STATISTICAL SIGNIFICANCE:
Implementing Adaptive Courseware in Gateway Math and Business Courses

Achieving the Dream ™

every**learner**
everywhere

A CASE STUDY OF LORAIN COUNTY COMMUNITY COLLEGE

JUNE 2021

ABOUT THIS CASE STUDY

Achieving the Dream (ATD) is one of 12 higher education and digital learning organizations that make up the Every Learner Everywhere (Every Learner) Network, whose mission is to help higher education institutions improve and ensure more equitable student outcomes through advances in digital learning, particularly among poverty-impacted, racially minoritized, and first-generation students. Every Learner partners are addressing high failure rates in foundational courses through the provision of scalable, high-quality support to colleges and universities seeking to implement adaptive courseware on their campuses. As part of its ongoing effort to help community colleges develop effective teaching and learning practices, ATD is working with seven community colleges in Florida, Ohio, and Texas on this initiative, providing coaching and direct support to the colleges, fostering collaboration within and among the participating institutions, and serving as a liaison to the Every Learner network.

The following case study is part of a series of studies conducted by ATD examining how adaptive courseware is implemented at those institutions as well as how courseware is used in particular disciplines to better serve students. Case studies are based on a series of interviews with college leaders, faculty, instructional designers, developers, technology specialists and students who were enrolled in classes using the courseware.

Acknowledgements

OVERVIEW

Faculty in several disciplines at Lorain County Community College explored the use of adaptive courseware, ultimately implementing it in a gateway statistics course and several business courses.

- Administrators framed participation in the Every Learner Network as part of a broader education technology capacity building effort that provided important support and time for participating faculty members to explore and implement adaptive courseware.

- Individual faculty members evaluated courseware to determine whether it met the specific needs of their courses, ultimately finding aligned products in business and statistics.

- Statistics faculty intentionally changed grading policies to encourage student usage of adaptive courseware, which was part of a broader redesign of supports for the gateway course with the highest enrollments at LCCC.

- Students and faculty both stressed the importance of faculty support above and beyond assignments provided through the courseware.

SUPPORTING INSTITUTIONAL REFORM

The Every Learner initiative supports broader efforts to foster student learning with evidence-based practices, including efforts to support the development of students' mastery of concepts and critical thinking skills. "The use of adaptive courseware in our statistics course supports our student-ready approach to teaching and learning," says LCCC President Dr. Marcia Ballinger. The initiative also reflects the contexts in which broader institutional reform is taking place at community colleges throughout the ATD Network, including building a culture of excellence in teaching and learning and leveraging data and technology to support student success and equitable student outcomes. To learn more, see p.7.
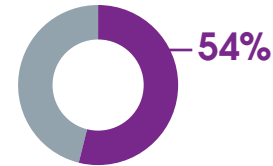
LORAIN COMMUNITY COLLEGE
DATA SNAPHOT[1]

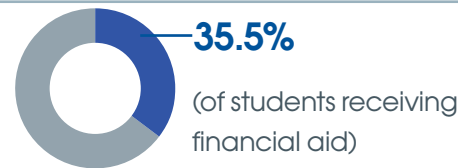**LOCATION** Elyria, OH

TYPE City

LOCATIONS (Campus/Centers) 5

ENROLLMENT
10,206

GENDER

FEMALE **61%**

MALE **39%**

Full-time vs. Part-time
- 27% Full-time
- 73% Part-time

Pell-grant recipients 54%

First-generation 35.5% (of students receiving financial aid)

RACE

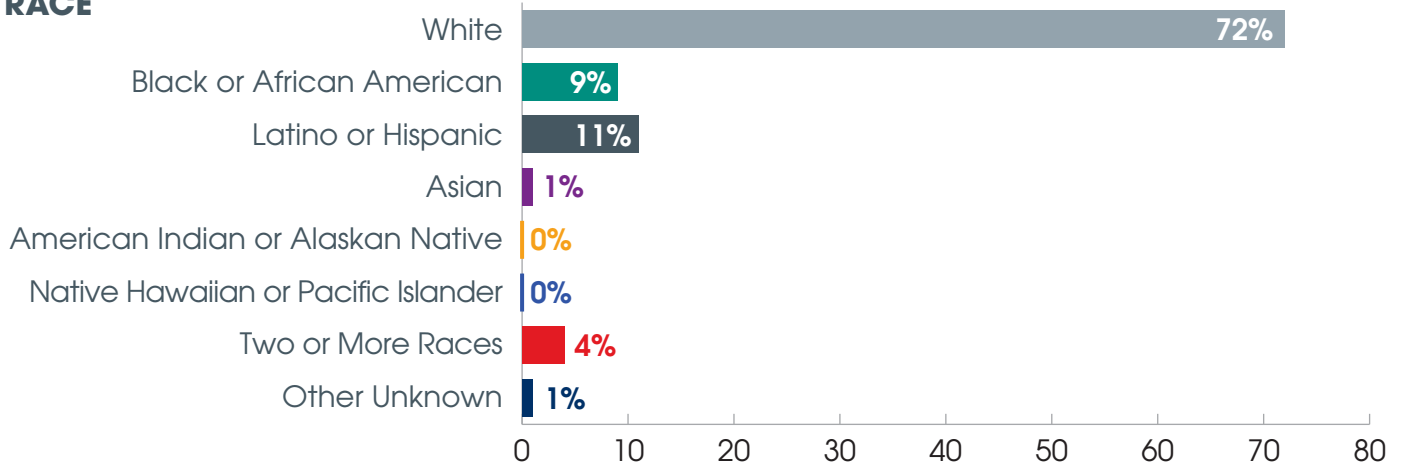| Race	Percent
White	72%
Black or African American	9%
Latino or Hispanic	11%
Asian	1%
American Indian or Alaskan Native	0%
Native Hawaiian or Pacific Islander	0%
Two or More Races	4%
Other Unknown	1%

(x-axis: 0 10 20 30 40 50 60 70 80)

ATD MEMBER STATUS | JOINED ATD 2011 | ATD ACHIEVEMENTS

ATD Leader College (2015) • ATD Leader College with Distinction (2018) • Leah Meyer Austin Award Winner (2020)

ELE INFORMATION

Discipline	Courses	Sections	Students	Full-time Faculty	Adjunct Faculty	Courseware
Math	Statistics (MTHM 168)	28	513	5	0	WileyPLUS Adaptive Practice
Business	Intro to Business Administration (BADM 155)	2	42	1	1	LearnSmart/Connect (McGraw-Hill)

1 The information contained in the Data Snapshot is based on data from the National Center for Education Statistics' College Navigator, data collected directly from the institution, and information maintained by ATD.

INTRODUCTION

Lorain County Community College student Sydney Wade hopes to pursue a career in the medical or environmental fields. Her first math course at the Ohio college was a critical first step.

"Statistics was a precursor to all my future math and science courses," says Wade, who plans to transfer to Bowling Green State University next fall.

As a prerequisite for majors in allied health fields, introductory statistics is the math course with the largest enrollments at LCCC. Faculty leveraged adaptive courseware as part of a broader curricular redesign to help more students complete the gateway course during their first year—a particular challenge given

that statistics is very different from the math courses students have taken before it. The nature of the course also requires faculty to more closely evaluate the questions that adaptive courseware automatically generates to avoid presenting students with problems that are difficult or impossible to solve.

"Statistics is just a finicky beast—you can't just fiddle with the numbers," says math faculty member Ian Morrison. "Problems have to be curated."

BEYOND THE NUMBERS

Historically, LCCC students who placed directly into introductory statistics had tended to do well. However, the majority of students start in developmental math courses, which focus on prerequisite concepts like algebra that don't directly correspond with the concepts taught in statistics.

Adaptive courseware was adopted as part of a "multifaceted approach" to redesigning the gateway statistics course, says Aaron Weiss, dean of science and mathematics. First, faculty created a paired developmental course that students took at the same time as the college-level statistics course to build prerequisite skills. Within the statistics course itself, adaptive courseware was used as a way for students to practice concepts outside of class and to prepare for class discussions. That added support has proven to be critical, given that most students find the concepts behind statistics unfamiliar and challenging.

"Students want to go step 1, 2, 3. Statistics isn't that—you have to decide when to do what. My students think they're going to fail before I say one word to them," says Kati Dobeck, a math faculty member. "The more familiar they are when they access the material, the more at ease they'll be."

Dobeck had experimented with adaptive courseware in her courses prior to LCCC's work with the Every Learner Network. Lessons from those earlier iterations informed the rollout in statistics, including replacing in-class quizzes with graded adaptive work to provide better feedback to guide instruction and ensure that students engaged with the courseware.

"We called adaptive work 'quizzes' so they understood it had higher stakes than regular homework," Dobeck says. "Students don't do optional, so something for a grade is really important."

Several other faculty members who taught statistics participated in the initial Every Learner implementation, saying they found the focus on adaptive work beneficial for both the students and themselves. "This software mixes up and throws it at them, not randomly, but in ways that forces them to think about concepts and come up with study strategies and some critical thinking skills," says Morrison. "I like it as an extra tool we have to give students something to think about."

BUILDING ON ATD'S CORNERSTONES OF EXCELLENCE

Like other community colleges participating in the Every Learner grant which are part of the ATD Network, LCCC has committed to engaging in bold, holistic, and sustainable institutional change across multiple institutional areas and priorities. The institution's efforts to implement adaptive courseware reflect the importance of several key cornerstones of institutional change, including building a culture of excellence in teaching and learning and leveraging data and technology to support student success and equitable student outcomes. "The learning technology helps our faculty meet students where they are, creates rich opportunities to help students reach their full potential, and prepares students with knowledge and skills to thrive in a changing world," says Dr. Marcia Ballinger, the college's president.

ATD's Institutional Capacity Framework and Institutional Change Assessment Tool (ICAT) outlines seven essential institutional capacities required to create a student-focused culture that promotes student success. One focuses specifically on teaching and learning and the commitment to engaging full-time and adjunct faculty in examinations of pedagogy, meaningful professional development, and a central role for faculty as change agents within the institution. Building capacity in this area is particularly crucial because, as ATD President Dr. Karen A. Stout recently asserted, "focusing on teaching and learning is still not central to the field's overall theory of change. We still have much more to do to build a deep focus on pedagogy and to support our colleges in building a culture of teaching and learning excellence."

To foster this culture of teaching and learning excellence, _ATD's Teaching & Learning Toolkit: A Research-Based Guide to Building a Culture of Teaching & Learning Excellence_ is centered on four cornerstones of excellence that provide a forward-looking vision that campuses can use to inform their work.

1 Full-time and adjunct faculty use evidence-based instructional practices to foster student learning.

2 Collaborative partnerships link faculty and Student Affairs professionals in shared efforts to cultivate learning and support student success.

4 The institution embraces professional learning for continuous improvement, realigning related expectations in hiring, evaluation, promotion.

3 Educators join students as active learners in an accessible, empowering, personalized, and supportive academic community.

Initiatives such as Every Learner provide important resources and supports to community colleges and the time, space, support, and resources to explore innovative pedagogical approaches to improving student learning and outcomes. They also offer sustained opportunities to build on these cornerstones of excellence. LCCC's work with the initiative exemplifies the importance of institutional efforts to empower faculty to consider, adapt, test, and refine new approaches to fit their campus context and the needs of their students. "It can be very time consuming to do research, build and implement, and train others. The hardest part is taking the initial steps … and allowing for the appropriate time for the faculty member to research and potentially build the tools," says Aaron Weiss, dean of science and mathematics.

This commitment builds on previous experiments with adaptive technology by individual statistics and business faculty members, which guided broader efforts to integrate and scale the technology in ways that aligned with evidence-based instructional practices that fostered student learning. In statistics, previous experiments informed efforts to integrate the technology into a broader redesign of the gateway statistics course, while adaptive courseware supported efforts to flip the classroom model in business courses. "It overall lines up with what we do in class, which I think students find helpful," says statistics faculty member Lisa Sheppard. Faculty also leveraged analytics from student work in adaptive courseware to pinpoint the ones who needed extra support.

The Every Learner grant also provided faculty with opportunities to collaborate with the ATD Network. "From an institutional perspective, it was an opportunity to learn from other institutions and get coaching around organizational pieces," says Karla Aleman, former dean of LCCC's library and eLearning.

EXPANSIONS AND SETBACKS

Efforts to implement adaptive courseware saw successes and setbacks in other disciplines at LCCC.

Like Dobeck, business faculty member Jerry McFadden had experimented with adaptive courseware in several of his business courses before joining the Every Learner project at LCCC. He has since rolled out adaptive courseware across all of his business courses after receiving positive feedback from students and observing that they were reading assigned materials before class.

"It forces them to do what all students should do—read the chapters," he says. "It essentially makes it a prerequisite."

McFadden uses courseware as part of a flipped classroom model,

with students reading materials and answering adaptive questions ahead of lectures. The questions help ensure "they're learning the concepts before I discuss them," he says. "That was the light bulb for me—it's helping them in a way they couldn't get from me lecturing. We all have different learning styles, and this is another tool in the toolkit they didn't have before."

Business students say that adaptive courseware helps them grasp concepts that were more difficult to hone in lengthy textbook assignments. "We read material and answer the questions, and you retain the material—it works," says business student Alichielle Shears, who returned to LCCC in fall 2019 after stopping out a decade earlier.

LCCC was one of a relatively small number of institutions which experimented with adaptive courseware in English. Faculty hoped to use adaptive courseware to support the students with the greatest needs in newly redesigned developmental courses that had been integrated to combine reading and writing skills.

"A lot of the conversation with faculty was about students coming in with reading levels below 7th grade," says Dr. Brenda Pongracz,

dean of arts and humanities. "Students just couldn't read at the level required to pass the writing (requirements). They're not going to be successful in college if they can't read at a college level."

To that end, faculty wanted to use adaptive courseware to support the development of reading comprehension skills to allow them to focus more intensively on writing in class. The goal, says developmental English faculty member Patty Mack, was to "isolate a few concepts that give a student a leg up to success, particularly directed at reading."

Mack and other faculty members explored existing products and had conversations with peers at other Every Learner institutions in search of a solution. While adaptive products exist that focus on the fundamentals of grammar, they found little that served the reading needs of their students. Even products targeted at K-12 students with similar skill levels focused on materials that weren't compatible with college-level reading.

"Nothing I looked at matched the needs," says Mack. "I'm going to try to teach my section conventionally this year and keep trying to get it right in my class."

■ THE STUDENT EXPERIENCE

Many LCCC students enrolled in introductory statistics courses are seeking careers in nursing, so perhaps it's not surprising that in conversations about adaptive courseware they often returned to the importance of feeling supported and cared for—regardless of technology or modality. "The professor is very important to how I'm doing in the class," says Samuel Bitter, who returned to Lorain as a career changer seeking a degree in nursing.

Students generally found adaptive practice within the courseware helpful, but particularly when supported by professors in synchronous online settings. Another returning student pursuing a career in nursing, Maria Cristarella, credits her professor with beginning each class session by asking whether students had trouble with their assignments in the courseware. "He'll go through the entire homework assignment if we want him to," she says. "As far as his notes and PowerPoints go, he gets some of the questions off the homework because we've seen them before. It makes it a bit easier."

Other students stressed the importance of faculty support during classes because of the limitations courseware can place on their ability to help while students are working asynchronously. "The adaptive quizzes time each question you're working on, so you can't send them to your professor to have them help you," says freshman Melanie Medina, who wants to become a school counselor. "She can't do anything about how it's structured, and she can't see the question I'm seeing."

While recognizing the challenges of the shift to online learning in 2020, students urged faculty to support their work within adaptive courseware as much as possible. "Time and caring may sound weird when you're taking about statistics, but there's a difference between having to teach the material to yourself and being taught," Bitter says.
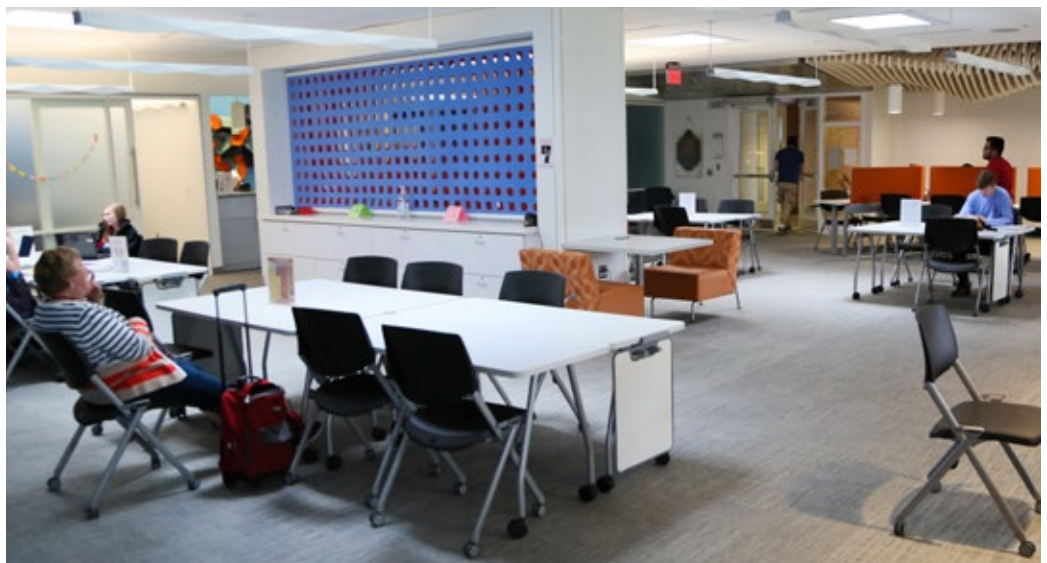
THE IMPACT

Statistics faculty found initial outcomes promising. Nearly as many students completed the gateway course in fall 2019 as during the entire previous year. Overall student grades also tended to mirror their scores in adaptive courseware more closely than the previous assignments, suggesting the homework was helping them master the course material.

Faculty in both statistics and business courses are now working to scale the use of adaptive courseware across additional sections, through both informal peer learning and by creating resources for other faculty members. In statistics, Dobeck developed a master course shell in LCCC's learning management system, with the idea that other faculty members could adapt it within their sections. In similar fashion, McFadden found that sharing adaptive resources with adjunct business faculty members helped encourage some who were less familiar with the technology to adopt it, particularly after classes shifted online during the pandemic.

In Fall 2020, almost all of the nearly 30 sections of the introductory statistics course, including those taught by full-time and adjunct faculty members, are using the adaptive courseware, giving the institution the opportunity to measure the impact of the technology at scale. "It will be interesting to see a larger student response across the majority of our sections," Weiss says.

What Worked Well:

Integration. Statistics faculty appreciated that the adaptive courseware selected for the pilot was developed by the same publisher they were using for the course. "We had already adopted this textbook and had been using the online homework," says math faculty member Kati Dobeck. "They liked the pedagogy of the textbook and the product was already there and seemed valuable to their learning."

Other faculty members said that integration helped ensure materials were aligned. "It overall lines up with what we do in class, which I think students find helpful," says statistics faculty member Lisa Sheppard. "It would be more difficult if things didn't match up with what we're doing in the chapter."

Students, including Sydney Wade, generally agreed that alignment between the courseware and assessments helped them master needed concepts. "I would find the questions in homework assignments in the courseware were the same as on the test," she says. "I thought I had a pretty good grasp of the concepts."

Adaptive practice. Faculty and students agreed that the premise of adaptive practice was particularly well suited for the business and statistics courses that used courseware. Students, mathematics faculty member Blerta Ereditario says, "like the experience of being able to practice over and over again." Business faculty member Jerry McFadden adds that the courseware helps students master key concepts and assess their progress. "Self-assessing is hard, and it reinforces and it's a nice gauge,".

Student Alichielle Shears agrees. "It helps a lot," she says. "It structures the homework and the studying. I would rather do it online than turn 60 pages in a textbook."

Pacing. Students in statistics class credit the weekly graded assignments with helping them stay on track. "It makes it easier because it's what you just learned," says Maria Cristarella. Freshman Melanie Medina agrees: "It's divided up enough so it's not overwhelming," she says. "If you were trying to figure out when to do everything by yourself, it would be more difficult."

Data reporting. Faculty members credit courseware with providing them insights into which students are struggling so they can intervene. "I can look up individual students and see where they're struggling," McFadden says. "I've been able to help a few students that way."

Cost. In statistics, the courseware was included in textbook costs, which had fallen to below $60. "Faculty didn't want them to pay for another thing," Dobeck says. "Students don't have a lot of money, and we don't want them to spend money if they're not going to have a lot of value."

Ongoing Challenges:

Onboarding. Some students reported that faculty didn't provide a specific introduction to how to use the adaptive courseware and why it would benefit them. While some said this was a minor issue—"it was all pretty easy to figure out once you got started," Wade says—faculty acknowledged that an explicit introduction can help explain the purpose of adaptive practice.

"Students sometimes have a hatred of the courseware, and often it's just because they don't understand how it works," Dobeck says. "They didn't realize they could keep working to improve their grade." To that end, statistics faculty created a video illustrating how adaptive assignments work as students progress through them—"from beginning to end," Dobeck says.

Difficulty. Faculty noted a lack of consistency between the difficulty levels of questions in adaptive courseware and their own course materials. "It's not surprising, because of lot of publishers have someone other than the (textbook) authors come up with solution manuals," says Aaron Weiss, dean of science and mathematics. One faculty member stopped using adaptive courseware because she found it tended to accept some answers she would have graded as incorrect, while other questions were overly time consuming for students.

While many students found adaptive homework aligned with what they were doing in class, some said the graded work within the assignments often felt different or disconnected. "They're the same questions, but they're worded differently or there's a different step that wasn't in the lesson you need to get it correct," says Medina.

Workload. Faculty noted that students spent varying amounts of time completing adaptive practice assignments. "That's not necessarily a bad thing—the time it takes each student to learn something is the time it takes," Weiss says. "What I need to know in the long run is if it's an appropriate amount of time."

Some students raised similar concerns, reporting that they could spend more than five hours on adaptive assignments if they were struggling with the content. "It's a good tool if you're proficient and you're trucking along, but if not, it's very different," says nursing student Sabrina Thompson. "Sometimes you get the same questions over and over again to boost proficiency, so it doesn't help in the long run."

Ultimately, some online homework questions were scaled back as a response, Weiss adds, as faculty took advantage of the courseware's ability to adjust the length and scope of assignments. McFadden made similar adjustments in his business courses to ensure that students wouldn't spend more than 30 to 35 minutes per assignment. "If you went by the default values, your students are going to be spending a lot of time in some of these chapters," he says.

Grading. While statistics faculty assigned grades to adaptive work to ensure that students consistently completed it, several students reported an unintended consequence to how adaptive courseware selects and grades problems.

Noting that the courseware identifies strengths and weaknesses as students progress through adaptive assignments in hopes they'll choose additional practice in areas of difficulty, Cristarella and other students acknowledge they often chose easier sections. "It's the easiest way to keep my grades up," she says.
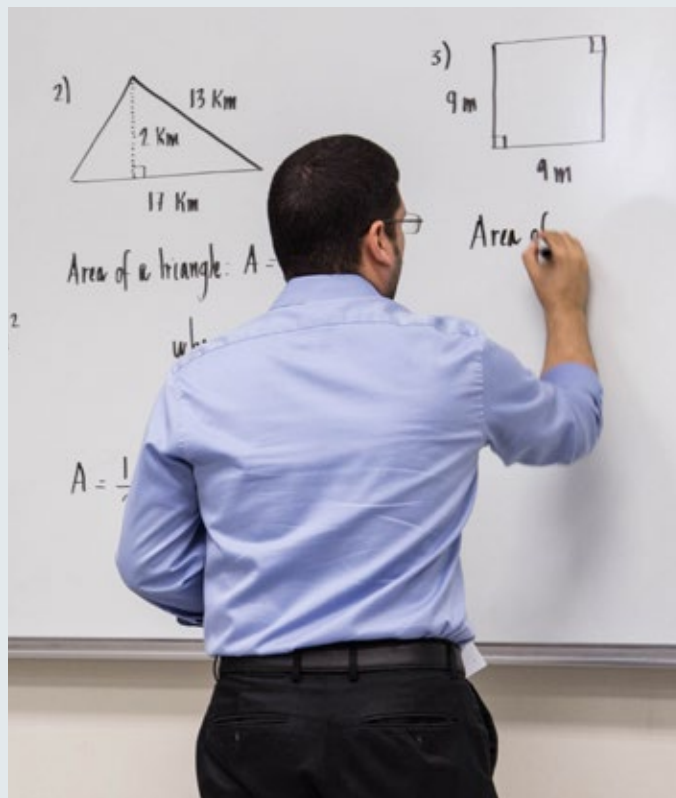
"I'll use the breakdown to see where I'm weakest," says student Samuel Bitter. "Those are the questions I'm most likely to get wrong, but I can choose an easier section and keep up my grade. I use it as a study tool, but only after I secure my grade."

Others pointed out that the courseware can reduce student scores if they need multiple attempts to solve a problem. "I don't think it's intentional, but it almost comes across that way," Thompson says. "Those little things could use tweaking to not discourage students."

Together, these issues also impact how students say they perceive adaptive work. "It's used more as an assignment to produce a grade than help," Thompson says.

English. As with other institutions, faculty struggled to find effective courseware for developmental English. "Nothing really addressed what we needed it to address. Unlike math, right and wrong answers are a lot more vague in reading than basic math and algebra," says Dr. Brenda Pongracz, dean of arts and humanities. "This would be a really good business opportunity for someone."

LESSONS LEARNED

Keys to LCCC's implementation of adaptive courseware:

- **Focusing on capacity building around all kinds of digital learning tools.** Administrators were initially uncertain about participating in the Every Learner initiative because of ongoing experiments with other digital tools, including Open Educational Resources (OER). Ultimately, they determined that experimenting and receiving supports and coaching through the network would help them more broadly build capacity to "identify new types of edtech and adopt them into our courses," says Karla Aleman, former dean of LCCC's library and eLearning.

- **Finding the right faculty champions.** Implementation in all three disciplines began with a single faculty member who took the lead and supported their peers. "There needs to be someone with a little bit of prowess working with the technology or the willingness to investigate it," says Aaron Weiss, dean of science and mathematics. "It makes the implementation easier."

- **Providing faculty with support for implementation—and ongoing usage.** The Every Learner grant helped support faculty professional learning and release time for implementation efforts, according to Weiss.

  Beyond implementation, however, it's still important for administrators to acknowledge that additional time will still be required for faculty to use adaptive courseware effectively, "particularly if it's being used correctly," Weiss says.

  "You're going in and monitoring based on this real-time feedback," he says. "That's a lot more time spent by faculty members."

- **Intentional grading policies.** By grading adaptive homework, statistics faculty ensured that the stakes for students were higher, but they also made efforts to ensure that the threshold to receive full credit was lower—70-80 percent correct on adaptive quizzes yields 100 percent in the course gradebook.

- **The importance of supporting students.** Faculty and students stressed the importance of providing support outside of the courseware (see sidebar, above). "You can't just press play and walk away," says math faculty member Kati Dobeck. "You have to say 'you can't settle for this grade—you can visit a tutor or use these resources.' That's absolutely an important part of this."

  "Thinking of adaptive practice as a silver bullet to solve all your problems is not helpful," Weiss adds. Instead, think of it as "a supportive tool designed to be used in your course appropriately as one more thing to help students learn," he says.

- **Considering implementation a long-term effort.** Recognizing that faculty members made adjustments from semester to semester, administrators are waiting to see the full impact of adaptive courseware. "We need to take the long view and allow people several semesters to see results," Aleman says.

- **Understanding the role of faculty in scaling.** Efforts to scale implementation across multiple sections of a course rely heavily on how closely faculty and adjuncts have historically coordinated, and whether faculty members are taking the lead. "It is very helpful to have someone who says, 'this is the course, this is the content, we've done this in one section and we're ready to scale," says Aleman.

- **Recognizing institutional capacity limitations.** After English faculty members failed to find adaptive courseware that met their needs in developmental courses, vendors offered to collaborate on a solution—essentially helping them build their own product. Faculty and administrators were cognizant, however, that they lacked the bandwidth to do so. "It's not an easy thing, or something that's easy for vendors to follow through on. In a perfect world, we would give faculty time to build something online, adaptable, and free—like OER," Weiss says. "Time is the hardest part to account for."

CONCLUSION

As faculty in both statistics and business courses continue to scale the use of adaptive courseware, administrators say that the Every Learner grant has opened the door for broader improvement efforts at LCCC, including opportunities to collaborate with the ATD Network and access to resources including coaching, professional development, and networking. "From an institutional perspective, it was an opportunity to learn from other institutions and get coaching around organizational pieces," says Karla Aleman, former dean of LCCC's library and eLearning.

Those resources may ultimately help faculty adopt adaptive courseware in other math courses and disciplines, including science, says Weiss. "The hardest part is taking the initial steps and getting someone interested — and allowing for the appropriate time for the faculty member to research and potentially build the tools," he says.

For students, the time devoted to implementation to date has paid off. As Wade progresses through her second year at LCCC, she thinks back to her first math class, saying that the adaptive courseware was a significant part of her gateway experience. "It was a good fit for me," she says.

Achieving the Dream ™