Mc Graw Hill

HIGHER

THE EQUITY EQUATION

McGraw-Hill
White Paper Series

WHAT IF EDUCATIONAL OPPORTUNITY BECAME A LEVEL PLAYING FIELD?

HOW WOULD THAT CHANGE THE LANDSCAPE OF TOMORROW?

The promise of adaptive learning to drive systemic change.

U.S. colleges and universities have made real progress in recent years to advance overall student success and college completion rates. A study released in December 2018 by the National Student Clearinghouse Research Center revealed that six-year national college completion rates increased for the third consecutive year in 2018, reaching an all-time high of 58.3 percent for students who entered college in fall 2012.

But under the surface of this encouraging news lies a disturbing reality: despite these improvements, serious opportunity gaps persist among first-generation students, low-income students, and students of color. The same study, for example, found that Asian and white students who started at four-year public institutions graduate at much higher rates (76.7 percent and 72.1 percent, respectively) than their black and Hispanic counterparts (47.6 percent and 57.4 percent, respectively).[1]

The statistics paint an even grimmer picture for students attending community colleges: according to the study, about 40 percent of all community college students who started their education in 2012 graduated within six years. But only 35.7 percent of Hispanic students and 27.5 percent of black students graduated from a two-year institution within that same time period. Further, nearly 55 percent of black students who enrolled at community college in 2012 did not complete their studies and were no longer enrolled at any institution.

As both the diversity of today's college students and the economic value of a college degree continue to grow, closing this opportunity gap remains one of the greatest challenges facing U.S. Higher Education. That's why colleges and universities across the country—be they two-year, four-year, for-profit, or private—are shining the light on educational equity as a key focus of their institutional strategies. And that means putting systems and support structures in place to ensure that every learner has an equal chance to succeed.

The drive to improve educational equity requires an understanding of the unique challenges faced by individual students— and the creation of learning environments that overcome those barriers by empowering instructors with choices to use what they deem as most appropriate course materials to meet their students' specific needs. McGraw-Hill believes that the combination of effective instruction, affordable learning resources, and innovative adaptive learning technology can help close the equity gaps and broaden access to high-quality learning opportunities that lead to student success.

This paper explores how the great potential of sophisticated adaptive learning systems can help drive meaningful and sustainable improvements in educational equity.

[1] National Student Clearinghouse Research Center, "Completing College – National by Race and Ethnicity – 2017," 2017

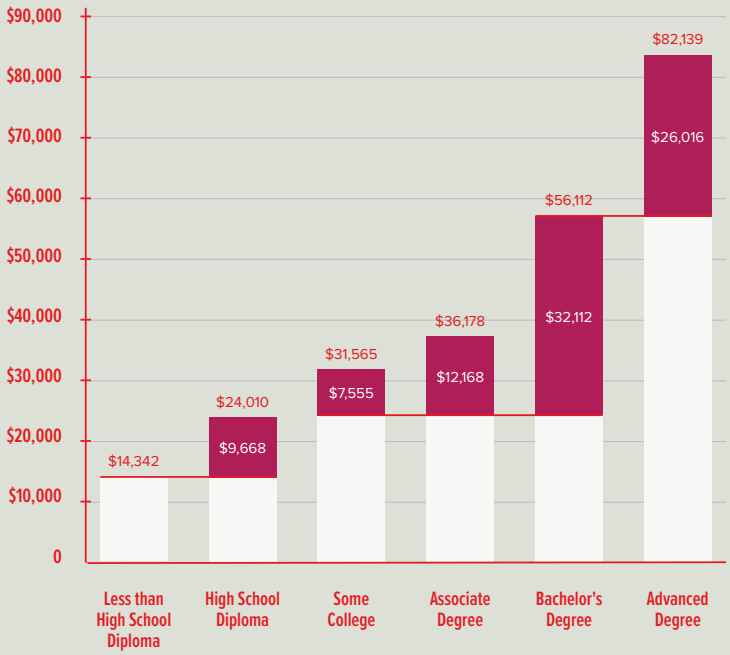

IMPROVING EDUCATIONAL EQUITY REQUIRES AN UNDERSTANDING OF THE UNIQUE CHALLENGES FACED BY STUDENTS.

SPOTLIGHT

DOLLARS AND SENSE: THE VALUE OF A COLLEGE DEGREE

As Warren Buffet famously stated, "the more you learn, the more you earn," and a college degree has long held the key to economic prosperity. A four-year degree can be worth millions of dollars over the course of one's career. And beyond financial gains, college graduates see a positive impact across a range of areas including lower unemployment rates, higher levels of happiness and job satisfaction, and better overall health.[2]

Average annual earnings*



* Source: Author's calculations using the 2012 American Communicty Survey Public Use Mirodata Sample, ages 27-66 and not enrolled in college, N = 1,546,287.

[2] Porter, ERIC Digest, "The Value of a College Degree," 2002

On an annual basis, bachelor's degree-holders earn about $32,000 more than those whose highest degree is a high school diploma.[3] Over 40 years, the college wage premium (the difference between the average salaries of college and high school graduates) doubled from 40 percent to 80 percent while the share of low-skill jobs fell from 39 percent to 29 percent of the workforce.[4] That's a $1.28 million average lifetime earnings difference between those who hold a bachelor's degree and those who only graduated high school.

Moreover, not all degrees are created equal. STEM, health, and business majors net the highest returns, leading with an average of $65,000 in annual salary earnings over the course of a career.[5] These top-paying majors can equate to an increase of 3.4 million in earnings over the course of a lifetime.[6] With as many as 2.4 million STEM jobs expected to go unfilled by 2025,[7] a recent report from STEMConnector outlines the need to build a stronger STEM talent pipeline to help students advance to high-paying STEM careers.

"BEYOND FINANCIAL GAINS, COLLEGE GRADUATES SEE A POSITIVE IMPACT ACROSS A RANGE OF AREAS INCLUDING LOWER UNEMPLOYMENT RATES, HIGHER LEVELS OF HAPPINESS AND JOB SATISFACTION, AND BETTER OVERALL HEALTH."

[3] Trostel, Lumina Issue Papers, "It's Not Just the Money," 2015.
[4] Grant, CNBC, "The downside of high demand for college-educated workers," 2015
[5] Carnevale, Cheah, and Hanson, Georgetown University, "The Economic Value of College Majors," 2015
[6] Carnevale, Cheah, and Hanson, Georgetown University, "The Economic Value of College Majors," 2015
[7] Fayer, Lacey, and Watson, U.S. Bureau of Labor Statistics, "STEM Occupations: Past, Present, and Future," 2017

HIGHER ACHIEVEMENT

Creating personalized pathways for every learner.

What if information about every student was made available to instructors so they could predict those who were likely to struggle and know exactly where and when to intervene? What if a learning system that lifted achievement across enormous populations of students and even offered one-on-one training to prepare students for new careers could be created?

This world is coming into focus. Powered by advanced algorithms and grounded in the science of how learning happens ("learning science"), best-in-class adaptive learning systems actively tailor learning to the individual and enable instructors to better allocate their time where it can have the biggest student impact. These systems continually assess skill and confidence levels and provide precise direction to fill knowledge gaps, accelerate mastery, and adapt to each student's individual learning styles and unique circumstances. As a result, each student takes a customized path through the course material based on how they interact with the software. And a faculty member is able to review data about each student's progress and learning needs in order to modify instruction in real-time. As a result, students get the content and activity that they need when they need it—much like the effect of one-on-one tutoring.
To understand more about how these systems work, consider the importance of foundational knowledge in several examples. When a chess master is able to recount a game, move by move, it's not because she/he has a spectacular memory—the master's short-term memory contains only as much memory as a novice chess player. The difference is that the chess master, by virtue of repeated games over time, has acquired a foundational understanding of the chess "schema." Musicians can suddenly play songs they only know the lyrics to, not because of some supernatural musical prowess, but because they understand that the songs fit into known chord progressions. Experts in any field make what they do look easy because, secure in their foundational knowledge, their movements and choices are sleek and efficient. They have all loaded information about their respective domains into long-term memory so that at any given moment, they can draw upon it.

Most adaptive learning systems try to enhance this kind of foundational knowledge using some version of an algorithm developed at Carnegie Mellon in 1995 known as Bayesian Knowledge Tracing (BKT). BKT traces a student's pattern of improvement to determine if he or she has learned a skill yet. Such systems have been effective up to a point, but they have stumbled in other ways—especially when it comes to a key factor about the human brain and the process of learning: forgetting.

As early as 1885, Hermann Ebbinghaus identified an exponential pattern for the way the brain forgets information. He called it the Ebbinghaus Forgetting Curve. Bayesian-based algorithms, while a breakthrough at the time, fell short in completely addressing the Forgetting Curve. But within the last decade, an algorithmic revolution has occurred.

Researchers at the University of California Irvine developed an algorithm that could assess a student's current knowledge, follow and adjust itself to the rate at which the student learner tended to forget new declarative knowledge, create variability in the lessons so that students mastered core principles rather than simply memorizing answers, and provide students with encouraging maps of their progress in different subjects.

BEST-IN-CLASS ADAPTIVE LEARNING SYSTEMS ACTIVELY TAILOR LEARNING TO THE INDIVIDUAL AND ENABLE INSTRUCTORS TO BETTER ALLOCATE THEIR TIME.

The new theory and algorithm compensated for each student's rate of forgetting by prompting students in a timely and calibrated way to assure subject mastery. The brain's Forgetting Curve acted like the force of gravity on the flight path of learning. The algorithm provided the engines to keep concepts in the air, moving from short-term to long-term foundational memory.

Improvements in algorithms have allowed for refinements, not only in the way that newly acquired knowledge is interspersed, recontextualized, and re-introduced, but also in the way the algorithm paces the rate of new knowledge acquisition—adapting to each student's zone of proximal development or "sweet spot" so that students remain confident and engaged but not overwhelmed by too much new material.

Over the last five years, these sophisticated learning systems, in conjunction with new teaching styles, have created remarkable outcomes, including starting to level the playing field for students from all backgrounds.

SPOTLIGHT

THE BLOOM EFFECT: ALL STUDENTS ARE CAPABLE OF HIGH ACHIEVEMENT

The Bloom Effect, first described in a 1984 research paper authored by educational psychologist Benjamin Bloom, concluded that nearly all students were capable of high achievement. It didn't matter, Bloom stated, that some students came better prepared with more prior knowledge than others. It also didn't matter that some students struggled with different subjects and learned things at different rates. What Bloom discovered was that all students could achieve a two standard deviation improvement in their learning. Since its discovery, this finding has been called the 2-Sigma Effect. All that was missing was the right instructional environment.

To create that environment, Bloom's researchers paired groups of students with one-on-one tutors. These tutor-student pairs used a method that Bloom called mastery learning, where each student was assessed with their prior knowledge of a given subject as the baseline, progressed at their own pace, and received frequent evaluations. Each tutor made numerous small adjustments based on that information. Previously mastered material would be reintroduced in slightly different forms over time—a technique called spaced practice—to anchor concepts in long-term memory.

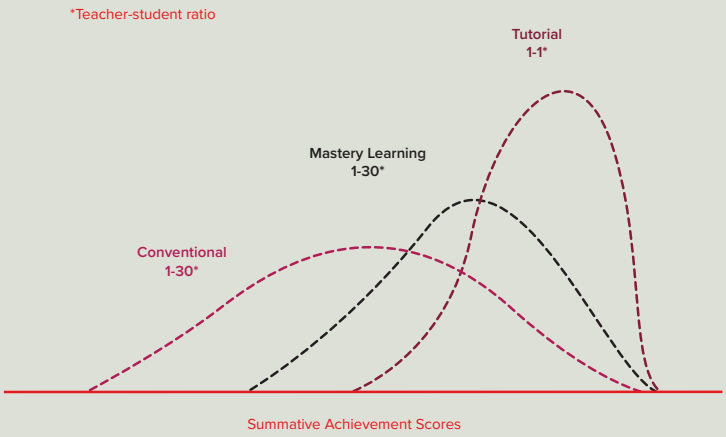
Bloom's results caught educators' attention largely because of the promise of educational equity. But the problem with Bloom's 2-Sigma was finding a cost-effective and easily adaptable way to provide tailored learning to all students.

"WE BELIEVE THAT HIGHER EDUCATION CAN BE SUPPORTED BY ADAPTIVE TECHNOLOGY, HELPING STUDENTS BECOME MORE CONFIDENT IN THEIR ACADEMIC PERFORMANCE."

Thanks to new technological advances and innovative approaches, higher education institutions are now able to make Bloom's 2-Sigma Effect a reality. Through the use of adaptive technology, dedicated teachers, and thoughtful implementation, institutions around the world are now able to execute Bloom's vision of mastery learning and create equity at scale.

Bloom's vision of a more equitable educational system lies at the very heart of McGraw-Hill's mission. As Scott Virkler, Chief Product and Operating Officer at McGraw-Hill higher education puts it, "Our approach is to build the best learning technologies based on the foundations of research, efficacy, and learning science. We believe that higher education can be supported by adaptive technology, helping students become more confident in their academic performance. This ultimately leads to better engagement in the coursework, better performance, and wanting to learn more."

Achievement distribution for students under conventional, mastery learning, and tutorial instruction



Source: Bloom, Benjamin (1984) "The 2 Sigma Problem"

HIGHER SUCCESS

Real-world applications demonstrate strong results.

Columbus State Community College

Very little about Columbus State Community College's "Bridge to College Math" course resembles what you might expect from a traditional classroom setting, with a teacher at the front of the room and students listening carefully to the lecture. Instead, one finds study carrels, each with a student at a computer and each student with a notebook filling up with equations and graphs. Students sit side-by-side in pairs. Two math instructors move from station to station, sitting down individually with students, conversing, answering questions.

A central workstation monitors each student's computer screen. It feels like a bustling newsroom, hours from deadline. The atmosphere is casual and collaborative, but focused.

Columbus State's math lab, which opened seven years ago, is built to allow instructors and students to work together on an adaptive learning system.[8] Here, each year, hundreds of students who have found themselves underprepared and outmatched for college-level work, whose life experiences, learning styles, ethnic backgrounds, and socio-economic statuses have silently worked against them their entire lives, are quietly and assiduously solving the equity equation, beating the odds, and making their way through college and into the workforce.

When Dr. David Harrison arrived at Columbus State in 2010 as the school's new president, he saw firsthand that it didn't matter if the regional economy was in boom or bust: lower-income citizens and people of color were disproportionately left behind. The institution's three-year graduation rate for first-time, full-time students was just 8 percent, and more than half of these incoming students were placed into at least one developmental course. Fall-to-fall persistence rates were weak: only 49 percent of full-time students who enrolled in 2012 returned the following fall. For part-time students, the retention rate was 32 percent.[9]

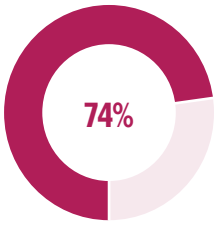
Working with the school's faculty and administration, Harrison decided to revolutionize the way Columbus State educated its students. The college invested in data and analysis systems to better understand the needs of underrepresented populations. They also adopted adaptive learning across all of their math programs and reconceived the classroom experience to enable students to study, work one-on-one with teachers, and collaborate with their peers more effectively.

[8] Columbus State Community College's Office of Institutional Effectiveness adopted McGraw-Hill ALEKS in their 1099 course, and then added the larger Dev Math sequence in fall 2014. Columbus State has since implemented ALEKS in other courses.

[9] Columbus State Community College Office of Institutional Effectiveness, 2012


TOO OFTEN STUDENTS
FIND THEMSELVES
UNDERPREPARED
AND OUTMATCHED
FOR COLLEGE.

Columbus State witnessed transformative change. By 2018, Columbus State's overall course completion among all students was nearly 74 percent, up from 67 percent in 2012. Semester-to-semester retention rates among black students increased to 81 percent, up from 68 percent in 2015. And the school reduced the gap in course completion success between white and black students from a 22 percentage-point gap in 2012 to a 13.7 percentage-point gap in 2018. Columbus State's adaptive learning approach showed that systemic change could be achieved at scale.[10] The school was recently awarded the prestigious Leah Meyer Austin Award at the 2019 "Achieving the Dream" conference for the school's transformational and sustainable work in closing opportunity gaps.



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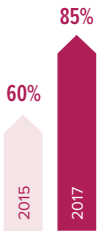
The College of Health Care Professions

Elsewhere, schools have achieved similarly impressive results using adaptive learning systems as an integral part of curriculum redesign. In September 2017, for example, the Texas Workforce Commission reported that the Texas economy had reduced the unemployment rate to 4.5 percent, and yet the Rio Grande Valley area still scored the highest on the unemployment rate for the entire state. The College of Health Care Professions (CHCP) saw an opportunity to build college programs based on employer needs to address the skills gap of unemployed workers from disadvantaged communities like the Rio Grande Valley. CHCP's student population is comprised of 56 percent Hispanic students, 23 percent African American students, and 17 percent Caucasian students. 88 percent of students are women, and the overwhelming majority of students qualify for Pell grants (most Pell grant money goes to students in poverty, with a total family income below $20,000).[11]

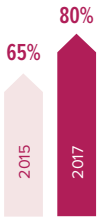
On each of CHCP's nine campuses, a sprawling career center serves as the nucleus for campus life—the priority is to get students employed and move them out of poverty. CHCP began working with health care employers across Texas to understand the workforce skills that were most in demand. The school also began adopting and implementing an adaptive learning system,[12] which allowed for a blended education model. Students, the majority of whom work more than one job, only need to be in school for two days a week and can participate remotely the rest of the time. The institution also focused on designing educational pathways that provided students the opportunity for more social mobility through stackable credentials. Stackable credentials create a series of gradual qualifications that allow students to progress from short-term certificates all the way to bachelor's degrees.

[10] Smola, The Columbus Dispatch, "Columbus State wins award for boosting student success, reducing gaps," 2019
[11] Scholarships.com, 2019
[12] The College of Health Care Professionals adopted McGraw-Hill Connect in 2015

With each credential comes greater economic opportunity. As a result of CHCP's efforts, the retention rate for students rose from 60 percent in 2015 to 85 percent in 2017. The graduation and job placement rate for the same timeframe rose from 65 percent to 80 percent, with graduates averaging nine months, including externship and certification testing, to graduation. Contributing to the high retention, graduation, and placement rates was an overall 98 percent student satisfaction score for both courses and instructors.[13]



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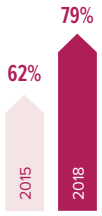
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Most of our students come from the lowest socioeconomic quintile," said Erik Bing, CHCP's Chief Executive Officer. "When they succeed and move up the economic ladder, they are able to break the cycle of poverty. Our adult learners are extremely busy juggling school and complex personal lives. We are offering our students a real opportunity for success and our use of adaptive learning has been an integral tool in allowing students to learn on their own time.

Arizona State University

At Arizona State University, after spending decades trying a variety of solutions for the 40 percent or above failure rate in their College Algebra classes, the school eventually eliminated all of its developmental math sections. ASU went all in on course redesign using a sophisticated adaptive learning platform, and students who would have normally placed into developmental math showed a 28 percent jump in success rate. This directly led to 800 more students passing math and staying in school.[14]

In fall 2015, before implementing the adaptive learning platform, College Algebra pass rates were 62 percent. After implementation, they rose to 67 percent in fall 2016, 74 percent in fall 2018, and 79 percent in fall 2018—a 17 percentage point improvement in only three years. Findings from a soon-to-be-released study show that, of the 12,711 undergraduate students of all demographics who enrolled in College Algebra courses during the academic years 2016 and 2017, those who passed the course showed significant grade improvements, with shifts from the C/D/F/ Withdrawal range to the A/B range.[15]



In fall 2015, before implementing the adaptive learning platform, College Algebra pass rates were 62 percent. After implementation, they rose to 67 percent in fall 2016, 74 percent in fall 2018, and 79 percent in fall 2018.

"It is about the opportunity to help students—particularly those from the lowest socio-economic brackets—succeed," said Dale Johnson, Director of Adaptive Learning Initiatives as ASU. "We believe that adaptive courseware builds a more equitable educational environment by empowering students, delivering the content that they need, just when they need it, based on their performance."

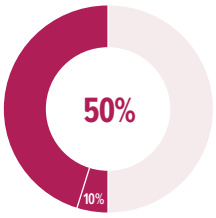
[13] College of Health Care Professionals independent research, 2018
[14] Arizona State University independent research, 2018
[15] Kizilcec and Fikes, Arizona State University unpublished manuscript, 2019

HIGHER POTENTIAL

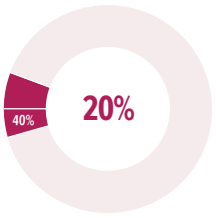
Gateway courses open the door to sustainable student success.

As many as 29 percent of first-year, full-time students—nearly 1 in 3 students—do not re-enroll for their second year of college.[16] Far too many students enroll in a program, accumulate debt, and then fail to complete their degrees. The majority of students who do not go on to earn a degree have failed to pass the gateway courses. Gateway courses are recognizable by their course names—frequently titles like English Composition or College Algebra—or by informal descriptions like freshman English, freshman math, or math fundamentals. These courses are students' first college-level courses: foundational courses that are for college credit and apply to the requirements of a degree.

Recent studies have shown that over 50 percent of students in community colleges start in a developmental course their first semester and fewer than 10 percent of these students graduate in three years.



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20 percent of students are required to take remedial courses. Almost 40 percent of these students never complete the course, much less earn a degree.

It is only slightly better at four-year institutions, where nearly 20 percent of students are required to take remedial courses. Almost 40 percent of these students never complete the course, much less earn a degree.[17] What's more is that these students typically don't get multiple shots at a higher education.

A recent study across the University System of Georgia found that students who passed both gateway courses of College Algebra and English Composition had a 68 percent chance of graduating; students who passed English but not math had a 42 percent chance of graduating; students who passed math but not English had a 36 percent chance of graduating; and students that didn't pass math or English only had a 4 percent chance of graduating.

"It is catastrophic for the students who don't pass their gateway courses," adds ASU's Johnson. "Completing college is a key stepping stone toward social mobility and a better life."

Adaptive learning systems can help answer these challenges and create equity at scale. In particular, adaptive learning platforms have enormous potential for what Johnson has called "mass personalization," whereby they can lift achievement across large populations of students while also attending to each student's unique experience level and learning needs.

[16] United States Department of Labor, Bureau of Labor Statistics, 2018
[17] United States Department of Labor, Bureau of Labor Statistics, 2018

Case in point, Columbus State's new math lab, or "emporium model," sought to accelerate students' completion of the school's developmental math sequence by using an adaptive learning system. In 2010, before the redesign incorporating adaptive learning, the average success rate for the developmental math sequence was 48 percent. After the adaptive learning implementation, the success rates jumped to 66 percent in 2014/15 and 68 percent in 2018.

"IT IS CATASTROPHIC FOR THE STUDENTS WHO DON'T PASS THEIR GATEWAY COURSES... COMPLETING COLLEGE IS A KEY STEPPING STONE TOWARD SOCIAL MOBILITY AND A BETTER LIFE."

Due to the encouraging results they achieved in developmental math, the school introduced a co-requisite College Algebra course pilot in 2017. Underprepared students, or students right on the cusp of college readiness, are placed into the credit-level College Algebra Plus course and given the support of an adaptive learning system. The initial results are impressive, especially for black students. When comparing students in two different co-requisite courses to their peers that normally would have transitioned from developmental math straight into College Algebra (the non-pilot program), success rates have jumped from 33 percent for students taking traditional College Algebra to 52 percent for students taking the redesigned co-requisite College Algebra Plus (the pilot program), a nearly 20 percentage-point gain between the two courses. Overall, the success rates of co-requisite courses in the Year 1 pilot are 52 percent, 10 points higher than the school's traditional College Algebra classes.[18]

"A GROWING BODY OF EVIDENCE PROVES THAT ADAPTIVE LEARNING PLATFORMS CAN BE A TOOL TO CREATE EQUITY."

These stories, and others like them across the country, demonstrate the transformative power that adaptive learning systems can provide to underserved and underrepresented students for whom a college or university education has been a distant dream. Indeed, successes in higher educational equity have attracted the attention of many private organizations and foundations. The Bill & Melinda Gates Foundation, for example, recently launched an initiative called Every Learner Everywhere to help improve outcomes for all students. With a network of 12 partner organizations, the initiative is focused on helping colleges and universities adopt intelligent adaptive learning platforms to support and broaden equity in education at scale. The initiative will start in a small set of two-year and four-year institutions in three states—Texas, Ohio, and Florida—and then will expand nationwide with plans to reach at least 200 institutions by 2022.[19]

"A growing body of evidence proves that adaptive learning platforms can be a tool to create equity," said Stacey Vanderheiden Guney, director of Every Learner Everywhere. "We cannot support retention and student success and increasing graduation rates if we don't carefully examine the gateway courses, which are traditionally viewed as weed-out courses. The effective use of adaptive learning systems can allow for learners to come up to the same speed and be supported in unique ways in the classroom. That's good for them and it's good for society as a whole."

[18] Columbus State Community College proprietary data, 2019
[19] Every Learner Everywhere mission statement, 2017


ALL STUDENTS
COULD IMPROVE
THEIR LEARNING
BY AT LEAST
TWO STANDARD
DEVIATIONS.

HIGHER EQUITY

Teachers, not technology, will drive the equity movement.

In 1976, John Carroll, a linguistic psychologist, was finishing his Ph.D. at Columbia University and took a job at IBM's Watson Research Center in Yorktown Heights, New York, which, at the time, IBM was the biggest computer research facility in the world. During this time, only a few people were thinking about how to bring a personal computer into every household or office cubicle. One of them was Carroll.

In a lab specially set up to study how humans—in this case, office secretaries—managed "frustration episodes" as they tried to accomplish everyday tasks with new technology, Carroll gradually developed an idea that had been building in his mind for a while: that the implementation of new technology was not so much about the machines themselves, but how people respond to those machines.

RESEARCH AND MOUNTING PEER-REVIEWED EVIDENCE VALIDATE THAT THE SYSTEMS WORK.

A similar interface challenge has emerged with the implementation of adaptive learning systems in colleges and universities. While the research and mounting peer-reviewed evidence validate that the systems work, such technology can seem to throw into question the role of teachers in the classroom, specifically how their autonomy shapes the tone, tenor, subject matter, and direction of their classes.

One concern that teachers often voice when contemplating adaptive learning is that these technologies will introduce chaos into the classroom—with students progressing at different paces, the teacher is unable to discern whether the class as a whole is, in fact, making the collective journey it needs to make.

Triton Community College

According to math faculty at Triton Community College in Chicago, where adaptive learning systems anchor the iLaunch Math Lab some teachers were apprehensive about losing control of their classrooms. However, they acknowledge that by relinquishing one aspect of control to the learning system, they gain actual leverage on student comprehension.

For better or for worse, in the traditional classroom, students move through the course at the same pace. In Tina Mote's three years of experience teaching at iLaunch Lab, she has learned that teachers lose something highly valuable when students learn in a traditional classroom: insight into whether they actually understand the lesson. "When the teaching paradigm assumes that the class needs to be moving all together," said Mote, "I actually lose control of being able to cater to individual students."

"WE SPEND SO MUCH TIME WITH STUDENTS ONE-ON-ONE, WE BECOME MENTORS AND MOTIVATORS. IT'S OFTEN ABOUT REINFORCING A GOOD WORK ETHIC, ABOUT ASPIRATION."

Adaptive technology, though, is all about individual student insights. With adaptive technology, students are not going through material as a collective, but rather working on lessons and questions according to their own understanding and ability. It's with this constant change of lesson material that teachers become the constants—the keys for success. Teachers in adaptive learning classrooms matter even more than teachers in traditional classrooms because they are responding directly to questions posed by students in ongoing discussions. "Another aspect of the new role I have, as teacher, is to get my students to become more honest with themselves about what they need as learners," says Triton College math instructor Tuan Dean. "So, because we spend so much time with students one-on-one, we become mentors and motivators. It's often about reinforcing a good work ethic, about aspiration." With adaptive technology, instructors can have greater insight into where individual students are in their learning journeys and support them at every crucial moment.

SPOTLIGHT

THE MAKING OF A MATHLETE: MEET ADRIAN

Meet Adrian. Adrian's a mathlete, but he didn't start out that way. In high school, Adrian struggled with math, thinking that he simply wasn't good at it. Things changed after Adrian enrolled at Triton College, a community college located just outside Chicago, and began taking developmental math courses.

After moving away from the traditional lecture-based classrooms in 2018, Triton College now uses an innovative approach to teach gateway math courses. Within a collaborative learning environment, adaptive technology is used to provide student instruction. Teachers and tutors are also on-hand to provide one-on-one help when students encounter difficult topics.

The Triton approach is working. With support from the Triton team, Adrian is now flourishing after discovering a deep-seated gift for math that he didn't know he had. As Adrian puts it, "Now I'm in Calculus, getting an A... math is beautiful".

WATCH THE FULL STORY

Visit **http://info.mheducation.com/adrians-story.html**


INTELLIGENT
LEARNING SYSTEMS
ALLOW TEACHERS
TO REACH
UNDERSERVED
STUDENTS.

HIGHER CONNECTION

Effective implementation is key to optimizing outcomes.

One of the perceived barriers to implementing adaptive learning systems has to do with faculty concerns about teaching autonomy: some teachers feel that using adaptive learning means that their course material, some of it developed over many years, will become irrelevant.

Adaptive learning systems also can be customized to suit the individual needs of a department. In fact, ASU's math department spent considerable time curating math videos and other instructional resources that its own teachers had developed over the years for incorporation into its adaptive learning platform.

"It wasn't one-size-fits-all, but it wasn't the Wild West, either," said ASU's Johnson. The department uploaded a selected variety of materials into their adaptive learning platform. "We were able to load about 10 years' worth of math instructional resources—hundreds of videos, online courses, and tutorials. Two big steps for us were course configuration and content curation—and both of these were localized, driven, and led by faculty members."

To build faculty confidence in adaptive learning, ASU requires that teachers of those sections actually take the adaptive technology-based course they'll be teaching. "That was very important," said Johnson, "because, if you're going to trust the technology, you have to understand it at that level, at the student's level."

ASU sent selected faculty to the adaptive learning system's provider to receive additional training on the platform, and the school also brought in experienced teachers to talk with ASU faculty about their own strategies. Now the school also requires that instructors attend a workshop prior to the beginning of each semester so they can share experiences and strategies and make suggestions for improving instruction. There's also a faculty coordinator for all the adaptive learning sections whose job it is to field questions and provide guidance during the semester.

"I USED TO TEACH ONE CLASS OF 100 STUDENTS, BUT NOW I TEACH 100 CLASSES OF ONE STUDENT EACH."

Teaching with adaptive learning systems does change the way students are taught—it makes teaching more effective, positively reshaping the relationship between teacher and student. Adaptive learning systems don't require a world without the powerful impact that teachers can have on student learning. Instead, it makes that impact more powerful for more students. As Doug Williams, the adaptive learning coordinator at Arizona State University, put it, "I used to teach one class of 100 students, but now I teach 100 classes of one student each."
"When you interact with students directly as much as we do now, you have many more 'aha' moments," says Triton College's Dean. "In a traditional classroom, sure, you might occasionally see a student light up with comprehension—but it's just one flickering light across an ocean."

Broward College

In one adaptive learning implementation that can serve as a model for many across the country, the teachers who were the most deeply skeptical of intelligent learning systems quickly changed their minds. Broward College has 60,000 students across three separate campuses in southern Florida, and its faculty across all three campuses stiffly opposed the school's decision to implement an adaptive learning system in response to new state-imposed requirements for developmental math. A faculty meeting held to explain the change quickly went south. The Q&A session bristled with skepticism—the instructors were deeply concerned that the learning system would compromise their autonomy and their ability to direct the course work.

That was in 2009. Ten years later, that same adaptive learning system is the primary means by which students learn math across the college. The question among the faculty now, according to Broward instructor Kelli Hammer, is "How could you not use intelligent adaptive learning systems in the classroom? There is no other way."

"It does take a little adjustment," said Johnson of ASU's implementation experience. "You have to cross a few philosophical thresholds. First, you have to move from being "teacher-centric" to being "learner-centric." Then you have to move to a mastery model. Mastery means that students move on when they're ready—not when the class is ready or when the teacher is ready. The third thing is that you have to trust the technology. If you look at the transformation in our society now, and you think about the capabilities we have with technology, we have to harness those capabilities for teaching and learning."


INSTITUTIONAL
COMMITMENT
COMBINED
WITH ADAPTIVE
LEARNING
TECHNOLOGY
CAN DRIVE EQUITY
AT SCALE.

HIGHER POSSIBILITIES

A new frontier: the change imperative.

One of the 20th century's great educational reformers, John Dewey, famously observed, "If we teach today's students as we taught yesterday's, we rob them of tomorrow."

As more teachers and administrators discover how adaptive learning systems allow them to reach the underserved and graduate more students than ever, they have become the new technology's greatest advocates—the "change agents" who see the promise of equity in education in the success of their students.

"The quest for educational equity has taken on even greater urgency as we seek to build a society in which every learner can reach his or her full potential," said Robert S. Feldman, Professor of Psychological and Brain Sciences, and Senior Advisor to the Chancellor, University of Massachusetts Amherst. Feldman channels his drive for equity and technological advancement as a McGraw-Hill author and as the leader of the company's board of external learning science advisors. "With advances in learning science and the advent of new educational technologies, we stand on the cusp of a new era in which we can significantly improve the likelihood for success for all students."

In the next five years, as adaptive learning solutions become more widespread and new technologies come to market, the higher education sector is positioned to undergo a complete transformation. It will be driven by passionate instructors and administrators who understand the imperative to create equity for all students and who fully integrate adaptive learning, and the corresponding student data insights, into the higher education experience. In doing so, universities will change the construction and nature of classrooms and re-evaluate the way in which all subjects are taught.

"NOW IS THE TIME FOR US TO JOIN TOGETHER ACROSS ALL ASPECTS OF HIGHER EDUCATION TO DRIVE THIS SYSTEMIC AND HISTORIC CHANGE."

"The power of technology and data has transformed almost every area of human life," said Ryan S. Baker, Associate Professor, Graduate School of Education, University of Pennsylvania, and a member of McGraw-Hill's Learning Science Advisory Board. "We're just starting to see its enormous potential in education to help all students succeed and erase gaps in opportunity. Now is the time for us to join together across all aspects of higher education to drive this systemic and historic change."

Triton's Kevin Li suggests that there is no "perfect time" to begin. "Don't wait for the big grant to come around," Li said. "Find the people who want to make a difference and support them as best you can. Our future depends on it."

McGRAW-HILL LEARNING ADAPTIVE SOLUTIONS

McGraw-Hill is a learning science company focused on changing the way students experience education through a powerful combination of adaptive technology and best-in-class content. With our affordable learning platforms, student learning is personalized and performance is accelerated.

ALEKS®
LAYING THE FOUNDATION FOR MASTERY

Underserved students who enter higher education face enormous challenges when obtaining a degree. Without a strong foundational education in K-12 or proper support systems that address their individual learning issues, many of these students enter higher education without the ability to ever graduate. The biggest roadblock for many is completing the math requirement.

Over the last five years, a groundswell of independent research from schools across the country has emerged about the efficacy of McGraw-Hill's ALEKS, an intelligent adaptive learning system developed with a grant from the National Science Foundation.

Using Knowledge Space Theory, ALEKS identifies each student's individual knowledge and knowledge gaps and then creates a personalized learning path tailored to each student's needs. In other words, ALEKS ensures that no matter where students start, even if they have very little foundational knowledge, that they have the opportunity to succeed in completing the course. Students are always presented with topics that they are ready to understand, a technique that boosts confidence and retention.

"ALEKS has created a revolution in learning. It proves that all students, regardless of their backgrounds, are capable of achievement when instructional methods are varied to match their individual learning needs,"

Scott Virkler
Chief Operations Officer, McGraw-Hill

GET IN TOUCH

To learn more about how ALEKS can improve student performance at your institution, contact Caroline Celano at **caroline.celano@mheducation.com.**

CONNECT® HELPING STUDENTS LEARN MORE EFFECTIVELY

McGraw-Hill recently released the latest version of its Connect adaptive learning system with SmartBook 2.0, which is based on extensive research. This system uses enhanced algorithms to adapt to individual learners' needs, identify and resolve knowledge gaps, and increase learning efficiency by moving knowledge into long-term memory more quickly.

Connect's SmartBook 2.0 tracks student progress and provides reports that allow instructors to identify exactly where and when students are struggling. The program pinpoints the students who may be at risk of failing, which enables instructors to assist them with the concepts and topics they need to learn to graduate and succeed.

With these new enhancements, instructors now have much greater course content control, including improved alignment with their syllabi and the ability to create pre-testing assignments that are personalized based on students' weakest areas. For students, Connect with SmartBook 2.0 includes offline and online mobile access to their course assignments and a personalized learning experience that helps them focus on areas where they need extra attention.

"Connect's SmartBook 2.0 is a powerful tool for the hundreds of students I teach every semester—helping pinpoint knowledge gaps and focus their learning on concepts requiring additional study. My students are grasping core concepts and coming to class better prepared for advanced instruction."

William Hoover
Professor at Bunker Hill Community College

GET IN TOUCH

To learn more about how Connect with Smartbook 2.0 can help your students come to class better prepared, visit **mhhe.com**

OPEN LEARNING SOLUTIONS CREATING TAILORED OPTIONS

A one-size-fits-all approach doesn't work for everyone. McGraw-Hill helps instructors successfully identify, create, and implement tailor-made courseware that's right for them and their students.

McGraw-Hill works in close partnership with instructors to understand their individual course objectives and provide access to the company's advanced tools for authoring content, creating assessments, and delivering digital courseware.

With Open Learning Solutions, faculty can choose to curate and combine multiple content sources: their own authored content, McGraw-Hill content, and/or OER. This content is supported by McGraw-Hill's renowned adaptive technology, robust assessment tools, mobile reading capabilities, and leading support services. The company also offers development and implementation support services, such as instructional design and systems integration.

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To learn more about how Open Learning Solutions can improve student performance at your institution, visit **mheducation.link/OLS**

About McGraw-Hill

McGraw-Hill (MH) is committed to unlocking the potential of every learner—no matter where their initial starting point is—and helping them to achieve their education goals. By partnering with educators around the globe, our content developers, instructional designers, and data scientists create digital and print resources and open, customizable technology platforms that have been shown to increase engagement, improve pass rates, and raise grades.Embedded in our DNA is a belief in the power of learning science data that gives educators a deeper understanding of their students' strengths and weaknesses and propels each student on a personalized path to success. As a learning science company, research and data provide the foundation for the decisions we make, the resources we create, and the partnerships we seek to build with educators, schools, colleges, and students.

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