



Integrating Adaptive Courseware as Part of a Comprehensive Redesign of a Gateway Math Course



A CASE STUDY OF MIAMI DADE COLLEGE

everylearner
←————→
everywhere

SEPTEMBER 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

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OVERVIEW

Math faculty at Miami Dade College integrated adaptive courseware into a larger redesign of a gateway college algebra course intended to provide greater consistency and support for students.

- The intentional course redesign integrated adaptive courseware into a broader rethinking of learning objectives, syllabi, daily lecture notes, and homework with the goal of ensuring a consistent focus on the core competencies faculty identified for the course.
- Student work in the courseware was balanced between developing prerequisite skills and completing college-level course objectives.
- Student supports — including one-on-one tutoring and a lab course — were based on work within the courseware.
- Efforts to scale the course redesign were strengthened by support



for adjunct faculty members and a platform-neutral approach that simplified adoption across multiple campuses using different learning management systems and 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. "Faculty-led efforts to incorporate adaptive courseware into a redesign of college algebra reflect MDC's commitment to creating accessible, high-quality teaching and learning experiences for our diverse global

community," says MDC President Madeline Pumariega. 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.



MIAMI DADE COLLEGE DATA SNAPSHOT¹



LOCATION Miami, Florida

TYPE City

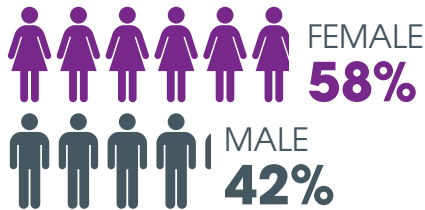
LOCATIONS (Campus/Centers) 9

ENROLLMENT

51,679



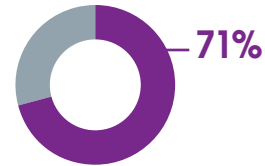
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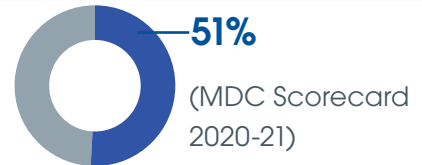
Full-time vs. Part-time



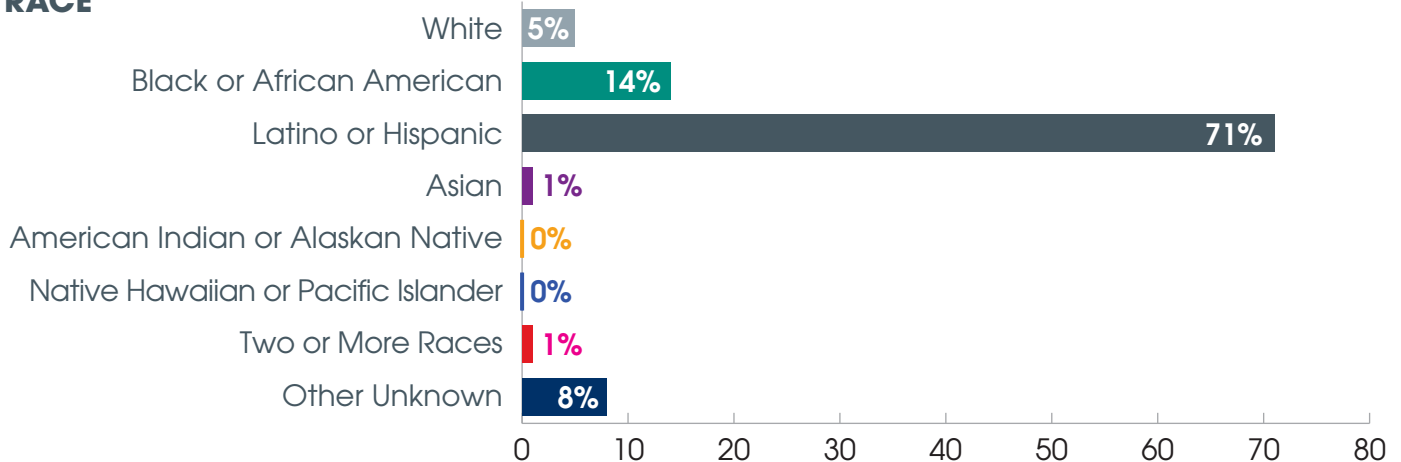
Pell-grant recipients



First-generation



RACE



ATD MEMBER STATUS

JOINED ATD
2012

ATD ACHIEVEMENTS

Leah Meyer Austin Award (2017)

ELE INFORMATION

Discipline	Courses	Sections	Students	Full-time Faculty	Adjunct Faculty	Courseware
Math	College Algebra (MAC1105)	36	1085	6	17	Pearson Integrated Review

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

A sophomore at Miami Dade College (MDC), Brandon Rios has grown accustomed to completing homework assignments online. Even so, he says that he and other students sometimes struggle with the differences between what's taught in class and the work they are assigned to complete on their own.

"You have to learn your way through (the homework) if you want to pass, because the lectures don't correlate with the homework," Rios, who is majoring in economics, says of one course he is currently taking.

But in his college algebra class the previous year, the "lecture and homework completely lined up," Rios says. "As soon as I finished the lecture and went into the homework, everything completely aligned."

Creating that aligned approach in the critical gateway math course was what drove Miami Dade College to participate in the Every Learner initiative. Following the elimination of developmental education in Florida, math faculty wanted to provide a consistent, "user friendly" experience for students now placed in college algebra as their first math course at MDC.



INTENTIONAL DESIGN

With that goal in mind, math faculty at MDC redesigned the course from the ground up, developing a common syllabus, learning objectives, and detailed daily lecture notes for faculty, with the ultimate goal that these materials would help ensure that “all students were learning the same material” in college algebra, regardless of faculty member, modality, or campus, says Nicholas Schur, Kendall math department chair. Doing so is critical to ensure students are prepared for subsequent math courses, adds math faculty member Lourdes Espana.

“Before, everybody would have their own materials and teach their own way, and maybe they’d think this was more important than that or skip one thing,” she says. “With something that’s systematic, we can be assured that the students who go on to the next level have had the most focus on the learning outcomes that are part of the course that make sure they’re successful in the next course.”

While adaptive courseware was envisioned as a key part of the

course redesign, math faculty deliberately began their work by focusing on the overall approach to teaching college algebra. “We decided as a faculty what should be in a college algebra course,” Schur says. Another key principle of the redesign was ensuring that the course materials they developed could be used across multiple learning platforms and adaptive courseware products. “We didn’t want to be limited by the courseware,” Schur says.

BUILDING ON ATD'S CORNERSTONES OF EXCELLENCE

Like other community colleges participating in the Every Learner grant which are part of the ATD Network, MDC 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 Every Learner grant supports MDC's culture of evidence, which is characterized by the achievement of measurable learning outcomes, innovative assessment modalities, and data-driven adaptability in serving students," says President Madeline Pumariega.

ATD's Institutional Capacity Framework and Institutional Capacity 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.

Initiatives such as Every Learner not only 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. MDC'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. In particular, faculty implementation of adaptive courseware supported both developing prerequisite skills and completing college-level course objectives to best serve the needs of all students. "It was a little about early intervention, but more about the support system," says Nicholas Schur, Kendall math department chair.

Intentional faculty-led efforts to integrate adaptive components into a broader course redesign align with evidence-based instructional practices that foster student learning. "With something that's systematic, we can be assured that the students who go on to the next level have had the most focus on the learning outcomes that are part of the course that make sure they're successful in the next course," says math faculty member Lourdes Espana.

To that end, faculty aligned courseware, curriculum, and out-of-class supports including student tutoring and a newly added lab course. "We built a structure so everyone learns the same college algebra at the same expectations," says Schur. "We built the structure first and integrated the courseware into the structure."

'FILLING IN THE GAPS'

Adaptive courseware was implemented within the course redesign as a way to support students who needed help mastering the prerequisite concepts required for college algebra. "It was intended to take care of students on the back end so they could catch up and (be) all the same in the classroom," says Schur.

Since Florida high school students are required to have learned these concepts before graduating, "we figured what students really needed was a platform where they could recall the information," Schur says. "They may not have taken math for a year or two after leaving high school. The platform could fill in some of those gaps."

When working in courseware, students are assigned a combination of adaptive homework based on guided skill checks that build prerequisite skills, followed by regular, nonadaptive assignments focused on the college-level material. "If they do poorly, the (adaptive) homework helps remediate before they start the homework assignments for college algebra," says math faculty member Maria Alvarez. The adaptive component "is really behind the scenes while students are doing individual work engaging with the platform," adds mathematics faculty member Dr. Luis Saumell.

To that end, very little of what happens in class involves the

adaptive homework, but math faculty designed the common lecture notes to facilitate a similar interactive approach to class discussion. Instead of traditional lecture topics, the notes included questions on key concepts and problems that faculty could pose to students at the beginning of each class and then provide guidance based on their responses — a model which intentionally parallels the support they receive outside of class in the courseware.

Student supports also are based on work within the courseware. MDC's math labs hire students as tutors, who faculty can refer students to for one-on-one support. "They're familiar with the courseware because most times they have gone through it themselves," says Schur. A new lab course to help college algebra students develop prerequisite skills also is being built around the adaptive courseware platform. "Whatever the courseware is telling them to work on, they can get help in the lab," Schur says.

THE STUDENT EXPERIENCE

As a high school student, Miami Dade College student Allison Martinez struggled with learning math from her textbooks — in part because she didn't always have a copy of her own. "I didn't have the book, so I had to take pictures of the book and do it at home," says Martinez, who came to the United States from Honduras as a high school junior.

Now a sophomore at MDC majoring in business administration, Martinez says she prefers the digital homework found in adaptive courseware. "I just log in, and it gets me the exercises," she says. "I don't have to find it in the book."

Emily Gonzalez, a former college algebra classmate majoring in photography, agrees. "When you think back to using textbooks, there's so much information in your face," she says. In courseware, "you have just one question presented to you, and then you go on to the next one. You're not bombarded with all these problems. We're used to technology and that simple format."

Martinez says assignments in the college algebra courseware were often challenging, but she found the process of working through problems on her own less stressful than asking the professor for help in class. "I knew if I was able to do this, the tests wouldn't be so hard," she says.

MDC sophomore Brandon Rios agrees, saying that the

courseware "really came through" for him by providing guidance on homework problems. "It gave me an example and walked you through a completely different example — if this happens, this is how you go about it," he says.

After taking college algebra, both Rios and Gonzalez worked as student tutors in the math lab, assisting students using the courseware. But all three students said that their professor — Lourdes Espana — was the main reason they were successful in the gateway course.

"I still want my professor to teach me in person. The way (math faculty member Lourdes) Espana taught, was the best way to incorporate a professor and the program," Martinez says. "She will go, 'don't worry about this, maybe the program didn't explain it, I'll give you another explanation or other way to do it.'"

Rios agrees, stressing the importance of ensuring that teaching is aligned with out-of-class work. "I enjoyed the blended instruction between the courseware and in-person, but if I had to choose one, it would be in person without hesitation," he says. At the same time, "the teacher I have right now is a good teacher, but if what he's teaching is not aligned with the homework he's giving, is it really working?"

SUCCESS AND SHIFTS IN MODALITY

Preliminary data suggests that adaptive courseware helped prepare students for college-level math, says Schur. Students who came into college algebra directly from high school performed as well as peers who had previously gone through intermediate algebra courses, although the impact on nontraditional students who entered college later was less clear in the absence of a more complete analysis of student data.

Espana said passing rates increased in her classes after using the software. “Bs and Cs became more As and Bs,” she says. In particular, the software helped “the middle group” of students, she adds. “A good student will always be a good student, but for the

average ones it brings their grades from Cs and Ds to Bs and Cs.”

The shift to online courses in Spring 2020 in the wake of the pandemic was made easier by the redesign and courseware. “The transition wasn’t difficult for students,” Espana says.



ADAPTIVE COURSEWARE IN PRACTICE: SUCCESSES AND CHALLENGES

What Worked Well:

Prerequisite skill building. The combination of the course redesign and adaptive homework helped students develop prerequisite skills. “Having the notes and guided assignments helped them catch up,” says math faculty member Maria Alvarez.

Students also said that the opportunity to reinforce prerequisite skills on their own helped reduce their anxiety about the college-level work required in class. “The program helped a lot because I can do it more than twice. If you do it in person and get it wrong, that’s it,” says student Allison Martinez. “Some professors are going to be like, ‘look it up in the book,’ or ‘I’ve already answered that question’ or ‘I just did this in class.’ I feel like I’m just going to shame myself.”

Ensuring consistency. Creating common course objectives and lecture notes helped ensure that students learned the same core skills required to be successful in subsequent math courses regardless of modality or instructor. “The course is much more organized than before,” says Alvarez.

Faculty members also often shared the guided notes developed as part of the course redesign with students. “Sometimes students don’t know how to take notes,” says math faculty member Lourdes Espana. “The notes are a guide to students and help them focus on what’s important.” The notes were particularly helpful to students for whom English is not their first language — 48 percent of all students at MDC, she adds.

Aligned student supports. Student tutors hired by the MDC math lab and the subsequent lab course intended to support college algebra students use the same adaptive courseware as the course itself. “The lab uses the same material, and tutors are trained on it,” says Nicholas Schur, Kendall math department chair. “All of this is happening in the background, which is what we wanted.”

Faculty also said that adaptive courseware helped them identify students who needed added help with prerequisite skills and refer them to tutoring in the math lab. “I’d send students who were not performing well or getting the 70 percent

knowledge required (by the courseware),” says mathematics faculty member Dr. Luis Saumell.

Support for adjunct faculty. Along with ensuring consistency, providing adjunct faculty with all the materials needed to teach college algebra was a key focus of the redesign. “If you’re a new adjunct faculty member, you’re going to be able to teach the class tomorrow,” says Schur. “It makes their lives easier.” Adjunct faculty who adopted the integrated materials and courseware during the shift to online instruction in Spring 2020 are continuing to do so.

Ongoing Challenges:

Addressing workloads and expectations. Faculty frequently reported students being overwhelmed by the number of prerequisite skills they had to master and how related assignments and tasks were presented by courseware. “It was structured in ways that students could throw their hands up in the air and say they can’t do the class,” Schur says.

Students agree that the way assignments were presented can be challenging. “When you first log into courseware, you see you have 30 assignments,” he says. “I think 10 a month, that’s not too bad,” says student Brandon Rios. “But if you wait a month to do everything, I can see how it can be overwhelming.”

To address issues with students becoming frustrated by their lack of progress, faculty ultimately overruled some of the courseware’s efforts to force constant retakes. “We minimized the number of skill checks, which is the adaptive piece, to show students there is light at the end of the tunnel and it’s not going to go on forever,” Schur says. The goal, he adds, is to strike a balance between remediation while “at the same time pushing forward.”

Onboarding. Many students have had experience with similar online courseware in high school, but as a student tutor, Emily Gonzalez noted that some found the college algebra courseware confusing. “If you’re not used to using the platform, you’re not going to feel motivated,” she says.



Mobile devices. While courseware is accessible on mobile devices such as phones and tablets, faculty and students said it was an inferior experience. MDC offered laptops to students who needed them during the pandemic, but math lab manager Raquel Ortiz says that some preferred to use their own devices.

Courseware formatting and content. Students generally gave adaptive courseware high marks for walking them through problems in helpful ways. “There’s not an overload,” Rios says. “It goes step by step, and it wouldn’t list the next step until you did the previous steps.”

Even so, faculty members said students would at times become frustrated by “esoteric” language used in some assignments in the courseware and need to have tutors walk them through what’s being asked. On rare occasions, students would encounter questions with errors that made them impossible to answer correctly. “It’s temporary, but

it’s frustrating for the good students who want to get 100 percent on everything,” says Ortiz.

Language support. Academic support leaders said that extra attention needs to be paid to students for whom English is not their first language, particularly at an institution like MDC where nearly half (48 percent) of all students are non-native speakers. “Mathematics is written in a strict grammatical style, which can seem a little out there for even native English speakers,” Ortiz says. “If you add that extra layer of not being your native language, that further confuses things.”

Zero-cost initiatives. While MDC is currently developing an OER-based adaptive tool to provide a no-cost option for students, Saumell says it’s been a major challenge. “It’s really hard to find something free that has the adaptive tools,” he says.

LESSONS LEARNED

Keys to MDC's implementation of adaptive courseware:

- **Focusing implementation on existing faculty objectives.**

MDC focused adaptive courseware implementation on college algebra because of math faculty's desire to redesign the course and make it more consistent and "user friendly" for students, with adaptive software envisioned as one means to that end. By contrast, plans to include a second class in another discipline ultimately fizzled because of less enthusiasm from faculty. Given that faculty often have broad latitude in how they approach their courses, "consider how faculty choose the material," advises mathematics faculty member Dr. Luis Saumell.

- **Intentional course design.** Faculty began their work by redesigning college algebra from the ground up — starting with learning objectives and course competencies determined by math faculty, and then generating syllabi, guided lecture notes that supported interactive class instruction, and other supporting materials. Adaptive courseware was seen as a critical component of supporting students with prerequisite skills, but "we built the structure first and integrated the courseware into the structure," says Nicholas Schur, Kendall math department chair.

- **A platform-neutral approach.**

Faculty also intentionally designed course materials, objectives, and the structure of adaptive assignments so they could be used on any online platform. That's crucial to scale adoption at a multi-campus institution like MDC, where different campuses use different LMS and adaptive platforms.

"Avoid looking at platforms first," Schur advises. "Come up with the idea of what you want it to be and... try to get the platform to meet those (needs)."

- **Integrated supports.** Adaptive courseware was seen as a way for students to self-remediate and build prerequisite skills, as well as the core of one-on-one student tutoring and the subsequent lab course. "It was a little about early intervention, but more about the support system," Schur says.

- **Responding to student needs.** When faculty saw that the courseware generated overwhelming amounts of assignments for many students, they limited the number of skill checks that generate adaptive homework, allowing students to more easily move forward to non-adaptive work based on



college-level expectations. “You can see progress and where help is needed,” Schur says.

- **Ongoing faculty collaboration.**

Faculty came together to review all aspects of the redesigned course, including the daily lecture notes and the balance of work within courseware described above, to identify areas of improvement.

- **Ensuring alignment.** Students favorably compared the redesigned algebra course to subsequent classes in which courseware and online assignments were less consistently aligned. “It works really well as long as what the professor is teaching and what’s in the software is

properly aligned,” says MDC student Emily Gonzalez. “Otherwise, you don’t know what way you should be solving problems. You learn something, you go home you’re supposed to be reinforcing the information, but it feels like you’re learning new things.”

Faculty say that the comprehensive approach to alignment provides support for students and instructors alike. “Students will be more motivated because they have guided lecture notes. They’ll fill in the gaps because they have the adaptive learning,” says math faculty member Lourdes Espana. “For the discipline itself, it helps everybody be on the same page.”

CONCLUSION

Administrators say that supporting adjunct faculty was a major focus of the redesign. In particular, the lecture notes and other supporting materials were intended to ensure consistency in courses taught by adjunct faculty, as well as to provide clear expectations and materials to support them.

“All they have to do is log in and everything is there for them and their students. The idea was that the platform would make their lives easier,” MDC’s Schur says. “We wanted a turnkey approach.”

The shift to online courses helped accelerate the shift to this goal by encouraging more adjunct faculty to adopt the full suite of lecture notes, adaptive courseware, and other materials.

Another intentional decision made at the beginning of the course redesign process — ensuring that the revised structure and materials could be used with different learning management systems (LMS) and courseware — also is helping to accelerate adoption. In summer 2020, two other MDC campuses opted to leverage Kendall’s course redesign materials into their own online platforms, a transition which is expected to be rolled out in spring 2021. Kendall faculty also are exploring the use of an open educational resource (OER) adaptive platform to provide a zero-cost option for students, says Saumell.

Ultimately, “all faculty collegewide will have the course to use with the underlying message that there’s an adaptive platform built for it,” Schur says. “We built a structure so everyone learns the same college algebra at the same expectations.”



Achieving the Dream™

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