convergence of online resources and tools and classroom learning – a form we still refer to as hybrid learning but may one day simply refer to as learning – we are likely to witness a similar convergence of education and training, of study and work, as adaptive learning materials and tools take their place in a wider variety of contexts.

IF INSTITUTIONS AND INSTRUCTORS CAN BECOME COMFORTABLE WITH THIS FORM OF EDUCATIONAL COLLABORATION, THEN THE POTENTIAL FOR ADAPTIVE LEARNING IS SIGNIFICANT.

If scenarios like this sound attractive to some, it is just as likely that they sound anything but desirable to others. For some, change itself is the inconvenience.

Big data and business analytics have the potential to improve the educational experience for students and faculty alike. However, this opportunity to "automate" components of the learning experience should converge with, rather than supplant, the human role in education. Consider how several years ago you might have lost your wallet and hurried home to call your credit card companies to alert them to the danger of your card being used without authorization. Today, by virtue of the routine data mining undertaken by credit card providers, you are much more likely to hear from them about your card being stolen than they are to hear from you. In a similar fashion, we may be on the cusp of a similar shift within the realm of pedagogy and learning.

Of course, adaptive learning applications – among other higher education innovations – still remain long on promise, and we must start with where we are. But we are already somewhere quite interesting – we are there in the chemistry lab, ready to get to work; we are alighting from the train, thinking in a new language; we are fostering more personalized collaboration among students and with instructors by virtue of new tools and new data that promise to bring the power of learning to more learners more effectively and more efficiently than ever before.

BIOGRAPHIES

ADAM NEWMAN, *Managing Partner*

Adam Newman is a Founding Partner of Education Growth Advisors, a revenue strategy consulting and advisory firm focused exclusively on the education sector. Adam has more than 15 years' experience in consulting and market research, management, banking, and teaching across all segments of the education sector. Previously a Director at Berkery, Noyes & Co., Adam originated the firm's strategic advisory practice for education companies and investors, supported the Education and Training practice's transactional activities, and launched the industry's seminal "Venture Capital in Education Summit," an annual event convening the most dynamic and innovative early-stage companies and entrepreneurs across the preK-12, postsecondary, corporate training, and consumer markets. Adam also served as a Managing Vice President at Eduventures, Inc.

PETER STOKES, *Special Advisor*

Peter Stokes serves as a Special Advisor to Education Growth Advisors, supporting the firm's initiatives and engagements in the postsecondary and lifelong learning segments. Peter is also Executive Director, Postsecondary Innovation, at Northeastern University's College of Professional Studies, where he leads research on innovative practices across a range of academic and administrative functions within higher education. He has also held positions as a technology industry analyst and management consultant, and served for more than a decade as the Executive Vice President and Chief Research Officer at Eduventures, Inc. A longstanding contributor to higher education public policy debates at the federal and state levels, Peter was recognized as one of "higher education's new generation of thinkers" by The Chronicle of Higher Education in 2005.

GATES BRYANT, *Partner*

Joining Education Growth Advisors as a Partner in 2011, Gates Bryant is a general manager and strategy consultant with proven success in bridging the gap between innovative strategy and practical execution. Prior to joining Education Growth Advisors, Gates was an executive with Houghton Mifflin Harcourt, working in strategy, product management, and finance during a period of dramatic change in the educational publishing and technology industry. Prior to joining HMH, Gates was a strategy consultant with the Parthenon Group, advising clients on revenue growth, profit improvement, and opportunities for mergers and acquisitions in the information, education, publishing, and technology industries.

ABOUT EDUCATION GROWTH ADVISORS

Founded in 2010 by longtime education and investment industry veterans Adam Newman and Christopher Curran, Education Growth Advisors ("EGA") is a strategic advisory and consulting firm and investment bank working across the K-12, postsecondary, corporate and lifelong learning sectors. EGA delivers business expertise that marries rigorous, research-based market analysis, hands-on education-industry experience and extensive transactional and capital markets experience. EGA's unique position at the heart of the education industry ensures that its clients have the partner they need to make the right decisions in today's complex and rapidly evolving education marketplace. For more information about Education Growth Advisors, visit ***www.edgrowthadvisors.com***.

This white paper, Learning to Adapt: A Case for Accelerating Adaptive Learning in Higher Education, is the precursor to a larger more detailed report. The full report, which is due to be published at the end of March, will provide institutions with more tools for evaluation of providers and deeper, richer insights into the rapidly evolving landscape of adaptive learning.

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