FAST FORWARD

A Case Study of Two Community College Programs Designed to Accelerate Students Through Developmental Math

Kelley Fong
Mary G. Visher

May 2013

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Overview

Community colleges face significant challenges retaining their diverse population of students and helping them progress to graduation. A key barrier is the developmental (or remedial) coursework in reading, writing, and/or mathematics to which a majority of entering students are referred. These lengthy sequences — often required for college-level work — can be daunting, and many students leave college before completing their developmental requirements, let alone attaining a credential. Developmental math, in particular, is a substantial stumbling block to college completion.

To support colleges as they address these challenges, Lumina Foundation for Education launched a national initiative, Achieving the Dream, in 2004. Today, Achieving the Dream is a nonprofit reform network working with nearly 200 colleges nationwide. Many Achieving the Dream colleges and others are experimenting with ways to reform developmental education. Gaining momentum are "acceleration" strategies, which modify the structure and/or pedagogy of developmental math courses to help students move more quickly toward college-level coursework. This report presents a case study of acceleration programs at two Achieving the Dream colleges: Broward College in Fort Lauderdale, Florida, and Tarrant County College in Fort Worth, Texas.

Faculty at Broward developed a model called "Math Redesign" that compresses the traditional sixteen-week developmental math courses into eight weeks, so that students can complete two levels of developmental math in a single semester. The model also includes collaborative problem-solving during class and computer-assisted instruction outside of class. At Tarrant County, faculty divided each developmental math course into three modules, in a program called "ModMath." Through a more fine-grained placement process, students may be able to skip content that they have already mastered. During class, students work at their own pace on computers using an instructional software package, while the instructor works with students individually. The self-paced nature of ModMath potentially allows students to complete more than three modules per semester.

Key Findings

- Both colleges have succeeded in implementing their programs as originally envisioned, strengthening them, overcoming challenges along the way, and scaling them up to serve more students each year of operation.
- Faculty leaders, motivated by engaged administrators and data-driven decision-making, helped the colleges grow their programs and fold them into broader student success agendas.
- Student outcomes data collected and analyzed by the colleges suggest promising trends associated with the programs, including higher success rates and lower withdrawal rates than for students in traditional math courses at the colleges.

MDRC hopes to obtain funding to conduct an evaluation of Math Redesign and ModMath in order to build knowledge for the field about the implementation and impacts of these acceleration approaches.

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Preface

Community colleges play a vital role in American postsecondary education, providing large numbers of Americans with the skills and knowledge to succeed in the 21st-century workforce. While community college enrollments are increasing, graduation rates remain disappointingly low. This is particularly true for students deemed academically unprepared for college-level work. These students, who constitute a majority of first-time community college students, are referred to a sequence of developmental (or remedial) courses. Unfortunately, more than half of these students do not complete their prescribed sequence. Colleges across the country are trying to reform developmental education — how it is organized and how it is taught — so that more students earn credentials or take less time to do so.

For the past decade, MDRC has evaluated a number of interventions designed to improve the outcomes of community college students, including enhanced counseling, learning communities, and financial incentives. Encouragingly, many of these strategies have produced positive effects, affirming that changes in institutional practices and policies can help more students succeed. At the same time, however, it is becoming increasingly clear that the effects of modest, short-term interventions tend to be small and to diminish after the program ends.

Increasing in popularity are instructional reforms aimed at accelerating students through the developmental course sequence, for example, by compressing the material into fewer semesters, allowing students to move through it at their own pace, or placing students directly into college-level courses with extra support. Reforms that make such deep changes to course structure and classroom instruction — like those profiled in this report — may have the potential for larger and more sustained impacts on student outcomes.

This report describes the experiences of two colleges in designing, implementing, and scaling acceleration programs in developmental math. The authors hope that lessons learned from these two programs are useful to practitioners considering acceleration programs as well as to policymakers seeking new and effective strategies to significantly increase the number of students who earn a credential. MDRC hopes to obtain funding to formally evaluate these two programs in the years to come.

Gordon L. Berlin
President

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The Authors

Executive Summary

Despite steadily increasing enrollments in community colleges, graduation and transfer rates remain disappointingly low. Six years after entering community college, almost half of first-time students are not enrolled at any institution and have not received a degree or certificate.[1] Students who take developmental courses for remediation in reading, writing, and math face even steeper odds.[2] Most students do not complete the developmental sequence, let alone attain a credential, and developmental math, in particular, is a formidable obstacle. With a lengthy series of courses, the developmental math sequence may not be optimally structured to retain students; research shows that most students who exit the sequence do so because they do not enroll in one of the courses, rather than because they fail or withdraw from a course.[3] In addition, developmental math classes are typically characterized by lectures and rote, procedural learning — an approach that may inhibit mathematical proficiency as well as student engagement in math and in college.[4]

Recognizing these challenges, Lumina Foundation for Education launched a national initiative called "Achieving the Dream: Community Colleges Count" in 2004, alongside a group of partner organizations. As part of their Achieving the Dream work, participating colleges seek, implement, evaluate, and refine promising practices to improve student outcomes. This report profiles two such practices implemented by Achieving the Dream colleges: programs at Broward College in Fort Lauderdale, Florida, and at Tarrant County College in Fort Worth, Texas, aimed at accelerating students' progress through the developmental math sequence, so that they may then go on to earn credentials or transfer.

Acceleration reforms in community college developmental education programs are gaining momentum across the country. By restructuring course sequences, content, pacing, and/or pedagogical approaches in an effort to move students to college-level courses more quickly, they represent a bold, innovative agenda for developmental education reform. Approaches to acceleration include:

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[1]Alexander Walton Radford, Lutz Berkner, Sara C. Wheeless, and Bryan Shepherd, *Persistence and Attainment of 2003-04 Beginning Postsecondary Students: After 6 Years* (Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2010).

[2]Clifford Adelman, *Principal Indicators of Student Academic Histories in Postsecondary Education, 1972-2000* (Washington, DC: U.S. Department of Education, Institute of Education Sciences, 2004); Paul Attewell, David Lavin, Thurston Domina, and Tania Levey, "New Evidence on College Remediation," *Journal of Higher Education* 77, 5: 886-924 (2006).

[3]Thomas Bailey, Dong Wook Jeong, and Sung-Woo Cho, "Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges," *Economics of Education Review* 29, 255-270 (2010).

[4]W. Norton Grubb with Robert Gabriner, *Basic Skills Education in Community Colleges: Inside and Outside of Classrooms* (New York: Routledge, 2013).

- **Compression.** Developmental courses are offered in a compressed time frame, so students can complete multiple levels of developmental education in a single semester.
- **Modularization.** Developmental courses are divided into discrete learning units; students complete only the modules that they need.
- **Curricular reforms.** Developmental curriculum is redesigned to decrease the number of courses that students need to take or to better align with what students need to know to succeed in college-level courses.
- **Mainstreaming and paired courses.** Developmental students enroll directly in college-level courses, linked either with a related developmental course or with supplemental support services.

This case study focuses on Math Redesign, a compression program at Broward College in Fort Lauderdale, Florida, and ModMath, a modularization program at Tarrant County College in Fort Worth, Texas. In addition to these structural changes, the two programs also incorporate pedagogical reforms, including computer-assisted instruction. They arose organically from departmental efforts to reform developmental math; although the specific models are "homegrown," they incorporate features common across other acceleration programs. This case study seeks to provide practical information about how Broward and Tarrant County designed and operated their particular versions of a compression and modularization approach, respectively, so that other colleges interested in implementing an acceleration strategy of their own may learn from Broward's and Tarrant County's experiences.

Two Acceleration Models

Math Redesign at Broward College

Math Redesign compresses what is typically a sixteen-week course into eight weeks, allowing students to complete two levels of math in a single semester. Math Redesign students complete the same number of class hours — and cover identical curricular content — as they would in a sixteen-week course. In addition to compression, Math Redesign changes the way that instructors deliver curricular content in class. Classes begin with immediate feedback to students, as instructors return graded worksheets completed the previous session and go over common issues with the class. Next, instructors present the lesson through brief, standardized instructional videos, interspersed with their own commentary. For the remainder of the class time, generally around half an hour, students collaborate with one another on a problem-solving worksheet, with the instructor moving around the classroom facilitating group work and

providing one-on-one assistance as needed. Math Redesign students continue their learning outside the classroom with computer-assisted instruction in the Assessment and Learning in Knowledge Spaces (ALEKS) system.

Compared with students in traditional developmental math classes, students in Math Redesign spend more class time actively engaged in problem-solving rather than listening to a lecture, and this active learning environment is theorized to support student engagement and mastery. One of Broward's math associate deans described the Math Redesign approach as "very student interactive." In contrast to traditional developmental math courses in which instructors primarily lecture to students, she added, Math Redesign instructors play "more [of] a facilitator" role.

ModMath at Tarrant County College

ModMath divides each of Tarrant County's three semester-long developmental math courses into three modules of five weeks each. Students begin by taking an additional placement test to determine their starting module,[5] and they enroll in three modules per semester. Classes consist of students working with an instructional software package, MyMathLab, at their own pace, with an instructor circulating to work with individual students. Students working quickly and effectively can take the final exam early and can move ahead to the next module, potentially completing more than three modules per semester.

By dividing the curriculum into modules, ModMath allows students to leave and return (or fail and return) without losing as much ground as they would in semester-length courses. Additionally, as in Math Redesign, ModMath students work on math problems in class, engaging them in solving problems and applying skills. The self-paced approach may help keep students motivated and engaged, as well as enable faster mastery of math concepts; students can move quickly through material that they pick up easily, while having the opportunity to spend more time to master concepts that they find more difficult.

Key Lessons

Bringing an acceleration model from idea to reality requires thoughtful planning and ongoing decision-making by program leaders. At Broward, Math Redesign is primarily coordinated by each campus's math associate dean, working with faculty leaders and drawing on support at the college level. A faculty member at Tarrant County coordinates ModMath, with support from senior administrators on her campus. These leaders work to schedule the classes, recruit students and faculty, train faculty, strengthen the model, manage administrative tasks, and

[5]This test is in addition to the placement test taken by all new students at Tarrant County.

expand the program. The experiences of Broward and Tarrant County — each of which has fine-tuned its program over several years — may provide valuable lessons to other colleges that are selecting, designing, or implementing developmental math acceleration programs.

Scheduling Course Sections

Since scheduling course sections can be logistically challenging, program leaders have worked to address these challenges in ways that also maximize the opportunity for students to accelerate through the developmental courses. Because Math Redesign classes typically meet four days each week, ensuring classroom space for a growing number of sections can be a challenge. To optimize use of classroom space, associate deans schedule the classes in pairs, one during the first eight weeks of the semester and the other in the same classroom at the same time during the second eight weeks. They try to set up these pairs so that a student who passes the first class can enroll in the next one in the same room, during the same time, with the same instructor. This supports cohorts of students continuing together with the same instructor and facilitates acceleration, removing scheduling and teacher selection barriers for students who are planning to complete two classes in one semester.

Tarrant County adopted a "one-room schoolhouse" format of mixed modules that has assisted with scheduling and may enable more students to move at a faster pace. Early versions of ModMath consisted of classes offered for a single module, and instructors typically lectured part of the time. However, offering separate sections for each module made it difficult to meet enrollment minimums, so the program shifted toward a model in which classes include students from multiple modules. These classes fill more easily because they can accommodate students from any level. Moreover, as mixed-module classes are entirely self-paced, they allow some students to work more quickly and accelerate their progress.

Student Recruitment

Once the class schedules are set, ensuring that a sufficient number of students enroll in the classes has been a continual challenge at both colleges, partly because advisers and students lack knowledge about the programs. To recruit students to Math Redesign, math associate deans work with college advising staff to promote the program to students. For ModMath, the program coordinator hopes to do additional outreach to educate advisers about the program, so that more students learn about it. Students at both colleges often hear about the programs through word of mouth, particularly as the programs have increased in scale. Going forward, leaders at both colleges continue to think about how best to promote Math Redesign and ModMath.

Colleges that are considering acceleration programs might also consider increasing student awareness of the benefits of moving through developmental requirements more quickly. Students may not know that these classes can help them save money on coursework and/or

move more quickly toward a credential. Students who have less confidence in their math abilities may be hesitant about a class termed "accelerated" or "fast," so coordinators and advisers might emphasize how the classes are designed to benefit students at all levels. For example, compression programs might highlight the increased mastery theorized to occur with more frequent class sessions. Modularization programs are well suited to students with conflicting demands on their time or those who prefer a slower pace. Highlighting these benefits for students might increase their interest in the program.

Faculty Recruitment and Training

Instructors currently volunteer to teach Math Redesign and ModMath. Program leaders encourage other instructors to volunteer through informal personal outreach and periodic information sessions. As the models feature instructional techniques that significantly transform the role of the instructor, leaders of both programs emphasized faculty development as a key consideration for colleges working to begin or strengthen acceleration programs. For example, new Math Redesign instructors may find it challenging or potentially threatening to their sense of professional autonomy to incorporate videos. Likewise, ModMath instructors may need support to adjust to the flexibility and individualized instruction that are central to the model.

To prepare faculty to teach in the new model, the two colleges have offered different training activities over the first few years. As is common at community colleges, training has not yet been formalized or made strictly mandatory for instructors, though both colleges are considering how to structure professional development moving forward. Colleges that are considering implementing acceleration programs should allocate resources for regular, intentional professional development. Providing clarity about the model may help instructors feel more comfortable and help them implement the model more consistently. Incorporating peer observations into trainings could also help instructors learn from one another and become more effective teachers in the new model.

Cross-College Collaboration

While ostensibly situated solely within a college's math department, programs like Math Redesign and ModMath have a much broader reach, with potential implications for course scheduling, information technology systems, financial aid, testing, and student advising. Math Redesign and ModMath program leaders emphasized collaboration with these other divisions as being crucial for program setup as well as continued operation. As discussed above, recruiting students to participate in accelerated classes can be a challenge, so the leaders of acceleration programs should collaborate early and regularly with advising and testing staff. Support from other divisions on campus can also reduce the administrative burden on program leaders and instructors, streamlining operations and helping the program move to a larger scale.

Program Evaluation and Scale-Up

Math Redesign and ModMath have gradually expanded their programs to serve more students. Both colleges started small with their programs and grew through a purposeful, grassroots approach to scaling. They focused in the initial years on planning carefully, building support, and continually developing, evaluating, and strengthening the model. At both colleges, faculty — not college administrators — led the design, developed the new courses, took ownership of the program, and made modifications as the program developed. This core group of faculty brought others on board through a grassroots approach. The programs also engaged college leaders from the beginning, who supported the program but encouraged faculty to continue leading it. Additionally, both colleges collected and analyzed data on student outcomes in the accelerated math classes. Promising data have played a key role in supporting scaling, helping to build engagement and inform program refinement.

Next Steps

Both Broward College and Tarrant County College plan to continue evaluating and refining their accelerated math programs. Program coordinators consider the programs sustainable and cost effective. Broward plans to continue scaling up and analyzing data on Math Redesign as part of the college-wide strategic plan, and Tarrant County is thinking about how to incorporate ModMath into other developmental math efforts. Both colleges want data on program effectiveness to determine how best to move forward amid numerous strategies and initiatives aimed at improving student outcomes in developmental math.

To date, neither of these programs or acceleration approaches has been rigorously evaluated, despite their promise for moving students through developmental math and the approaches' growing popularity at community colleges across the country. While data collected by the two colleges show promising trends associated with the programs, students who choose to participate in these programs may differ from those who do not, for example, in motivation or prior academic experience. Further research is needed to establish causal evidence of the effectiveness of the two programs. Should funding become available, MDRC looks forward to partnering with Broward and Tarrant County to conduct an evaluation of the programs. Such an evaluation would use a random assignment research design to compare the outcomes of students who have the opportunity to enroll in the accelerated courses with a comparable group of students who do not have this opportunity. MDRC would also study the implementation of the programs. Findings from this evaluation would provide policymakers and community college practitioners with reliable evidence on which to base decisions about how best to improve student outcomes.

Chapter 1

Introduction

Eleven years after dropping out of high school, Maria had earned a General Educational Development (GED) certificate and had enrolled in a local community college, looking forward to earning a credential or transferring to a four-year college.[1] Before even setting foot in a college classroom, she took a standardized placement test to determine her readiness for college-level work. "Looking back, I couldn't remember anything," she says. "I could barely remember my times tables, let alone being able to do long division like somebody out of high school should be able to do it."

Maria's score on the test placed her in the first of three levels of developmental (or remedial) math, consigning her to at least three semesters of math courses that do not carry college-level credits, count toward a degree, or transfer to four-year institutions. Unfortunately, given this circumstance, it is unlikely that Maria — who also has a job, a young child at home, and a limited amount of financial aid money — will meet her goal.

Like Maria, well over half of students entering community college are judged in need of developmental education.[2] Six years after enrolling in community college, close to half of first-time students are not enrolled at any institution and have not received a degree or certificate, and students taking developmental courses face even steeper odds.[3] This report profiles two programs — one at Broward College in Fort Lauderdale, Florida, and one at Tarrant County College in Fort Worth, Texas — aimed at accelerating students' progress through the developmental math sequence, so that they may then go on to earn credentials or transfer.

In 2004, recognizing the challenges faced by Maria and countless other students, Lumina Foundation for Education launched a national initiative called "Achieving the Dream: Community Colleges Count" alongside a group of partner organizations. Today, Achieving the Dream is a nonprofit national reform network dedicated to community college student success. Broward began participation in 2004, and Tarrant County began participation in 2010. (See Box 1.1 for more information about Achieving the Dream.) In particular, reforming developmental education remains a key objective of the initiative. As part of their Achieving the Dream work, participating colleges — including Broward and Tarrant County — continue to seek, imple-

[1] "Maria" is a pseudonym.

[2] Adelman (2004).

[3] Radford, Berkner, Wheeless, and Shepherd (2010); Attewell, Lavin, Domina, and Levey (2006); Adelman (2004).

Box 1.1

Achieving the Dream

Achieving the Dream, Inc., is a national nonprofit organization dedicated to helping more community college students — particularly low-income students and students of color — stay in school and earn a college certificate or degree. Evidence-based, student-centered, and built on the values of equity and excellence, Achieving the Dream aims to close achievement gaps and accelerate student success nationwide by (1) guiding evidence-based institutional change, (2) influencing public policy, (3) generating knowledge, and (4) engaging the public. Conceived as an initiative in 2004 by Lumina Foundation and seven founding partner organizations, today Achieving the Dream works with nearly 200 colleges, more than 100 coaches and advisers, and 15 state policy teams in 32 states and the District of Columbia.

The Achieving the Dream Student-Centered Model of Institutional Improvement is a five-step process that guides colleges in their reform:

- Commitment from college leadership to improve student outcomes
- Use of student outcomes data to prioritize actions
- Stakeholder engagement to develop a plan for improving student achievement
- Implementation, evaluation, and improvement of strategies
- Establishment of a culture of continuous improvement

Combined with support from Achieving the Dream and investments by the college, this five-step process is designed to help colleges build an evidence-based culture that is dedicated to student success and program completion.

ment, evaluate, and refine promising practices to increase the number of students who make it through developmental education and earn a credential.

Most community colleges offer sequences of three or four courses in developmental math, reading, and writing that aim to equip academically underprepared students for college-level work. Students' placement test scores determine their starting level — whether in one of the developmental courses or in college-level work. At many colleges, students who are referred to developmental education are required to take these courses, and/or developmental courses are prerequisites for many college-level courses.

The lengthy sequence of developmental courses can be daunting for students, especially those who place in the lower levels. Developmental math, in particular, is a formidable obstacle,

as only one-third of students who are referred to developmental math complete that sequence.[4] Students who are referred to the lowest levels of developmental math complete the sequence at even lower rates; only 17 percent of students who place three levels below college-level math complete the sequence.[5] With multiple exit points along the way, the developmental math sequence may not be optimally structured to retain students. Research shows that most students who exit the sequence do so because they do not enroll in one of the courses, rather than because they fail or withdraw from a course.[6] In addition to the structural obstacles, instructional techniques employed in developmental math classrooms may contribute to student attrition. Traditionally, developmental math classes are characterized by lectures and rote, procedural learning[7] — an approach that may inhibit not only mathematical proficiency but also student engagement in math and in college.

Developmental Education Acceleration Reforms

In response to these challenges and low success rates, reforms to accelerate students through developmental education are gaining momentum across the country. Bolstered by the widespread belief that community colleges' current approach to developmental education is ineffective, acceleration strategies represent a bold, innovative agenda for developmental education reform. These reforms do not just tinker at the margins; they restructure course sequence, content, pacing, and/or pedagogical approach in an effort to move students to college-level courses more quickly. As evidence is mixed as to whether developmental education improves student outcomes,[8] progressing through it as quickly as possible may be the best option for some students to increase their chances of degree completion or transfer. Most acceleration reforms fall into one of four categories:[9]

- **Compression.** Developmental courses are offered in a compressed time frame, often as half-semester courses scheduled so that students can move seamlessly from one course to the next. Often, the number of total hours in class remains the same as traditional, full-semester courses. Compressed courses allow students to complete multiple levels of developmental education in a single semester.

[4]Bailey, Jeong, and Cho (2010).
[5]Bailey, Jeong, and Cho (2010).
[6]Bailey, Jeong, and Cho (2010); Jenkins, Jaggars, and Roksa (2009).
[7]Grubb (2013); Grubb (2001); Hodara (2011); Golfin, Hull, and Ruffin (2005).
[8]Bettinger and Long (2009); Calcagno and Long (2008); Martorell and McFarlin (2007).
[9]This typology is adapted from Zachry Rutschow and Schneider (2011) and Edgecombe (2011).

- **Modularization.** Developmental courses are divided into discrete learning units, or modules, focused on particular skill sets; students complete only the modules that they need. In some modularization models, students use software to work at their own pace, potentially completing multiple levels of developmental education in one semester.

- **Curricular reforms.** Developmental curriculum is redesigned to decrease the number of courses that students need to take or to better align with what students need to know to succeed in college-level courses. For example, colleges may create accelerated course sequences focused on statistical literacy, rather than on pre-calculus, for students not pursuing majors in science, technology, engineering, or mathematics.[10]

- **Mainstreaming and paired courses.** These models are based on a belief that students in developmental education are capable of college-level work with extra support. In mainstreaming models, developmental students enroll directly in college-level courses, while receiving supplemental support services, such as tutoring or study skills courses. Paired courses link developmental courses with related college-level courses so that students have the opportunity to earn college credits sooner.

These models are sometimes combined with pedagogical reforms aimed at increasing student engagement and mastery. For example, in paired courses, instructors integrate the two courses' curricula, and compressed courses can have longer class periods in which instructors may choose to pursue more diverse learning activities.[11]

Acceleration strategies at community colleges are becoming increasingly popular. Of 288 community colleges that participated in an institutional survey in 2011, 120 (42 percent) reported offering accelerated or "fast-track" developmental education courses. At 15 of these colleges (13 percent), first-time developmental students are required to participate in these courses.[12] Even entire states are joining this movement: Indiana, North Carolina, and Virginia are replacing their developmental math courses with modularized courses, and other states are moving in this direction. Anecdotally, community college stakeholders are increasingly thinking and talking about accelerated approaches as innovative ways to help students succeed.

[10]Cullinane and Treisman (2010).
[11]Edgecombe (2011).
[12]Center for Community College Student Engagement (2012).

Building Evidence on Acceleration Strategies

Despite promising trends associated with acceleration strategies and the growing popularity of such models at community colleges nationwide, there is a dearth of reliable evidence about the effectiveness of acceleration programs.[13] The Community College Research Center conducted a quasi-experimental evaluation of the Accelerated Learning Program (ALP), a developmental English mainstreaming strategy at the Community College of Baltimore County, finding that students participating in ALP completed college-level English courses at higher rates than non-ALP students.[14] Thus far, however, the ALP approach remains the only acceleration strategy known to have been tested with a research design that attempts to account for differences in observable baseline student characteristics.[15] More rigorous research about the impacts of these approaches is critical to inform colleges, policymakers, funders, and other stakeholders as they determine how best to move forward in helping students in developmental education reach their academic goals.

Interested in building evidence on acceleration approaches, MDRC embarked on a reconnaissance effort in 2011, funded by a grant from Carnegie Corporation of New York, to better understand the various acceleration programs currently in the field. MDRC identified dozens of innovative programs in colleges across the country and visited several of them. Two models that incorporated popular approaches to acceleration emerged as the most policy-relevant and promising: a compression model at Broward College called "Math Redesign" and a modularization model at Tarrant County College called "ModMath." Both programs are poised for an external evaluation, with institutional data suggesting promising outcomes and with supportive faculty and college leaders. The programs also have the potential to reach the large numbers of students necessary for an evaluation, while operating alongside traditional math classes that could serve as a counterfactual. MDRC, in partnership with Broward and Tarrant County, hopes to obtain funding to conduct a formal evaluation of the programs that will provide evidence about their impacts on student outcomes, such as student motivation, student engagement, and academic progress. This evaluation would use a random assignment research design to compare the outcomes of students who have the opportunity to enroll in the accelerated courses with a comparable group of students who do not have this opportunity. Such an evaluation would provide much-needed evidence about the "value added" of these acceleration programs.

[13] Zachry Rutschow and Schneider (2011); Edgecombe (2011).
[14] Jenkins et al. (2010).
[15] Zachry Rutschow and Schneider (2011).

Two Acceleration Programs: Math Redesign and ModMath

This case study highlights two math acceleration programs so that other colleges can learn from their experiences designing and operating such programs. The Math Redesign program at Broward College in Fort Lauderdale, Florida, uses the compression approach, while the ModMath program at Tarrant County College in Fort Worth, Texas, uses the modularization approach. In addition to these structural changes, aimed at moving students through developmental math more quickly, the two programs also incorporate pedagogical reforms, including computer-assisted instruction. Additionally, both arose organically from faculty-led math reform efforts. This case study does not provide evidence regarding program effectiveness but, rather, seeks to provide practical information about how Broward and Tarrant County designed and operated developmental math acceleration programs.

Since their establishment in the 1960s, both Broward and Tarrant County have grown to large, multicampus institutions serving over 40,000 students each fall, as shown in Table 1.1. As is typical of many community colleges, most students are female, most attend part time, and most receive some form of financial aid.

With three primary campuses located in and around Fort Lauderdale, Broward draws a diverse population of students from over 150 countries, studying business administration, liberal arts, criminal justice, nursing, and a wide variety of other subjects; the college also awards a small number of bachelor's degrees in education, nursing, and applied science.[16] Broward's student body is approximately one-third black, one-third Hispanic, and one-quarter white.

Tarrant County College District has five campuses in Fort Worth, Arlington, and Hurst, offering programs in more than 80 technical or transfer areas; approximately 1 in 18 residents of Tarrant County takes a class at the college each year.[17] About half the students are white; 22 percent are Hispanic; and 17 percent are black.

Like other community colleges around the country, Broward and Tarrant County struggled with high placement rates in developmental education and developmental math, in particular, but low success rates in these sequences. At both colleges, approximately two-thirds of first-time-in-college students — almost 4,000 students at Broward and almost 5,000 at Tarrant County — place into developmental education in at least one subject each fall, and most of these students have developmental math needs. Yet fewer than half of them will complete the developmental education sequence in a timely manner. For example, at Broward, on average, 45 percent of students with developmental needs complete the sequence within two years of

[16]Broward College (2012a).
[17]Tarrant County College (2012).

Table 1.1

Selected Characteristics of Broward College and Tarrant County College

	Broward	Tarrant County
Location	Fort Lauderdale, FL	Fort Worth, TX
Degree of urbanization	Large suburb	Large city
Number of campuses	3	5
Fall 2010 enrollment		
Total enrollment	40,375	49,108
Full-time students (%)	36	36
Part-time students (%)	64	64
Female (%)	59	58
Male (%)	41	42
Asian/Hawaiian/Pacific Islander (%)	3	6
Black/African-American (%)	31	17
Hispanic (%)	31	22
White (%)	26	52
Other/unknown (%)	8	2
Financial aid[a] (%)		
Any financial aid received	80	66
Pell Grant received	68	49
Developmental education[b] (%)		
Students referred to developmental education	67	65
Students referred to developmental math	57	49
Transfer and graduation, 2010[c] (%)		
Transfer rate	20	21
Graduation rate	22	9

SOURCES: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); Broward College institutional data; Tarrant County College District institutional data.

NOTES: Distributions may not add to 100 percent because of rounding.

[a]Financial aid data refer to full-time, first-time students for the 2010-2011 academic year.

[b]Data are for first-time-in-college students. Broward data are from fall 2011, and Tarrant County data are from fall 2008.

[c]Transfer and graduation rates are calculated for full-time, first-time degree- or certificate-seeking students who graduated or transferred to another institution within 150 percent of the "normal" time to completion, as defined by IPEDS.

initial enrollment.[18] At Tarrant County, only 8 percent of the students who place into developmental math attempt a college-level math course within two years.[19] At both Broward and Tarrant County, concerned math faculty members responded to the poor outcomes for students in developmental math by developing and piloting instructional reforms aimed at increasing students' engagement, improving their mastery of math competencies, and accelerating their progress.

Faculty at Broward developed a model called "Math Redesign" that compresses the traditional sixteen-week developmental math courses into eight-week sessions. The model also directs instructors to give short "mini-lectures," typically incorporating instructional videos, and to engage students in collaborative problem-solving.[20] Additionally, Math Redesign utilizes computer-assisted instruction with Assessment and Learning in Knowledge Spaces (ALEKS), an adaptive, Web-based system.[21] Although more research is needed about the types and prevalence of various compression approaches, Broward's model includes elements similar to compression approaches at other colleges.[22] Students can complete multiple levels of developmental math within one semester, and, like some other compression models, the course incorporates computer-assisted instruction. Unlike some other models, Broward's program includes redesigned classroom activities and is not specifically designed for better-prepared developmental education students. This report thus provides a case study of a compression program with structural as well as pedagogical changes aimed at serving students at any level of developmental math.

Faculty at Tarrant County decided to divide the college's three levels of developmental math into three modules each, in a program they called "ModMath." Students who are interested in enrolling in ModMath take an additional placement test to determine their starting module. Currently, the model is designed so that class is held in computer labs, with students working at their own pace using MyMathLab, an instructional software package, while the instructor circulates around the room to work with students individually. With its revised assessment and its curriculum broken into discrete learning modules, Tarrant County serves as a case study for the modularization approach. Like Tarrant County, colleges with modularization programs often utilize computer-assisted instruction. Still, Tarrant County's program represents just one

[18]Broward College Division of Institutional Research, Planning, and Effectiveness (2012). Data on developmental sequence completion is for first-time-in-college students in the fall cohorts of 2007 through 2010.

[19]Tarrant County College District Office of Institutional Research, Planning, and Effectiveness (2012). Data are for the fall 2008 entering cohort.

[20]The terms "faculty" and "instructors" are used interchangeably throughout this report, although many distinguish between faculty, who are full-time and tenured, and adjuncts, who are not.

[21]MDRC does not endorse ALEKS, MyMathLab, or any other product.

[22]Zachry Rutschow and Schneider (2011).

of a variety of different modularization models; for example, other colleges offer instructor-led, rather than self-paced, modularized courses.[23]

Encouraged by faculty engagement, leadership commitment, and promising data collected and analyzed by the colleges, the two colleges have scaled up the programs, folding them into their Achieving the Dream efforts and their broader student success agendas. Both Broward and Tarrant County began their programs a few years ago, with a few hundred students enrolled, and they expanded gradually over time. Still, many more developmental math students at the colleges are enrolled in traditionally taught classes, as the colleges continue to build engagement and evidence of program effectiveness before further expanding the programs.

Research Methods and Data Sources

This case study report is based on an analysis of data collected from field visits to the two colleges in fall 2012. A team of two MDRC researchers conducted a two-day visit to Broward and a daylong visit to Tarrant County. Research activities included:

- At Broward, interviews with senior administrators in academic affairs and developmental education; at Tarrant County, interviews with campus leadership (President, Vice President of Academic Affairs, and Dean of Science and Technology)
- At Broward, interviews with math associate deans on two campuses; at Tarrant County, interviews with math department co-chairs and the ModMath coordinator (a faculty member) on one campus
- At both colleges, a focus group including 10 to 15 faculty members teaching the accelerated math courses and a focus group including 5 to 15 students enrolled in the accelerated math courses
- At Broward only, a focus group including 5 to 15 students enrolled in traditional math courses
- Observations of accelerated math courses (two each at Broward and Tarrant County) and of traditional developmental math courses (two at Broward and one at Tarrant County)[24]

[23]Zachry Rutschow and Schneider (2011).

[24]Interviews and focus groups were audio-recorded. Half of these activities were professionally transcribed; for the other half, researchers took extensive notes and transcribed quotations verbatim, as appropriate. Researchers used a protocol for classroom observations to take detailed notes.

At each college, program coordinators reached out to instructors to recruit participants for the student focus groups; the instructors then asked for student volunteers. All faculty teaching accelerated math courses were invited to participate in the faculty focus groups. Focus group participants were not intended to be representative of all students or all faculty in the programs. Rather, the focus groups aimed to illuminate a small number of student and faculty experiences in more depth. Program coordinators selected classes for the research team to observe, based on the day and time offered. As with the focus groups, the observations were not intended to provide a full picture of accelerated and traditional classes but, instead, to shed light on how some classes were operating.

Before these field visits, beginning in spring 2011, MDRC researchers had several informal conversations with program leaders and college administrators. They visited each college twice before fall 2012 to meet with students, faculty, and administrators; to observe classes; and, at Tarrant County, to observe a ModMath faculty training session. These activities provided background information for the fall 2012 visits and for this case study.

Additionally, the two colleges' institutional research departments provided data on developmental education placement, course enrollment, and course outcomes. MDRC researchers reviewed the data — some of which are presented in this report and attributed to the colleges — as well as other documents from the colleges, such as promotional materials and internal documents about the programs.

The Organization of This Report

The following chapters highlight the experiences of Broward College and Tarrant County College with their developmental math acceleration programs, drawing on student, faculty, and administrator perspectives where appropriate. Chapter 2 describes the development of Math Redesign at Broward, the key components of the model, and how the program operates. Chapter 3 does the same for ModMath at Tarrant County. Chapter 4 concludes the report by offering some lessons from these two colleges' experiences designing, operating, and scaling up developmental math acceleration programs and provides recommendations and considerations for other colleges that are thinking of implementing similar programs.

Chapter 2

Math Redesign at Broward College

Seeking ways to improve outcomes for students in developmental math, a small group of Broward College faculty collaborated to develop redesigned courses for the developmental and gatekeeper (introductory) math courses.[1] Since Math Redesign classes were first offered in fall 2009, Broward has scaled up the model and incorporated it as part of the college-wide strategic plan. (Box 2.1 provides more information on the history and development of the program.)

This chapter describes the key components of Math Redesign; how students, faculty, and administrators perceive the program; student recruitment; faculty recruitment and development; scheduling challenges; and program scale-up and evaluation efforts.

Components and Perceptions of the Program

Two Semesters Compressed into One

First, Math Redesign compresses what is typically a sixteen-week class into an eight-week session, allowing students to take two levels of math back-to-back and to complete both in a single semester. As shown in Table 2.1, Math Redesign students typically attend class four days a week to complete the same number of class hours — and to cover identical curricular content — as they would in a sixteen-week class. Class sessions almost every day are thought to improve student learning by engaging students in mathematics more frequently.

Additionally, "students can focus for eight weeks," said one long-time Math Redesign instructor who said that now he would not teach developmental math any other way. "Sixteen weeks just drags on and on and on." As this instructor suggested, even though students are in the classroom for the same number of hours, Math Redesign halves the number of weeks it takes to complete the course. Students may build momentum toward college-level work more quickly, and the shorter period of time may help them concentrate on and retain content, ultimately building engagement and mastery. The intensive nature of the course is also thought

[1]These courses include Developmental Mathematics I (Pre-Algebra), Developmental Mathematics II (Elementary Algebra), Intermediate Algebra, and College Algebra. Pre-Algebra and Elementary Algebra do not carry college-level credits. Students receive college credit for Intermediate Algebra, but the course does not count toward the state general education math requirement for an associate's degree. College Algebra does count toward this state requirement.

Box 2.1

Flipping the Classroom: The History and Development of Math Redesign

By Alan Lebovitz, Math Associate Dean, Broward College

Driven to Action

Broward's math curriculum redesign started in 2006 to address the pattern of low success rates in mathematics courses. During this time, the college-wide mathematics department examined all aspects of our developmental and algebra-based classes, including placement, course content, alignment of student learning outcomes between the courses, and — most important — how to improve success rates in our developmental math courses. The main inspiration for this initiative came from *Beyond Crossroads,* which was published by the American Mathematical Association of Two-Year Colleges. Within *Beyond Crossroads* was the idea to "flip the classroom." This method changes the classroom presentation from instructor-based lectures with minimal student interaction and participation to a setting in which students are actively engaged in the learning process, with an emphasis on peer learning and cooperation.

Designing a Solution

In the 2008-2009 academic year, faculty and the associate deans from the mathematics departments met to discuss how to redesign developmental mathematics classes to enhance student success. Various faculty attended a conference about math initiatives at Florida Atlantic University, attended a second conference sponsored by the National Center for Academic Transformation, and visited Daytona State College to investigate and learn about various redesign and/or Emporium models of instruction. Using the flipped classroom idea and what we learned from our research and site visits to other colleges, the faculty adopted and developed a basic structure of video mini-lectures, in-class assignments, homework assignments to be completed online by the students, and real-world application projects. (These application projects were dropped from the classes after the first year due to faculty consensus that the projects did not encompass enough material from the courses to be beneficial to student learning and success.) Implementation of the Math Redesign program began in the 2009-2010 academic year.

Making It Happen

In the first year of the program, different campuses used different online delivery systems for homework, either MathXL or ALEKS. All campuses used one of the two systems during the fall semester and then switched to the other system during the spring semester, ensuring that all faculty had an opportunity to see and compare how each system affected student learning and mastery of outcomes. At the end of the year, the faculty decided to use ALEKS for all Math Redesign courses.

(continued)

Box 2.1 (continued)

Additionally, in the first year, faculty created course "shells" in the college's online learning system that were designed to be the engine in which information was delivered to students, both in and out of the classroom. The shells contain the videos, in-class worksheets, and tests, organized by day. This allows for uniform delivery, consistency, and standardization across different campuses and faculty. Because this is an online system, students can access the videos from home for additional review.

For videos, we looked at the best options available from the authors of textbooks used by the department at the time and selected one author's videos because of their style and concise nature. The in-class worksheets were created by the faculty members who also worked on the course shells. During the first three years of the program, faculty and associate deans met to discuss modifications to, and expansion of, the shells, including adjusting the day-to-day pacing of the courses, adding new material, and updating in-class worksheets; the new Math Redesign courses were finalized based on experiences during the program's initial implementation.

to create high expectations for student achievement, reinforcing their confidence in their own abilities.

One student found the rigor of attending class and learning new material almost every day challenging: "You learn two, three things in one day," the student commented. "Then the next day you learn another thing. Then the next day you learn another thing and you're still trying to learn the other thing that you learned before. Then you're behind." Others in the focus group believed that the shorter time frame helped them retain material. For example, one student noted that since she has math class four days in a row: "I always have the math locked in my head. I don't lose track of what I learned. . . . I'm taking only eight-week classes from now on." Another Math Redesign student said that the compressed class might not be ideal for all students: "I cannot come here four days a week for a math class. [My class] was twice a week. It was three or four hours a day. It's a lot of time, 'cause there's people that get really bored and they can't concentrate in a four-hour class, but I feel it's a really good method if you can handle it."

Immediate Feedback, Mini-Lectures, and Collaborative Problem-Solving

In addition to compression, Math Redesign also changes the way that instructors deliver curricular content in class, incorporating immediate feedback from the previous class, mini-lectures interspersed with videos, and collaborative problem-solving. Compared with students in traditional developmental math classes, students in Math Redesign spend more class time actively engaged in problem-solving rather than listening to a lecture, and this active learning

Table 2.1

Key Components of Math Redesign, Compared with Traditional Developmental Math

	Math Redesign at Broward College	Traditional Developmental Math Classes at Broward College
Course structure	8-week, 3- or 4-credit course	16-week, 3- or 4-credit course
Number of class sessions per week	4 (typically)	2
Enrollment process	Self-enrollment	Self-enrollment
Class composition	Students in same course	Students in same course
Pedagogy	Mini-lectures and collaborative problem-solving	Lecture
Software	Assessment and Learning in Knowledge Spaces (ALEKS)	About two-thirds of classes offer computer-assisted instruction, primarily MyLabsPlus or ALEKS
Placement assessment	Postsecondary Education Readiness Test (PERT)	Postsecondary Education Readiness Test (PERT)
End-of-course assessment	Departmental final exam at the end of the course	Departmental final exam at the end of the course

SOURCE: Interviews with college administrators and faculty.

environment is theorized to support student engagement and mastery. One of Broward's math associate deans described the Math Redesign approach as "very student interactive," with activities "geared at hands-on working in class, helping each other in class, student interaction in class." In contrast to traditional developmental math courses in which instructors primarily lecture to students, she added, Math Redesign instructors play "more [of] a facilitator" role.

This section describes Math Redesign instruction as observed and as explained by program designers, administrators, and most faculty. While the curricular content is standardized across classes and campuses, instructors vary slightly in delivery, as discussed below in this chapter. Box 2.2 provides an illustration of a Math Redesign class.

Immediate Feedback

The instructor begins class by returning graded worksheets that the students completed in the previous class and spends a few minutes going over common issues on the board. These "tips and tricks," in the words of one instructor, give students immediate feedback before they move on to the next topic. Rather than offering a general review of the previous day's lesson or immediately moving on to new concepts, as might happen in traditional classes, instructors can

Box 2.2

One Morning in a Math Redesign Classroom

About 15 students filed into the classroom at the North Campus of Broward College, each headed to his or her favorite desk among the rows of desks facing the screen and the front of the room. The students chatted with one another as they settled in, with one group of four or five students in the front row interacting as though they were friends. The instructor — a full-time faculty member experienced in teaching Math Redesign — handed out the graded worksheets that the students had completed the day before and explained where they could find review questions in ALEKS for the final exam the following week. Students made a note of it, looking not a little anxious about the final, and turned their attention to the video, which the teacher just turned on. With that, the class began.

For the next 40 minutes, the teacher explained how to convert fractions to percentages and percentages to fractions. She flipped back and forth every few minutes between using the video — narrated by a pleasant and soothing female voice — and writing out examples on the whiteboard. Students paid close attention, leaning forward at their seats, often raising their hands to ask questions. Some clearly struggled with the content. This was the lowest level of developmental math; the teacher frequently had to stop and explain simple arithmetic expressions. But with only one or two exceptions, the students appeared engaged and eager to understand.

Twenty-five minutes before the end of the class, the teacher handed out new worksheets with problems similar to those she had just walked through, and, without prodding, the students set to work on them — but not all on their own. Within a minute or two, one student turned to her neighbor and another twisted around in his seat to talk with the student behind him. Soon the room was alive with quiet talking as at least half the students worked with each other to solve problems. The others worked on their own.

The teacher moved around among the students — working with individuals, pairs, or groups — and then she collected the worksheets. The students gathered up their belongings, knowing that the next day they would get back those worksheets graded. Many headed to the lab to put in some hours on the ALEKS homework.

provide targeted remediation to go over the specific concepts and skills needing additional attention. Grading worksheets every day can be time-consuming for instructors, but it gives them real-time feedback on the strengths and weaknesses of individual students as well as of the class overall. They can then intervene with individual students and can adjust and improve their teaching to respond to areas of need. Another instructor noted that receiving a grade every class period serves as a motivation for students. Such frequent feedback can give students a more

accurate assessment of their mastery, increasing academic self-awareness and, in turn, building self-confidence and motivating the development of strong academic habits.[2]

Mini-Lectures

For the next 30 to 45 minutes, instructors present the lesson through brief, standardized instructional videos, interspersed with their own commentary.[3] They typically show several videos, totaling 15 to 20 minutes, that show an instructor working through a few problems. Some instructors pause the video frequently to add comments, while others wait until the video finishes. Students also have access to these videos outside of class, so they can watch them if they miss class, before class if they want to prepare, or after class to go over the concepts again. One student said: "If you're questioning yourself about something, you can always go home and review them. You teach yourself."

A veteran Math Redesign instructor explained that the key concept was not the videos but, rather, an abbreviated lecture period. She said that for factoring, for example, she omits the videos and shows the problems herself, because she likes to teach the topic a certain way. "So we can get away from not using a video every single time, but it's really making sure that the lecture is shorter. It's concise." According to program designers and leaders, this succinctness helps instructors contain their lectures, set the pace of the class, and keep it on track. Additionally, an associate dean who has taught Math Redesign classes pointed out that switching back and forth between himself and the video instructor helps keep students engaged: "I consider myself a pretty dynamic lecturer, and, even saying that, sometimes I could notice students dozing off in class." The videos break up the class a bit: "She [the video instructor] does her thing, and [I] interject after. . . . She's talking and I'm talking, and all of a sudden, it's a live guy up here shaking and baking. She's back to talking. Here I am, I'm back again."

Several students pointed out that they appreciated hearing the lesson explained different ways by multiple people. One student echoed the associate dean's comments: "They're like compound to one piece. She's saying something. He's like, 'Okay, stop, pause, I'm going to explain it to you.'. . . So it's like two professors interacting." Another student explained that her instructor will show a different way to solve the problem than the video, so students can choose the method that makes sense to them: "They both help you out."

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[2]Bickerstaff, Barragan, and Rucks-Ahidiana (2012).

[3]The videos are aligned with Florida's math learning competencies and were created by Julie Miller, mathematics faculty at Daytona State College and coauthor of multiple mathematics textbooks.

Collaborative Problem-Solving

For the remainder of the class time, generally around half an hour, students collaborate with one another on a problem-solving worksheet, with the instructor moving around the classroom facilitating group work and providing one-on-one assistance as needed. Faculty designed these worksheets to mimic the problems shown in the videos, so students can apply what they learned right away. With this instructional strategy, students in Math Redesign spend more time in class actively engaged with problem-solving, compared with students in traditional developmental math classes, who typically spend all or nearly all of the class period watching the instructor solve problems and taking notes.

The collaborative aspect is thought to promote active learning, minimize competition, increase motivation, and lead to cognitive growth.[4] An associate dean explained it this way: "Part of the theory . . . is as math faculty, we see this very often, are students who are passive learners. If I teach a regular lecture class and I'm writing on the board and I say, 'Okay, but here's an example. You guys go ahead and try it on yourselves,' and I would walk around the room . . . and I say [to a student], 'Come on it. Give it a try.' 'No, I'm just gonna watch. I got it.' And invariably, that student does not succeed. So what [Math Redesign] does is it kind of forces them to be active learners." Another instructor reported that the "more dynamic" atmosphere, in her experience, helped to increase student motivation.

Additionally, during collaborative problem-solving, instructors can identify student needs and intervene appropriately. Instructors pointed out that collaborative problem-solving allows them to spend more time with the students who need it. Instructors added that, often, working with students individually helps students understand concepts better than hearing them in lecture form. Meanwhile, an instructor pointed out that collaborative problem-solving provides leadership opportunities for students strong in math: "You see these students come out of their shell," he said. "It's fun to teach."

Despite a much shorter lecture period, Math Redesign instructors reported that, based on their experience, collaborative problem-solving helps students master the material. "It's when they start doing the classwork that they start to learn," one instructor noted. "It seems like that's how they're really retaining the material." Math Redesign students in the focus group agreed that collaborative problem-solving helped them better understand the lesson. "With the traditional way, it's like you just get a lecture. You might ask a question, but you're not getting that interactive [part]," one student said. Another added: "If you don't really put the lecture to practice in class, . . . it's not as beneficial."

[4]DeCorte (2007); Hodara (2011).

Solving problems with peers seemed particularly valuable to the students in the focus group. The peer learning model is thought to benefit both high and low performers, who learn about the material from interacting with students at different levels. Students agreed, with one student saying that he learned while explaining problems to peers and another emphasizing the benefit of hearing her classmates' explanations. As one instructor put it: "When an instructor says it, it's one thing. When a peer says it, it can carry more weight."

Computer-Assisted Instruction

Math Redesign students continue their learning outside the classroom with computer-assisted instruction. As discussed in Box 2.1, Math Redesign faculty decided to use the Assessment and Learning in Knowledge Spaces (ALEKS) system, one of several software programs offering computer-assisted instruction. ALEKS is a Web-based system that uses periodic assessments and artificial intelligence to provide each student an individualized, adaptive learning plan.[5] Faculty aligned ALEKS with the pacing and student learning outcomes in each course outline. In continuing with Math Redesign's focus on active, mastery-based learning, ALEKS "really works with the students' needs from where they are and what they need to do to get through these topics," said one associate dean. "If there's anything that's lacking at any point, it makes them go back and redo [it]. So it's really very interactive." ALEKS' adaptive features support mastery learning by providing customized remediation so that each student moves at her or his own individual learning pace.

In ALEKS, students must master each concept before moving on. "ALEKS won't let them go onto something new until they have all the background that they need to get to that point," said one instructor, who liked that ALEKS meets the needs of students who cannot keep up with course material. Additionally, instructors said that they particularly appreciated that ALEKS continually reassesses students. One instructor noted that Math Redesign may be successful because "ALEKS is constantly not only looking forward, but backwards, and they're constantly reviewing throughout the semester when getting reassessed." Another instructor pointed out that this kind of review built into ALEKS is absent from traditional textbooks. "Math is cumulative," she said, adding that many students do not have basic math skills. "That's why I think a lot of us are liking ALEKS, because it's making them go back to what they didn't learn."

Students in the focus group found ALEKS demanding, calling it "challenging" and "a lot of work." They reported spending 60 to 70 hours using ALEKS per course, and some said that they spent 100 hours on the program during the eight weeks. Still, they felt that the program helped them learn math better, as it "forces" them to redo problems that they answered incor-

[5]ALEKS Corporation (2012).

rectly. "You had to really be on top of it," one student said. "I'm not gonna lie. It was very rigorous, but it helped me a lot. . . . With ALEKS, if you don't like doing the work, this is not the program for you; but if you want to get a lot out of it, if you want to learn math, the redesigned course is what you want to be in."

Program Operations

As with any new, multifaceted program, implementing Math Redesign poses challenges for program leaders: Who will lead the program, manage its growth, and coordinate across campuses? How will leaders ensure that students enroll in the sections? How will leaders recruit and train faculty to teach in this new way? How will the classes be scheduled? How will leaders decide whether or when to scale up the program? Even though curricular content in Math Redesign is identical to that of traditional developmental math, and even though the concept of eight-week courses was not new at Broward, the college encountered a number of implementation issues and questions in the first few years of the program. This section describes how the college responded to these questions, from the perspectives of administrators, faculty, and students. As the number of Math Redesign sections increases, and as more instructors and students become involved, program leaders are continuing to develop and fine-tune recruitment, training, and scheduling processes.

Program Management Institutionalized

Each campus at Broward has a math associate dean who oversees all instructors in the department, including those who teach Math Redesign. The associate dean sets the number of sections to be offered, coordinates teaching assignments, recruits faculty to Math Redesign, and directs faculty training. Additionally, each campus has a faculty member designated to coordinate developmental math efforts; these faculty members meet regularly with the Assistant Vice President for Developmental Education and Student Success to discuss initiatives like Math Redesign and to foster consistency across campuses. This assistant vice president supports Math Redesign at the college level. Management of Math Redesign has thus been incorporated into existing administrative positions, though one math associate dean acknowledged that scheduling and promoting Math Redesign does take more time than "business as usual."

Getting the Word Out to Students

Ensuring that students sign up and fill the allotted sections can be a challenge with any new course format, particularly one like Math Redesign that represents a greater time commitment for students. To recruit students into the program, math associate deans work with college advising staff to promote Math Redesign. One math associate dean sends a flyer to the campus's associate dean who is responsible for advising and counseling, so that advising staff

can advertise the classes to students. Another math associate dean held an open house about the program.

As the program increased in scale, math associate deans said that students started hearing about the program through word of mouth. "Now [students] all know it, because it's been around, and word of mouth, a lot of the students like it because they like that hands on approach, working every day," said one associate dean. Another associate dean acknowledged that the process is gradual: "I think that's something that will come in time. . . . It's not there yet via word of mouth. I think in time it will get there, but it takes time."

Despite the outreach efforts, many Math Redesign students might not be aware at enrollment that they have selected a different type of class. The students in the focus group were not aware of the instructional changes before the first day of class. A faculty member who has taught Math Redesign since its inception said that when she asks on the first day of class, only one or two students report hearing that anything is different about the course, aside from its compression into eight weeks. Continuing students who register online might see information designating the course as Math Redesign, but students said that the text is small. "I just ignored it," one said. Even students who hear about the class through advising are not always clear about it: "When I register, they just told me it was going to be [an eight-week class]. I didn't know what [that] was. . . . They told me it was a fast-track class. I still didn't know. It's my first time. . . . I heard 'fast,' and I'm like, well, I'm not good at math, but I didn't have no other choice 'cause they didn't have [any sixteen-week classes]."

Student affairs staff at one campus said that they could not recall having to cancel Math Redesign classes due to low enrollment, though Math Redesign classes tend to fill up after traditional developmental math classes. Administrators see student recruitment as a continuing challenge. As one math associate dean said: "People in general gravitate to what they know. Students know sixteen-week classes. That's what they've always known. So those classes will tend to fill first, regardless of the instructor, and then sometimes [students say], 'Oh, eight weeks. I don't want to take an eight-week class. That's too fast.'" The college continues to think about how best to promote Math Redesign as the program expands.

Recruiting and Training Instructors

An important part of math associate deans' role with respect to expanding the Math Redesign program is recruiting faculty members to teach the model. Although several faculty involved have taught Math Redesign classes for years, the associate deans have done personal outreach to encourage others to volunteer to teach Math Redesign. One math associate dean said that his predecessor "played a tremendously active role" in recruiting faculty and increasing the number of sections offered, talking with faculty personally rather than sending e-mails. About an equal number of full-time and adjunct faculty currently teach Math Redesign. Associate

deans are often more directive in recruiting adjunct faculty. "With adjuncts, there can be a certain amount of, 'This is good. I think you should go ahead and try it,'" an associate dean said. "That's part of recruitment. It's selling it."

As more faculty begin teaching Math Redesign, they bring others on board by talking about how they overcame their hesitations. A math associate dean who taught Math Redesign before assuming his position said that when he first heard about the program, "my first reaction was, 'Videos, really?' And I'll be honest, my ego stepped in and said, 'No one can do me as well as I do me.' . . . But having taught [Math Redesign] for a couple years, I am completely sold on this project, and I learned that I can still be me. I can still incorporate my knowledge, my passion, my style into a Math Redesign class, even though it has the videos and the worksheets and things are already set up. It doesn't remove me and who I am from the equation. And that's what I've told other instructors." The associate dean continued: "Some people [at a faculty recruitment and training meeting] were very hesitant. They were very outspoken. 'What do you mean you're going to have me show videos?' which is the same reaction I had, and I expressed that. I said, 'Listen, when I first heard this, I said, "You guys are out of your mind if you think this is going to be effective." And I'm here to tell you that I was wrong, that it works, that I've seen better results.'"

The college also held two recruitment and training sessions in June 2012 for experienced and prospective Math Redesign faculty. One campus's meeting focused on training for the online learning system and ALEKS; at the other campus, veteran faculty explained and discussed the Math Redesign model and demonstrated a day's lesson. These meetings, funded by MDRC, drew 26 faculty across the two sessions.

The program has offered different training activities over the first few years to ensure that faculty are prepared to teach Math Redesign and use ALEKS, and training also varies by campus. Training activities are not strictly mandatory for faculty, but, as one associate dean noted, "We have the kind of faculty that if you ask them to come to a meeting, they will come because they're passionate about what they do, and it's all about student success." One campus's professional development activities for fall 2012 instructors included a workshop in which a veteran Math Redesign instructor demonstrated how to properly teach a Math Redesign class, an ALEKS training, and meetings before and during the semester to check in. A faculty member on another campus said that he felt prepared to teach Math Redesign without formal training on the model, as he relied on informal support from experienced colleagues; he attended an ALEKS training but did not find it helpful. Another faculty member went through a mentoring program in which she observed at least three classes before teaching. She said that seeing different instructional styles helped her develop her own Math Redesign style. Broward has not formalized a training structure going forward; one associate dean said that the frequency of trainings offered will depend on how many faculty are new to Math Redesign.

Adjusting to Math Redesign

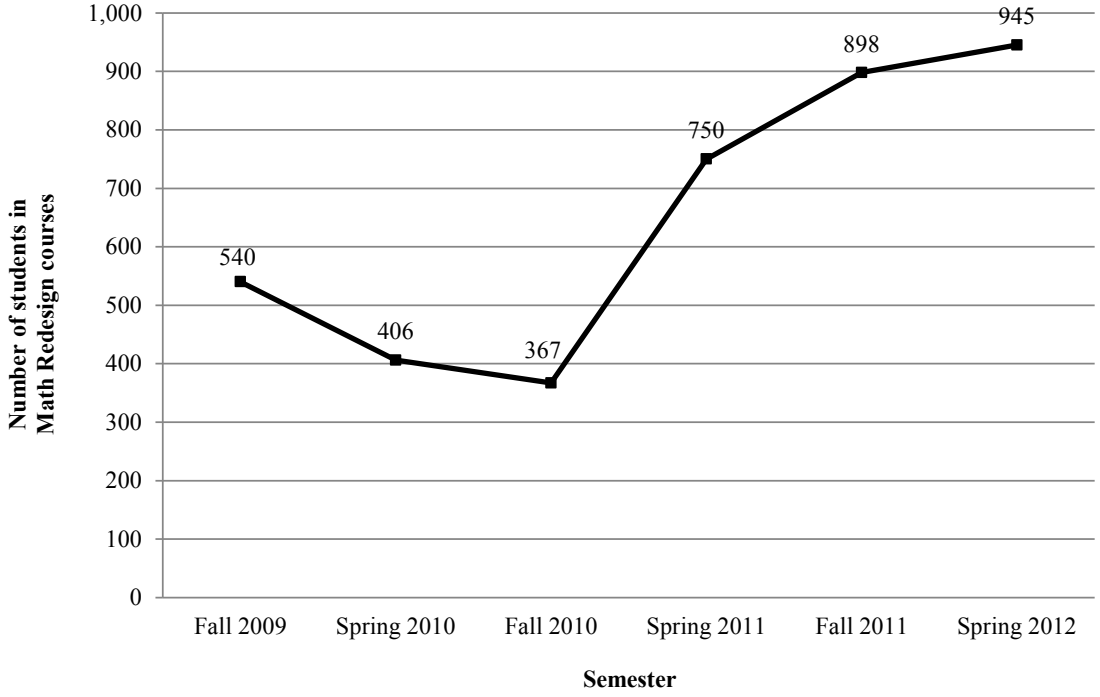
For instructors new to Math Redesign, the unfamiliar delivery format can be challenging. One instructor said that she initially found it difficult to adjust to mini-lectures: "It's hard to cut it down. You feel like you have so much to tell them, and then you're not sure if you should just rely on them learning some stuff that you didn't have a chance to tell them." New instructors also struggled with how to incorporate the videos into the class — for example, whether to play the video all the way through or to pause it to interject comments — and practices varied. One new instructor said that pausing to comment on the video takes too long but that playing the videos without pausing did not seem effective in teaching students. He said, "I haven't found a good rhythm with the videos, and am starting to get really frustrated." While the program was designed to incorporate at least 30 minutes of collaborative problem-solving, faculty reported — and associate deans observed — that the mini-lectures can run long, leaving less than half an hour for collaborative problem-solving. Veteran Math Redesign instructors acknowledged the challenge of figuring out how to pace the class, but they noted that the learning curve can be overcome relatively quickly. "It's much easier the second time around," said one instructor. An associate dean schedules two semesters of Math Redesign for faculty new to the model, so they can become comfortable with it before deciding whether to continue.

Scheduling in Pairs

As Math Redesign classes typically meet four days each week, ensuring classroom space for a growing number of Math Redesign classes can be a challenge. "I'm using every bit of space, all day long," one associate dean said. To optimize use of classroom space, associate deans schedule the classes in pairs, one during the first eight weeks of the semester and the other in the same classroom at the same time during the second eight weeks. They also try to set up these pairs so that a student who passes the first class can enroll in the next class in the same room, during the same time, with the same instructor. They feel that this removes scheduling barriers for students who are planning to complete two classes in one semester and that it facilitates cohorts of students continuing together with the same instructor. These cohorts may foster stronger relationships with instructors and peers. As one instructor said: "When they go into the next class, first, they feel comfortable with you. They're so afraid of math. Once you feel comfort with your instructor, it's not having to go through that, 'Oh, I have to build rapport with another instructor.' . . . They already have built their bond [with other students]. They know, 'Oh, that's a stronger student. I'm going to go work with them because they explain it to me.'"

Figure 2.1

Math Redesign Scale-Up, Broward College, Fall 2009 to Spring 2012



SOURCE: Broward College institutional data.

Another potential challenge arises if the second eight-week session fills up and students who enrolled in the corresponding first eight-week session are blocked from registering for the second. To avoid this, one associate dean opens enrollment for the second session only halfway at the start of the term. Another restricts enrollment for the second session at the beginning of the term so that students cannot self-enroll, and Math Redesign students are given priority. The college is considering potentially registering Math Redesign students for both sessions at the start of the term.

Using Promising Data to Drive Scale-Up Activity

As shown in Figure 2.1, the Math Redesign program at Broward has almost doubled in size since its inception. The program began in fall 2009 with 10 faculty from all three campuses offering 17 sections across the four developmental and introductory mathematics courses. In the second academic year, due to faculty attrition, the program scaled back slightly. In preparation for a rigorous evaluation, MDRC worked with the college to set benchmarks for program scale-

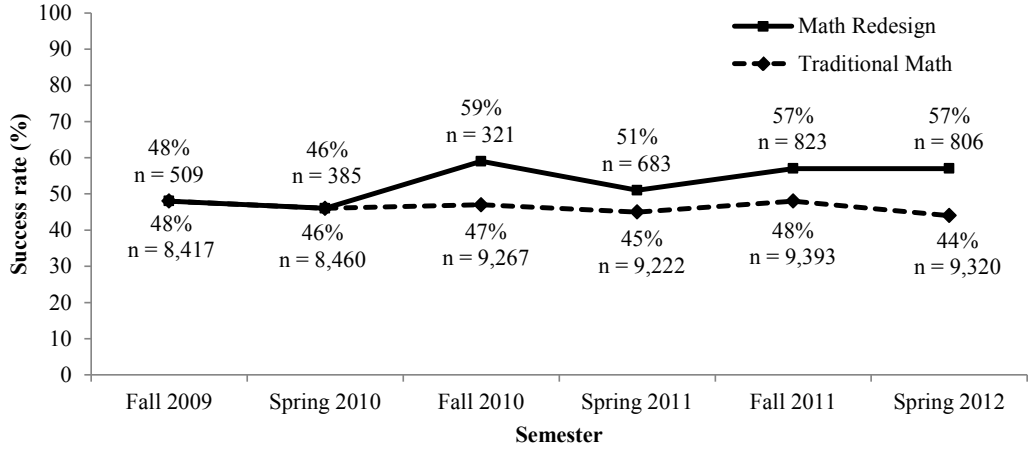
Box 2.3

Comparing Student Outcomes in Math Redesign and Traditional Developmental Math Courses: Analysis by College Staff

By Joanne Bashford, Assistant Vice President for Developmental Education and Student Success, and Alan Lebovitz, Math Associate Dean, Broward College

Since the early years of implementation of the Math Redesign model, Broward's Office of Institutional Research, Planning, and Effectiveness has analyzed data on student outcomes in Math Redesign and traditional developmental math courses. After the first year of implementation, Math Redesign students have consistently outperformed their peers in traditional math: Math Redesign students withdraw from their courses at lower rates (not shown in figure below), while earning grades of A, B, or C at higher rates than their counterparts.

Math Redesign and Traditional Math Success Rates in Pre-Algebra, Elementary Algebra, and Intermediate Algebra



SOURCE: Broward College institutional data.

NOTES: Successful completion is defined as earning a grade of A, B, or C. Unlike the data in Figure 2.1, which includes all four classes in which Math Redesign has been implemented, the figure above includes only the courses that do not count toward the state's general education math requirement (Pre-Algebra, Elementary Algebra, and Intermediate Algebra), due to the focus of this report on developmental math.

Importantly, no attempt was made to account for any differences between students who choose to enroll in Math Redesign courses and those who select traditional courses, so results should be interpreted with caution.

up beginning in spring 2011. In part due to this external encouragement, the third year saw some growth, and, in the fourth year (not shown in figure), the program has worked to recruit new faculty and offer many more sections. Math Redesign has been incorporated into Broward's college-wide strategic plan, with a campus president designated to ensure that the initiative meet its goals.

Promising data collected by Broward's Office of Institutional Research, Planning, and Effectiveness, shown in Box 2.3, also contributed to scale-up. Broward's participation in Achieving the Dream helped it build institutional research capacity and foster a culture of data-driven decision-making. Broward embraced the Achieving the Dream model of piloting the strategy and then comparing student outcomes in the two formats to inform decisions about how best to proceed with Math Redesign.

Data on outcomes for Math Redesign students mutually reinforced faculty interest and institutional commitment to drive increasing scale. For example, one associate dean said that scaling has driven faculty interest and vice versa: "We've been asked to scale up, so each term I've offered a few more, and the more we offer, the more we get faculty interest. . . . [Then,] some of the faculty who've taught with the redesign don't want to go back to traditional." A faculty member pointed out that student outcomes data help bring faculty on board: "If a faculty member is really into teaching, and they see redesign is better for the student, they would want to do it. . . . You can see it on your tests."

Chapter 4 provides additional reflections on scaling. Broward continues to analyze data on Math Redesign and hopes to participate in a formal evaluation as it considers how to refine and expand the program moving forward.

Chapter 3

ModMath at Tarrant County College

Tarrant County College divided its three developmental math courses into nine discrete "ModMath" modules following a district-wide effort that began in 2006. As part of this effort, Tarrant County identified learning outcomes and aligned math curricula to these outcomes, but some math faculty thought that additional reform was needed, leading to the development of ModMath. The ModMath coordinator described the motivation for the program: "We think there's more going on than just the curriculum content. We think it's how students are at community colleges. They have life events that make them leave, and then they're having to come back and start all over again." The purpose of modules, she said, was so that students "could leave after finishing a mod or two mods or five mods, and come back and pick up. You know, you have a baby, you come back; you change your job, you come back." Faculty piloted ModMath in fall 2008. Since then, the program has continued to grow and evolve. (Box 3.1 provides more information on the history and development of the program.)

This chapter outlines the key components of ModMath; how students, faculty, and administrators perceive the program; and how the program has operated and evolved.

Components and Perceptions of the Program

ModMath students enroll in one of nine 5-week developmental math modules that cover the same content as Tarrant County's three semester-long developmental math courses. Students begin by taking an additional placement test to determine their starting module, and then they enroll in three modules per semester. Class consists of students working with an instructional software package, MyMathLab, at their own pace, with an instructor circulating to work with individual students; this self-paced nature allows students to complete more than three modules per semester if they work quickly and pass the final exams.

More Finely Tuned Placement Test

Tarrant County students take the ACCUPLACER test to determine math placement.[1] Besides ACCUPLACER, students who enroll in ModMath take an additional assessment, as faculty believed that ACCUPLACER was inadequate for the specific placement needed for ModMath. As shown in Table 3.1, Tarrant County currently administers MyMathTest, a

[1]The State of Texas is currently developing a new placement assessment to replace ACCUPLACER. Implementation of this assessment was scheduled to begin in fall 2013.

Box 3.1

Modularizing Math: The History and Development of ModMath

By Greta Harris-Hardland, Math Faculty Member, Tarrant County College

Driven to Action

In October 2006, a group of faculty and administrators from all four campuses at Tarrant County College met to discuss developmental mathematics. The district and state had recently published completion rates, and Tarrant County was at the same poor level as other community colleges: 30 percent to 50 percent of developmental math students finished the course with an A, B, or C. Our project included looking at the developmental courses and the first college credit course, College Algebra, to see what ideas faculty had to improve the completion rate. At that time, only 12 percent of students who started in developmental math obtained an associate's degree. Much lower percentages finished among students who needed all three levels of developmental math.

The main goal of the project was to increase student success rates (a grade of C or better) in College Algebra. The faculty was also charged with increasing retention rates in the developmental courses and the first college-level course, vertically aligning the learning outcomes in developmental courses, writing a notebook with the details of the learning outcomes, and creating courses with the same content on all campuses.

Designing a Solution

The group of faculty and administrators — tagged "The Math Think Tank" — began by mapping our curriculum from College Algebra down to the first developmental course. The group met each month while collecting and sharing the learning outcomes from other universities and planning an all-day College Algebra Summit. The summit was held in March 2007 and included over 200 faculty and administrators from 10 area universities and community colleges. After establishing and arranging common goals, Tarrant County faculty were offered summer stipends to create district notebooks, including lesson plans, example problems, test-bank sample problems, pretests, and weekly expectations for each course.

As the summer progressed, the faculty kept returning to the same topic: Even though the courses were now aligned and repetition was removed, student outcomes might not change at all, since we had not addressed the problems that students encounter during a semester at Tarrant County.

In fall 2007, students were surveyed to identify the reasons that a course was dropped. Negative comments about the course or faculty were rare. Most of the reasons involved personal issues, such as job loss, change of schedule, loss of child care, eviction from housing, incarceration, illness, and lack of transportation. From this survey, the faculty began to discuss what might make a difference in overcoming students' personal issues. We saw students leaving midsemester with no math credit and wanted to allow progress for what was accomplished while attending. The idea of ModMath came from these faculty meetings.

(continued)

Box 3.1 (continued)

Making It Happen

Administrators and faculty began to look at the issues that needed to be addressed in order to create nine 1-credit courses. Discussions with the head of registration overseeing all campuses and with the director of financial aid were the first step. Then, all vice presidents from what are now five campuses discussed and resolved issues that they foresaw impacting the project. Next, we needed to place students more "granularly," or more precisely, than the state tests could do. The faculty spent a day taking tests from the Assessment and Learning in Knowledge Spaces (ALEKS) system — one of several software programs offering computer-assisted instruction — and decided to evaluate this the first semester. We ran into difficulty with the length of the test and the inflexible order of content, and so we looked for other options for the following year. By fall 2009, we had created a test that matched our outcomes and took students about half the time to complete. The group used MyMathTest and tested how well this placement test put students into the needed starting place. The test is reviewed and tweaked as we review and change the course content.

Pearson product, to place students into one of the nine modules or into college-level math. Faculty at Tarrant County worked with Pearson to construct the test; like ACCUPLACER, MyMathTest is computerized and adaptive.

Using a more fine-grained placement test is thought to enable more accurate placement, which, in turn, allows students to focus on the topics in which they actually need remediation, rather than spending time on material they already know. One instructor pointed out that this targeted remediation can help students stay engaged and develop strong study skills. In traditional developmental math classes, she noted, many students know the early material and pass the first test, but, around the middle of the course, "they've got bad study skills by then because they already thought: 'Oh, I know this. This is a piece of cake. I can do it.' And then they hit the wall. Well, then they're going to fail because they don't have any study skills established. So that's the other thing about the mods. If they'll take that mod placement test, they can place into where they really belong instead of [thinking]: 'Oh, I already have this. I don't have to work in this course.'"

Five-Week Modules

ModMath restructures the college's three 16-week traditional developmental math courses, dividing each course into three 5-week modules. These modules cover the same competencies as the traditional courses. By organizing the content in this way, ModMath allows students to leave and return (or fail and return) without losing as much ground as with semester-

Table 3.1

Key Components of ModMath, Compared with Traditional Developmental Math

	ModMath at Tarrant County College	Traditional Developmental Math Classes at Tarrant County College
Course structure	5-week, 1-credit modules (students enroll in 3 modules per semester, though they can complete more)	16-week, 3-credit course
Number of class sessions per week	2	2
Enrollment process	Permission from math department necessary	Self-enrollment
Class composition	Students in multiple modules	Students in same course
Pedagogy	Self-paced on computers, with an instructor and instructional aide circulating	Lecture
Software	MyMathLab	About 20 percent of classes use MyMathLab; others do not offer computer-assisted instruction
Placement assessment	ACCUPLACER and MyMathTest	ACCUPLACER
End-of-course assessment	Final exam at the end of the module or earlier if the student is ready	Departmental final exam at the end of the course

SOURCE: Interviews with college administrators and faculty.

length courses. This is thought to facilitate students' progress through the sequence, accommodating the many community college students who have to "stop out" during their studies due to family, work, or other responsibilities. "What I try to tell [students] all the time is you have a chance," one ModMath instructor said. "Even if you have to repeat one module, you could still have one or two hours toward your developmental [requirement] versus if you don't make it in a regular class, you've lost the whole semester. So one hour beats nothing. One hour of progress in the mods is progress of some sort, instead of: 'Okay, I'm back at square one. I'm signing up for that again.'"

Additionally, instructors believe that the opportunity to complete modules every five weeks helps students stay engaged and engenders a sense of accomplishment. "Students do somehow respond to that whole, short, 'It's five weeks; you get in, you get it done.' You have that sense of accomplishment, unlike just a unit test," one instructor said. Another instructor agreed: "I think that means a lot to them that 'I got a credit. Five weeks are over, and, actually, it's posted on my grades; I have a grade,' and that can't be taken away from them."

Box 3.2

One Morning in a ModMath Classroom

In the ModMath classroom at Tarrant County College, there was little of the hustle and bustle of many typical college classrooms as students pulled out their textbooks and settled in. Instead, students entered quietly and seated themselves at one of the 25 computers arranged in five rows facing the front of the classroom. There was little or no conversation among them — not surprising, given that the students were all working on different math problems and there was no lecture, no question-and-answer period, and no group work. But students seemed serious and focused as they pulled out notebooks and pencils, put on their headsets, logged on to where they had left off in the MyMathLab program, and began working through the problems. This was one of the "one-room schoolhouse" ModMath classes, where students work on any one of the nine modules and do so entirely at their own pace.

The professor — one of Tarrant County's veteran math teachers — immediately seated herself in an empty chair next to one student, who was already hard at work on the computer. The students spaced themselves out in the room, most leaving an empty chair next to them as though awaiting the professor to sit in it at some point. By the end of the hour, she actually did sit down with each student — with some for just a few minutes, with others for as long as 15 minutes. Speaking quietly, she talked through a few problems with the first student, who was working some quadratic equations, before getting up, glancing around the room, and then walking over to a student who had raised her hand. She sat down in the empty chair with a friendly, "How is it going here?" and quietly began a conversation with the second student. This student was working on multiplication problems, a full two courses behind the other student. A young teaching assistant also moved around the class, helping students who raised their hands. Students rarely looked up from their computers, all seemingly intent on working through the math problems and preparing for the final exam for the module on which they were working. As the hour drew to a close, students began to pack up their notes and shut down their computers. They left as quietly as they had arrived, with little interaction.

Self-Paced Learning

In most ModMath sections, students in multiple modules — sometimes all nine — work side by side in computer labs in what program leaders call a "one-room schoolhouse." As illustrated in Box 3.2, students work at their own pace, while the instructor and an instructional aide move around the room to work with students individually or in small groups. Because students move at their own pace, an instructor said that she found it "pretty much impossible to lecture," because even students working on the same module were at different places in it. Instead, she works one-on-one with students to see what questions they have and what progress they are making. Headphones are available for students who find the background conversation distracting.

Students are required to take the module's final exam within the five-week session and a midterm halfway through that time, but students working quickly can take the final early and move ahead to the next module, potentially completing more than three modules per semester. An instructor said that, in her experience, if students complete a module before the next five-week session starts, "most of them are really willing [to move ahead] — 'Yeah, I want to get going.'" An instructor estimated that approximately one-fourth of ModMath students test early and move ahead to the next module.

The self-paced nature of the program also may benefit students who are moving more slowly. In traditional semester-long classes, students "just kind of give up . . . if they've failed a couple of tests," said one instructor. ModMath, on the other hand, allows students who fail the exam an opportunity to move more quickly through the material the second time. For example, one instructor said that some students pass the midterm but fail the final: "I said, 'You can go as quickly as you would like, get to that midterm again, and then focus on the part that gave you trouble, take that final again, and get moving.' And sometimes they will get caught up and still complete the three mods. . . . So that's what they really like is that make-up aspect of it." This self-paced approach may help keep students motivated and engaged, both those who are moving quickly and those who are struggling. It may also enable faster mastery of math concepts, as students can move quickly through material that they pick up easily, while having the opportunity to spend more time to master concepts that they find more difficult. In turn, increased engagement and mastery may build students' self-confidence in math. One ModMath student wrote to tell his instructor that his confidence in math was "increasing every day," adding, "I hope teachers' reward[s] are on earth and not in heaven."

One ModMath student said that, without lectures, she felt that she was memorizing steps rather than learning concepts. However, she noted that some students do well without lectures. Students in the focus group said that they liked the self-paced format and appreciated its flexibility, as they can work their ModMath class around other commitments. For example, they can take an exam ahead of time if they anticipate a heavy workload in other classes. They found that the five-week, self-paced model offered the right balance of structure and flexibility. As one student put it: "You have five weeks to do X amount of work before the exam. And you can do half of it in a weekend, or you can space it out according to what time you have, so you can do it a little more around your life schedule, whether you work, or kids or whatever. . . . You've got some flexibility to a certain point, and that is really nice for people who don't have just school." She added that when she had to travel out of state for a family emergency, she appreciated that she could make up the work afterward without losing ground.

Computer-Assisted Instruction

During class and for homework, ModMath students at Tarrant County use MyMathLab — a Web-based instructional software package produced by Pearson and customized by the college's faculty to align with their learning outcomes. As with Math Redesign (described in Chapter 2), students work on math problems in class, engaging them in active learning and increasing the amount of class time in which they solve problems and apply skills.

ModMath's blend of online learning and direct instruction is an approach that may create "the best of both worlds."[2] Indeed, students said that they appreciated the combination of the two. As one student put it: "Technology's going to give you something. It's going to give you probably 90 percent of what you want. But there's only 10 percent that you're like, 'Okay, I need a little bit [of] extra help.' That's why you have your teacher." Another student added that she appreciated the ability to "pause" a lesson and listen to it again if she struggled to grasp a concept. As with Math Redesign, having different instructional formats — videos on MyMathLab, textbook pages to view online, and their instructor — provided different options for students who have different learning styles or who want to hear a lesson multiple ways.

Program Operations

As described above, the ModMath model represents a significant shift in how instructors and students interact in the classroom. Moreover, its modularized format carries implications for students, faculty, and administrators. As with Math Redesign at Broward, bringing such a model from idea to reality requires thoughtful planning and ongoing decision-making by program leaders to recruit students and faculty, train faculty, revise the model, manage administrative tasks, and evaluate the program.

The program has evolved as leaders have gained experience in scheduling and recruitment; program leaders hope to increase student recruitment efforts and to build processes to minimize administrative burdens. A math faculty member who was involved in the program's development coordinates the program, with support as needed from her campus's President, Vice President for Academic Affairs, department chairs, and dean. She receives release time equivalent to one course to oversee processes related to setting up the classes and moving students through the modules. This section describes student recruitment, faculty development, the evolution of the ModMath model, and logistical challenges associated with the program.

[2]Martyn (2003) and Ward (2004) as cited in Rambo-Igney and Brinthaupt (2008).

Getting the Word Out to Students

Promoting ModMath to students so that they enroll in the classes has been a challenge for Tarrant County from the start. Still, as the program has become more well known, the classes have started filling up based on time of day offered, as opposed to, initially, when ModMath classes all filled up more slowly than traditional developmental math classes.

Unlike Broward's Math Redesign, students cannot self-enroll in ModMath, due to the additional placement test. Anecdotally, it seems that advisers often refer students to ModMath after they have failed one or more times in traditional math courses. ModMath is seen by instructors, advisers, and students as an alternative approach or even a last resort that might help such students pass, suggesting a potential opportunity for the program to recruit students who are new to developmental math. One student said that she talked to the math lab manager, who suggested ModMath for students like her, who struggled with math and/or had been out of math for a long time. He encouraged her to try ModMath, and she took his advice.

The program coordinator hopes to do additional outreach to educate advisers about ModMath, so that more students hear about it. Due to turnover in advising staff, the ModMath coordinator felt that she needed to do additional training with them to ensure that they present the program appropriately. "Our biggest help can be counselors and advisers," she said. "I think we need to reeducate them. It's been a while."

The program coordinator and math department chairs said that they had not done much advertising this year, though they made a video in the early stages of the program and created a poster to display on hallway bulletin boards. According to the program coordinator, most recruitment happens through word of mouth, particularly as word gets out that students who have severe difficulties with math have done well in ModMath. Students might also see ModMath classes on the course registration Web site. Still, informing students about the program remains a challenge. One instructor said, "Unless they've been in a class and somebody has mentioned it to them or they just happened to know this [course] number looks different — 'What is this?' — and they ask, they won't know." Another instructor added that challenges may remain even after increasing awareness: "Try as we might to explain it to them, they're somehow fearful of something different," she said. The college is working on communication efforts to educate students about the different options for developmental math, including ModMath, which should help spread the word about the program.

Recruiting and Training Instructors

Full-time faculty at Tarrant County volunteer to teach ModMath. Department chairs assign adjunct faculty to classes after full-time faculty have selected their schedules, but even adjuncts are not required to teach this way. The program coordinator noted that ModMath may

be a better fit for some faculty than others. Faculty who are organized and know their students' names early in the semester are well suited for the program, she said, as ModMath instructors always need to be aware when students are missing and need to turn grades in to the program coordinator every couple weeks. Additionally, according to the program coordinator, not all instructors may embrace the model's flexibility: "It makes [some instructors] uncomfortable — this whole idea of, 'My goodness; you move students' schedules, and more than one thing [is] going on in the room at a time?'" Moreover, as faculty are accustomed to traditional lecture classes, they may be hesitant about relying on instructional software and individualized instruction, rather than lectures.

To get the word out to prospective instructors about ModMath, the program coordinator has held periodic information and training sessions, though the trainings have not yet been formalized or required. As is typical in community colleges, most professional development seems to occur informally, as the program coordinator stays in continuous communication with ModMath faculty throughout the semester. Faculty will come to talk one-on-one with the program coordinator or with veteran instructors. One experienced ModMath instructor said that a new ModMath instructor came to her a few times the previous fall. "I met him for, like, 30, 45 minutes and kind of gave him . . . all the tips I could tell him and how things worked and everything," she said, adding that other instructors whom she has never met e-mail questions about how to handle things. Tarrant County also supports new faculty by scheduling ModMath classes in side-by-side computer labs and placing experienced ModMath instructors next door to new instructors or those who need additional coaching. The two instructors can circulate through both rooms, with the experienced instructor serving as a mentor.

MDRC provided funding for an information and training session in June 2012 that was attended by 19 faculty members. At this session, the program coordinator and veteran instructors covered such topics as course content for the modules, how to work mixed-module classes effectively, and logistical issues like paperwork and grading. The program coordinator planned to hold another training in spring 2013, particularly if new faculty signed up to teach ModMath. As all instructors, including adjuncts, are required to complete professional development hours, the program coordinator believed that she would not have difficulty encouraging faculty to attend in-service trainings.

The program coordinator and a math department chair believed that more support and professional development would be beneficial. The math department chair suggested providing an in-service training to show how program leaders envision the class, to foster consistency across instructors and sections, and to help instructors along the learning curve. She added that instructors might also benefit from additional support, perhaps through informal meetings to share reminders and check in about how things are going. Looking forward, program leaders

hope to offer such activities to provide faculty with the preparation and support to teach ModMath effectively.

Moving to the "One-Room Schoolhouse"

Early versions of ModMath consisted of courses offered for a single module; that is, students would enroll in a class with others in the same module and would move on to a different class after five weeks. Some sections included computer-assisted instruction in class, while others used it only for homework; in both instances, lecturing was common. However, this model encountered some scheduling challenges, as offering separate sections for each individual module made it difficult to meet enrollment minimums. As one instructor said: "They've not been willing to let anything with less than 10 students make a class, and sometimes we were really struggling to get 10 students. Sometimes we still struggle."

Partly in response to this concern and partly because ModMath began incorporating more sections with self-paced, computer-assisted instruction, the program has shifted toward a "one-room schoolhouse" model, in which classes include students from multiple modules. This case study focuses on that model because the program is moving in that direction; in fall 2012, the first five-week session on one campus featured four single-module classes and six mixed-module classes. In the second five-week session, all classes are mixed-module classes, as students in the former single-module classes either move on to the next module or repeat the previous module. All sections include computer-assisted instruction. Program leaders find that classes in the one-room schoolhouse fill more easily because they can accommodate students in any level. Anecdotally, the program coordinator thought that the mixed classes showed no significant decrease — and possibly even an increase — in completion rates.

In the one-room schoolhouse, the instructor's role is completely different than in a traditional lecture class, as instructors work individually with students at sometimes very different levels and have to be prepared to teach any concept. One student working on arithmetic may be seated next to a student solving quadratic equations. The program coordinator said that this challenge appealed to some instructors. One instructor had previously taught mixed classes but said: "Some people that have never done that, it might bother them to constantly be shifting. You're doing arithmetic with one student, and you're doing algebra with another, but that doesn't bother me." Instructors also discussed the challenge of checking in with each student every class. "Even with an aide, we're pretty much running the whole time to get to everybody," said one instructor. They also have to balance their time with students who want more of their attention and those who never ask questions.

A small number of instructors do lecture in mixed-module classes involving only two or three modules, dividing the class and their lecture in half or thirds, with students working individually on the computer while the instructor lectures to the other group. As suggested

above, some students may feel that they learn best using a lecture rather than a self-paced format, so ModMath leaders are thinking about how to accommodate students and instructors who have this preference.

Additional Administrative Tasks

ModMath also carries some additional logistical tasks for instructors and program leaders. For example, although the self-paced nature of ModMath allows students to take the final exam early, early testing means that instructors must prepare and set up tests ahead of time, potentially creating a disincentive to encourage students' more rapid progress. Instructors may also find it difficult to keep track of students' early testing plans, or they may have commitments that prevent early testing. For example, an instructor recalled a student who was ready for his final on a Friday. The instructor said: "I can't give it on Friday. I'm gone. I don't have time to get your final ready. It'll be ready Monday." Another instructor, describing having to remember to set up tests, said, "It's just the little logistical things like that that are a challenge."

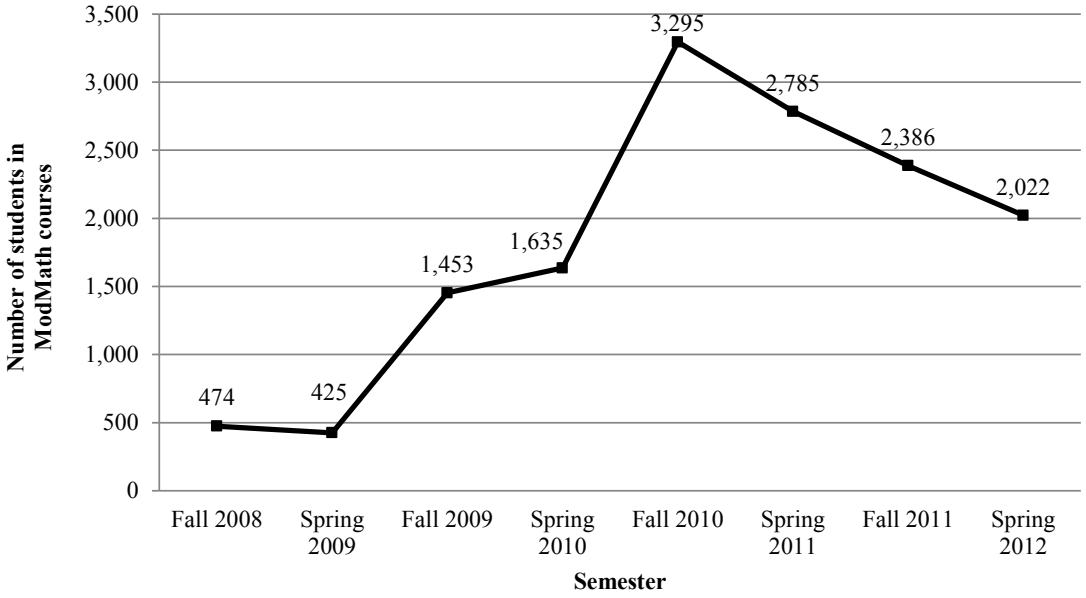
Additionally, between five-week sessions, instructors face a quick turnaround to grade exams and get students started on the next module. For example, if students take a final exam on Thursday, instructors have to enter grades in time for students to be placed in the correct module the following Tuesday. One instructor noted that there is a learning curve for new instructors as they become accustomed to this short turnaround time.

Operating ModMath also requires coordination with other departments at the college. To set up the modules, the program coordinator worked with representatives from the registrar's office, information technology, and financial aid. For example, with mixed-module classes, the coordinator had to figure out how to cross-list the different courses so that sections could accommodate students from multiple modules. After program startup, she has maintained these relationships to ensure that students take the appropriate tests and are enrolled in the appropriate modules. She works with the registrar and financial aid office to manually add and drop students from classes as needed, so that students are registered for the appropriate module. The weekend between sessions is particularly busy for her, as she has to shift students in time for them to begin the next module the following week. Efforts to automate these processes had been under way but were stalled due to staff turnover in other areas of the college.

Overall, though, instructors in the focus group did not feel that ModMath was more work than a traditional class, as the additional administrative burden occurs in bursts and thus evens out over the semester. The program coordinator believed that her work was equivalent to the release time she has received and that the logistical challenges were manageable, as she has developed a spreadsheet process to move students to different modules.

Figure 3.1

ModMath Scale-Up, Tarrant County College, Fall 2008 to Spring 2012



SOURCE: Tarrant County College Statistical Handbooks.

NOTE: This figure does not reflect the unique number of students enrolled in ModMath courses each semester, as students can enroll in up to three modules per semester.

Using Promising Data to Drive Scale-Up Activity

The role and size of the ModMath program at Tarrant County have evolved over the past several years. Figure 3.1 depicts ModMath enrollment. Tarrant County piloted ModMath with 35 five-week-module sections on all four campuses in fall 2008, and it continued the pilot with 47 sections the following semester. After the pilot year, Tarrant County reviewed results from ModMath classes and believed that the data and feedback from the program merited further piloting and expansion. (See Box 3.3.) Consistent with their Achieving the Dream commitment, "we've been looking at a lot of data" to help improve outcomes for developmental math, said one campus president; "we'll continue to look at more and more data."

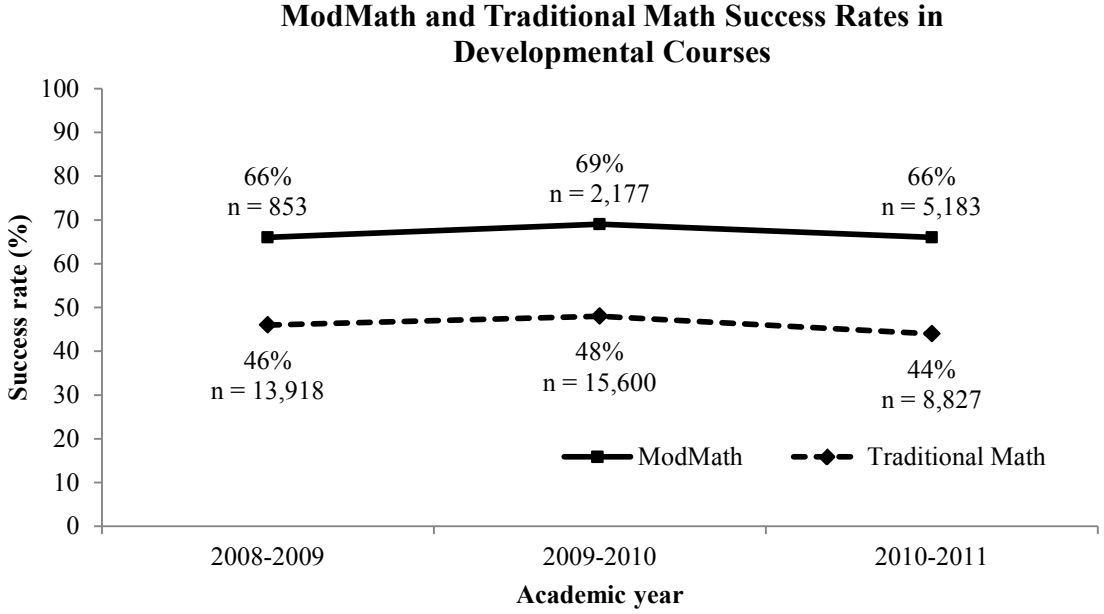
In the 2009-2010 academic year, Tarrant County opened its new Trinity River campuses, where it decided to offer exclusively ModMath for developmental math courses. One campus, Southeast, chose not to continue offering ModMath due to space constraints. Still, the program more than doubled in size, with 94 sections offered in fall 2009 and 110 sections in

Box 3.3

Comparing Student Outcomes in ModMath and Traditional Developmental Math Courses: Analysis by College Staff

By Greta Harris-Hardland, Math Faculty Member, Tarrant County College

Tarrant County College, along with four other Texas community colleges, participated in the "Success Initiative in Developmental Education — Mathematics" (SIDE-M), a project funded by the Texas Higher Education Coordinating Board. As part of SIDE-M, Tarrant County collected and analyzed data on ModMath to compare outcomes for five-week ModMath modules and sixteen-week traditional developmental math courses. As shown in the figure below, since the ModMath pilot began in fall 2008, ModMath students earned grades of A, B, or C at rates approximately 20 percentage points higher than students in traditional courses. In semesters for which data were collected, ModMath students also withdrew from their math courses at lower rates (not shown in figure).



SOURCE: Tarrant County College institutional data, as reported in Texas State University-San Marcos Education Policy Implementation Center, 2012.

NOTES: Successful completion is defined as earning a grade of A, B, or C.

Results should be interpreted with caution, since no attempt was made to account for any differences between students who choose to enroll in ModMath courses and those who select traditional courses. Additionally, these success rates are not directly comparable to one another. The ModMath rate represents success in a one-credit module, while the traditional math rate represents success in a three-credit course. Moreover, in the figure above, each student in traditional math is counted just once per semester, while each individual ModMath student may be included up to three times, as ModMath students can earn up to three grades per semester. Inasmuch as the type of student included multiple times seems more likely to be the type of student making good progress, the data presented may overstate the difference between the two formats.

spring 2010. In the 2010-2011 academic year, South campus continued around the same level, with the Northeast and Trinity River campuses each increasing their section offerings.

Looking Ahead

As with Broward, MDRC worked with Tarrant County beginning in spring 2011 to guide program expansion, due to its interest in conducting a rigorous evaluation. In fall 2012, Tarrant County began moving toward an Emporium model of developmental math. This model mirrors the pedagogical approach of ModMath, eliminating lecture to deliver content through interactive software in computer labs, with students receiving assistance from an instructor.[3] As of fall 2012, four of Tarrant County's five campuses were transitioning their developmental math sections to Emporium classes, reducing the number of ModMath sections offered. However, ModMath leaders see the modularized structure as adaptable to Emporium or any other curriculum or delivery method. As the district assesses the different models going forward based on results and feedback, the ModMath program may evolve and expand in coming semesters to fit the district's approach to developmental math.

[3]Twigg (2011).

Chapter 4

Lessons and Considerations

The developmental math acceleration programs that are profiled in this report represent deep changes in classroom instruction and pedagogy. In an interim report on Achieving the Dream, MDRC identified such changes in teaching and learning as an important focus for colleges seeking to improve student outcomes.[1] Moreover, Broward College and Tarrant County College have made significant progress in scaling up their programs — a considerable challenge for colleges undertaking these types of reforms.[2] This final chapter takes a broader look at these two colleges' experiences and offers considerations, based on their experiences, for other colleges to take into account as they think about designing and implementing developmental math acceleration programs. Key lessons and considerations in this chapter include:

- The compression and modularization approaches that are profiled in Chapters 2 and 3 have similar goals but also have structural and pedagogical differences.
- Important operational considerations for colleges thinking about acceleration programs include faculty development and collaboration with divisions across the college.
- Acceleration program leaders should consider how to promote and structure programs to maximize opportunities for students to accelerate through developmental math, as this does not always happen automatically.
- A grassroots approach — spurred by faculty leadership and supported by engaged administrators and data-driven decision-making — helped these two colleges' programs increase in scale in the early years of implementation.
- Further research is needed to establish more conclusive evidence about the effectiveness of these and other acceleration approaches. Both colleges plan to continue evaluating and refining their acceleration programs, and, once funding is available, hope to work with MDRC on an external evaluation.

[1]Zachry Rutschow et al. (2011).
[2]Zachry Rutschow et al. (2011); Quint, Jaggars, Byndloss, and Magazinnik (2013).

Comparing the Two Models

This section summarizes the main programmatic similarities and differences between Math Redesign and ModMath, to inform those considering developing and implementing such programs as well as those generally interested in acceleration approaches. As discussed in Chapters 2 and 3, both programs reform developmental math through pedagogical changes, moving away from the full-class lecture typical of traditional developmental math classes. They also incorporate computer-assisted instruction, utilizing instructional software packages rather than textbooks. Significant course content is online so that students can learn and review lessons outside of class. The two programs also share the goals of increasing student engagement, improving mastery of math concepts, and accelerating progress through the developmental math sequence.

The two programs have some key structural and pedagogical differences as well. Structurally, the compression model of Math Redesign doubles weekly class time so that students can complete a course in eight weeks instead of sixteen. ModMath, on the other hand, does not require students to spend more time in class each week. As discussed below, it may be more difficult for students with other commitments to fit a compressed course like Math Redesign into their schedules. Additionally, Math Redesign classes, unlike ModMath classes, carry the same course numbers and credits as traditional developmental math classes. Pacing in Math Redesign is also identical to traditional classes, with Math Redesign simply compressing the class periods into half the number of weeks. In contrast, ModMath leaders worked with the registrar to set up one-credit modules and worked with financial aid representatives to ensure that ModMath students enrolled in the right number of credits to maintain eligibility for financial aid. Before implementing the program, ModMath instructors also spent time reorganizing curricula into such modules and selecting a placement test to match students with the appropriate modules.

The two programs also feature very different roles for instructors and different approaches to teaching and learning overall. While Math Redeign instructors use brief instructional videos, that part of the class looks relatively similar to a traditional math class: Students sit at desks taking notes while an instructor works through problems, either live or on video. All students in the class learn the same content on the same day. In contrast, ModMath instructors typically do not lecture at all, instead working individually with students who need assistance. Students sit at computers, where they spend the entire class period working on problems at their own pace. In this way, ModMath requires a total shift for instructors in the way they teach and interact with students. ModMath also necessitates sufficient computer lab resources for participating students.

Additionally, Math Redesign places a premium on student collaboration in the classroom, as the model directs students to work with one another on problem-solving worksheets

for approximately half the class period. The classes are scheduled to support cohorts of students taking sequential classes together, and instructors in the focus group noted the camaraderie among students in their Math Redesign classes. ModMath, however, does not focus on peer learning and interactions. Although a student in the focus group said that she sometimes asks a classmate for help, the model does not explicitly promote this, as students are at different places in the modules and typically spend their time interacting with the computer or with their instructor.

Math Redesign and ModMath are just two of a large variety of acceleration programs operating around the country, but many of their features are common among other programs. Colleges interested in developing their own acceleration programs might consider some of the approaches discussed in this case study, from video instruction to self-paced learning. The remainder of this chapter builds on these programmatic considerations to offer lessons related to program implementation and scale-up.

Lessons for Program Operations

Supporting Faculty and Clarifying Expectations

As discussed above, the two acceleration approaches highlighted in this report feature instructional techniques that significantly transform the role of the instructor. While the models impose a certain structure, they also allow for some flexibility on the part of the instructors. Faculty development is thus an important consideration for colleges working to begin or strengthen acceleration programs. Clarity about the model — for example, what is flexible and what is not — and faculty development that incorporates class observations may support faculty so that they feel more comfortable and can implement the model consistently.

At Broward, some faculty expressed challenges with timing and adjusting to the mini-lecture format. Even veteran Math Redesign faculty implement the model in somewhat different ways. Some say that they play the videos through faithfully, while others use the videos sometimes or not at all; some say that they devote at least 30 minutes to collaborative problem-solving, while others struggle to reserve 20 minutes for it. At Tarrant County, the use of lectures is inconsistent; a small number of instructors teaching in ModMath classes still incorporate lectures, while instructors in other classes do not lecture at all. Instructors new to the "one-room schoolhouse" may need support to make the accompanying sweeping pedagogical changes.

Colleges that are considering implementing acceleration programs should allocate resources for regular, intentional professional development. MDRC supported full-day in-service training sessions at Broward and Tarrant County in June 2012, offering stipends to compensate faculty for their time. Colleges looking to institutionalize acceleration programs like Math

Redesign and ModMath will benefit from formal training activities for new and continuing instructors. Incorporating peer observations into pre-service and in-service training could also help instructors in acceleration programs learn from one another and become more effective teachers in the new model.

Cross-College Partnerships

While ostensibly situated solely within a college's math department, programs like Math Redesign and ModMath have a much broader reach, with potential implications for course scheduling, information technology systems, financial aid, testing, and student advising. Math Redesign and ModMath program leaders emphasized collaboration with these other divisions as being crucial for program setup as well as for continued operation.

Recruiting students to participate in accelerated classes can be a challenge, and, to overcome this, acceleration program leaders should collaborate early and regularly with advising and testing staff, if applicable, to build strong working relationships. As one associate dean at Broward said: "If you don't get support from other areas of the college — to advertise it, promote it, get students in there — it just goes nowhere. Because I've seen that happen. We've tried things in the past where if you didn't promote it and get the advisers, the testing people, the counselors, and even other associate deans aware of it, it just goes nowhere." Program leaders at Tarrant County acknowledged that they hoped to do more outreach with advising staff to educate them about ModMath so that they can pass along information to students and promote the program. Because many students — particularly, continuing students — register online without seeing an adviser, providing more information online might also direct more students to the programs.

Support from other divisions on campus can also reduce the administrative burden on program leaders and instructors, streamlining operations and helping move the program to larger scale. At Tarrant County, for example, ModMath leaders expressed the importance of building strong relationships with information technology staff, to enter the courses into the software system correctly, and with financial aid staff, to make sure that students received their financial aid despite dropping and adding modules during the semester. The program coordinator believed that some processes could be automated with support from other divisions at the college, which would eliminate the need for her to have release time. Particularly with multi-campus institutions, however, building such relationships and working with other campuses and district office staff to coordinate processes at the district level can prove challenging.

Lessons for Maximizing Opportunity to Accelerate

A central goal for Math Redesign and ModMath is accelerating students' progress through developmental math. Broward and Tarrant County's experiences provide lessons on how to message and structure programs to support acceleration. It may be unrealistic to expect all, or even most, students to accelerate their progress through such programs. Broward instructors and students noted that some students cannot come to class four days a week, and students may have other commitments that intervene. Students in the ModMath focus group said that, due to other commitments, they did not think that other students were trying or expecting to complete more than three modules per semester. A ModMath instructor noted: "For the most part, doing one extra mod in a semester is about what they're going to do. . . . They've got other classes. I mean, it's a lot to go faster and really understand it and be able to progress. More often than not, the ones that are moving ahead, . . . they failed. They are in to repeat it, so they can go very quickly through the material." Program designers should consider how to promote and structure their programs to maximize acceleration.

Messaging Acceleration to Students

Colleges that are considering acceleration programs should highlight to students the benefits of moving through developmental requirements more quickly. Some students in the accelerated math class focus groups said that they had not chosen those classes in an effort to accelerate their progress. Instead, they were drawn to other aspects of the course, such as scheduling and teacher selection. Students may not even be aware beforehand that the accelerated classes can help them move faster through developmental math, which, in turn, may allow them to save money on coursework and/or to move more quickly toward a credential.

At Broward, messaging about a "fast-track" class that met four days a week left some students in traditional developmental math courses with the impression that the compressed courses were not for them. One student in traditional math said that Math Redesign's compressed format "would be beneficial for those who are really, really good at math; and [for] those that aren't really, really good at math, keep the extended classes." Coordinators and advisers of acceleration programs should emphasize that the course's active learning aspects are designed to benefit students at all levels. Perhaps promotional flyers or videos could feature student testimonials talking about their experiences struggling with math and then succeeding in an accelerated course.

Additionally, some students may want to go at a slower pace, as expressed by students in both the traditional math and the Math Redesign focus groups. Three Math Redesign students in the focus group were in the first level of developmental math; one planned to take the next course in the second eight-week session of the semester, while the other two planned to take the traditional version of the next course in the spring term. "I just need my time with math. I really

do," said one of these students; "I think I'm going to need more time to understand it. So I decided to go take the slow version." A student in traditional math said that she would not be interested in Math Redesign: "Math isn't really like my best subject, so at like a slower pace is best for me because I can actually get the concept and do it right." However, learning in the classroom more frequently, as in Math Redesign, may help students master math concepts. Acceleration programs might emphasize this, as well as the advantages of acceleration and the supports available for students, to encourage participation.

Modularization models like ModMath, on the other hand, are well suited to students who have conflicting demands on their time or who prefer a slower pace. Students who leave midsemester may be able to return, having earned some math credit, and students who fail a module still have the opportunity to retake it and earn math credit that same semester. As discussed in Chapter 3, students in ModMath appreciated the flexibility and self-paced nature of the program. Highlighting these benefits might increase student interest in the program.

Structuring Programs to Maximize Acceleration

Program structure also plays a key role in maximizing opportunity for acceleration. For example, focus group students emphasized the importance of teachers in class selection, and they valued continuing with teachers whom they knew and liked. "You can't have math with a professor that you don't know, 'cause it can be a whole other story — You can have a nightmare," said one student; "It's not always an easy class, and it's better if you take it with someone you know or with someone that's good." Compression programs should consider scheduling teachers to continue with the next class in the same time slot, as Broward has begun to do. This facilitates students continuing with the compressed format without any interruption; several Math Redesign students in the focus group had waited or were waiting to take the next class with their favorite teacher. Of course, this likely happens frequently in traditional math as well; through its standardized format, Math Redesign may actually reduce student attachment to an individual teacher. Two Math Redesign instructors talked about students of theirs who were nervous about starting a semester with different instructors but were committed to Math Redesign. One of these instructors said that some students chose a Math Redesign course with a different instructor instead of taking the course with her in traditional format. "It made me feel really good that it's not the instructor," she said; "It's the concept."

The "one-room schoolhouse" format of mixed modules adopted at Tarrant County may enable more students to move at a faster pace. One instructor estimated that approximately one-fourth of students take a module's final exam early, giving them the opportunity to move ahead to the next module. ModMath courses with lectures do not provide as much of an opportunity to accelerate, as the instructor controls the pace of the course. "That's the beauty of the mixed mods, is they can go full speed ahead," said one instructor. To further support acceleration,

modularization models not only should encourage students to test early and move ahead but also should streamline early testing processes to remove or lessen the administrative burden for instructors. One instructor noted that a set of tests could be placed in the test center so that "I don't have to stop right here today and make you a final today, and make my own copies and be sure I bring it to class or be sure I put it in there [with] your name on it." Such changes could potentially make an important difference in accelerating students through the modules.

Lessons for Scale-Up

As described in Chapters 2 and 3, both Broward and Tarrant County made considerable strides to expand their programs. As other colleges look to grow small-scale or pilot programs serving developmental education students, the experiences of these two colleges may be informative. This section discusses how their faculty leadership, supportive administrators, and program evaluation efforts contributed to thoughtful, organic approaches to scaling up.[3]

Faculty-Driven Reforms

At both colleges, the new models originated from faculty who were alarmed by high failure rates and who led the design of the program, developed the new courses, took ownership of the program, and made modifications as the program developed. This core group of faculty engaged others through a grassroots approach, gradually reaching out to other interested faculty to secure buy-in. One associate dean emphasized the importance of faculty involvement "right from the beginning, [to] plan it, shape it; and luckily, I've had that." As faculty members themselves, initiative creators shared their experiences with peers to encourage them to try teaching in the new method. Thus far, neither Broward nor Tarrant County has required faculty to teach this way, instead relying on volunteers; so engaging potentially resistant faculty may be a challenge as the colleges think about further scale.

Supportive Leaders

From the beginning, the two programs engaged college leaders who supported the movement but also encouraged faculty to continue leading it. This strong support from the outset was crucial to scaling; it ensured adequate resources, such as computer labs, and communicated to faculty an institutional commitment to sustainability. Leaders at various levels supported the model. Individuals responsible for math departments — math associate deans at

[3]As discussed in Chapter 3, Tarrant County's transition to the Emporium model means that only one campus, Northeast, plans to continue offering ModMath sections for the time being, while the other campuses are scaling back. Thus, discussion in this section focuses on how the Northeast campus, in particular, scaled up and worked to sustain ModMath.

Broward and department chairs at Tarrant County — understood the model, with many of them having taught it themselves. Inasmuch as these individuals schedule courses, coordinate professional development, and observe faculty, their engagement was invaluable. They could advocate for the program at a higher level, such as at district-wide Math Council meetings at Tarrant County, and could ensure that faculty had the support needed to implement and expand the program.

For multicampus institutions considering acceleration programs, educating district or college leadership about the program and securing their buy-in may be central to scaling and sustainability. Tarrant County has had strong support from campus-level leadership on the Northeast campus, where the ModMath program coordinator works. The campus's President and Vice President for Academic Affairs expressed a strong desire to continue to scale up ModMath based on evaluation data. Northeast campus leadership plans to continue evaluating the program, so that the district and state can determine how best to move forward with developmental math reforms, and the district has agreed that ModMath can continue at Northeast, at least until an evaluation is completed.

As mentioned in Chapter 2, Broward incorporated Math Redesign into its college-wide strategic plan, directly naming the initiative under the goal of "[scaling] student success strategies which increase student completion rates."[4] "That in itself is an indication of how seriously the institution is taking the Math Redesign project as part of its overall, in general, strategy for student success," said one campus's dean of academic affairs. One of the campus presidents serves as the executive sponsor for Math Redesign, taking responsibility to ensure that the objective of scaling the program is met. Implementation of the strategic initiative is led by the Assistant Vice President of Developmental Education and Student Success, a college-wide position that works with academic and associate deans on each campus. The college will measure whether the objective has been met by examining the number of Math Redesign sections and the student outcomes data collected.[5] Including Math Redesign in the college's strategic plan, as Broward has done, may engender commitment and accountability that facilitates further scaling.

Building Engagement Through Data

Both Broward and Tarrant County compared student outcomes in the accelerated developmental math classes with student outcomes in traditional developmental math, as discussed in Chapters 2 and 3. While this descriptive research method does not provide conclusive evidence about the effectiveness of the programs — as it does not take into account differences

[4]Broward College (2012c).
[5]Broward College (2012b).

between the two groups — the data are promising and helped build engagement by making a case for key stakeholders. One Broward instructor discussed how she overcame her doubts about moving to a facilitator role: "When I first heard about this, I was, like, I teach them all these good things. My students really seem to like it. But this is proven to be successful, so let me try something new." A math associate dean on a different campus noted that student outcomes data could help drive scaling by engaging students as well: "I don't know how much further we can scale up without then limiting the number of traditional sections that we're going to offer. This is right now. Four or five years from now, if we continue with these numbers and we have the success, and we can promote it, and students say, 'That sounds like a good idea. I see how this is working. I want to give it a try.' From there, it may grow."

Tarrant County uses student outcomes data to determine how to modify the reform. For example, the program coordinator plans to compare midterm and final data for students in ModMath classes with and without lectures, to help think about how best to move forward. Additionally, Tarrant County campus leadership is interested in understanding whether options like ModMath work better for some students — for example, students entering directly from high school or students with different baseline math levels — than for others. A campus president said, "For us, having Emporium, having traditional, having mods is the best of all worlds, because if they all turn out to be about the same level of quality, then you can start fitting students into their best learning styles."

In this way, the two colleges embraced the Achieving the Dream model for improving college programs and services: stakeholder engagement to develop reforms to address priority problems, implementation and evaluation of selected reforms, and expansion of approaches found to be effective.[6] This process helped Broward and Tarrant County develop promising interventions and build momentum toward further scale.

A Thoughtful, Grassroots Scaling Approach

In scaling up their programs, both colleges expanded gradually and purposefully, with an emphasis on careful planning and continuous refinement of the model. Broward and Tarrant County started small with their programs, focusing in the initial years on building support and on developing, evaluating, and strengthening the model. Though the ModMath coordinator noted that starting with a smaller-scale pilot made it more difficult to make a case for other divisions on campus to set up systems and processes, this deliberate approach to scaling seemed sensible at these colleges. With their evaluation, refinement, and engagement efforts, the colleges seem to be in strong positions to grow effective programs moving forward.

[6] Achieving the Dream (2012).

The way in which Broward and Tarrant County scaled up their reforms supports some of the findings in a recent evaluation of the Developmental Education Initiative, which provided funding for 15 Achieving the Dream colleges to establish and/or scale up interventions for developmental education students. In particular, the final report from this evaluation identified three important factors promoting large-scale implementation: resource adequacy, communication, and engagement.[7] This case study finds that Broward and Tarrant County used a model of faculty ownership combined with supportive leaders and data analysis to ensure adequate resources and facilitate communication and engagement. For example, as described above, college leaders at Tarrant County secured sufficient computer lab space for ModMath, and student outcomes data at both colleges contributed to engagement among key stakeholders.

Although Math Redesign and ModMath were not serving most eligible students after a few years of implementation, such rapid expansion was not either college's aim. Some Developmental Education Initiative colleges successfully implemented instructional reforms at full scale by deciding that all class sections would be taught in a new way,[8] but representatives from Broward and Tarrant County did not advocate moving their programs to full scale, at least at this point in their development. An associate dean at Broward said, "We still have faculty who still like to do their own thing in a certain way, and would be unhappy teaching a class like this, and it's not worth it to rock the boat that much and make them that unhappy." He added that traditional classes are still needed, as they want to provide students with options, since not everyone can commit to the amount of time required by Math Redesign. For example, Broward offers night classes one day a week, and he was not sure whether Math Redesign could be adapted for that format. The ModMath program coordinator emphasized the importance of faculty preferences and did not want faculty to be directed to teach a certain way at this point. She said that she would advise other colleges to "start small and see what you need, see who will help you get it done." Finally, the two colleges hope to participate in a formal evaluation of their programs to build more conclusive evidence on program effectiveness before moving to wider scale.

These two colleges' model of faculty-driven reform bolstered by engaged leadership and a culture of continuous improvement and refinement aligns with a grassroots, bottom-up approach to scaling. In such a framework, supported by literature in community development and K-12 innovation, the reform develops organically within the institution; practitioners take ownership of the reform; and the reform has flexibility to adapt as the institution's needs or circumstances shift.[9] Such conditions — central to the Math Redesign and ModMath scaling stories — make the reform responsive to the local context as well as build motivation from

[7]Quint, Jaggars, Byndloss, and Magazinnik (2013).
[8]Quint, Jaggars, Byndloss, and Magazinnik (2013).
[9]Kezar (2011).

within the institution to foster sustainability.[10] Importantly and perhaps due to this approach, Math Redesign and ModMath development and expansion will continue in the coming years. The two colleges' thoughtful approach to scaling, rooted in a deep sense of faculty ownership, poises Math Redesign and ModMath for more widespread adoption if found to be effective.

Next Steps

Both Broward and Tarrant County plan to continue to evaluate and refine their accelerated developmental math programs, with a constant focus on how best to support student success. As mentioned above, Broward plans to continue scaling up and analyzing data on Math Redesign, and Tarrant County is thinking about how to incorporate ModMath into other developmental math efforts that show promise. These include the Emporium model, discussed above, and the New Mathways Project, a statewide effort under way in which students take developmental math courses supporting their career goals, such as statistics and quantitative literacy. Such efforts do not necessarily conflict with ModMath, as the modularized approach can be applied to any curriculum, and program leaders see this flexibility as central to its sustainability.

Program coordinators consider the programs sustainable and cost-effective, though further research is needed to assess cost-effectiveness. Both colleges want data on program effectiveness to determine how best to move forward amid numerous strategies and initiatives aimed at improving student outcomes in developmental math. Despite promising institutional data, not much research has been done on some program components, and research is mixed on other aspects, such as the effectiveness of using technology in the classroom.[11] To date, neither of these programs or acceleration approaches has been rigorously evaluated, despite their promise for moving students through developmental math and the approaches' growing popularity at community colleges across the country. While the data collected by the two colleges show promising trends associated with the programs, the students who choose to participate in them may differ from other students, for example, in motivation or prior academic experience. As such, further research is needed to establish causal evidence on the effectiveness of the two programs, so that policymakers and community college practitioners have reliable evidence on which to base decisions about how best to improve student outcomes.

If and when funding becomes available, MDRC hopes to work with Broward and Tarrant County to conduct a formal evaluation of the two programs to build knowledge for the field about their effectiveness. This study would aim to answer the following questions:

[10]Kezar (2011).
[11]Golfin, Hull, and Ruffin (2005).

- Do students in Math Redesign and ModMath achieve better academic outcomes — such as progress through the math sequence, total credits earned, and math learning — than students in the colleges' traditional developmental math programs? Do the programs' impacts vary by student characteristics, such as baseline level of need for developmental math?

- How are the programs implemented? To what extent are the programs implemented as designed? To what extent do students in Math Redesign and ModMath experience something different than their peers in traditional developmental math?

MDRC would answer the first set of questions using student background information and transcript data. The evaluation would use a random assignment research design, comparing outcomes for students who are given the opportunity to enroll in Math Redesign or ModMath and outcomes for students without that opportunity. Random assignment ensures that students in both groups will be similar in terms of observable characteristics (like age, gender, or race) as well as harder-to-observe characteristics (like academic experiences before college or personal motivation). By following both groups and comparing their outcomes, the evaluation will provide reliable evidence of the "value added" of the acceleration programs.

MDRC would answer the second set of questions by surveying instructors and students; analyzing computer usage data; and visiting each college to observe classes and interview administrators, instructors, and students. MDRC is eager to learn more about these two promising programs and, in the coming years, hopes to inform practitioners and policymakers seeking to help students move through developmental math and to transfer or graduation.

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About MDRC

MDRC is a nonprofit, nonpartisan social and education policy research organization dedicated to learning what works to improve the well-being of low-income people. Through its research and the active communication of its findings, MDRC seeks to enhance the effectiveness of social and education policies and programs.

Founded in 1974 and located in New York City and Oakland, California, MDRC is best known for mounting rigorous, large-scale, real-world tests of new and existing policies and programs. Its projects are a mix of demonstrations (field tests of promising new program approaches) and evaluations of ongoing government and community initiatives. MDRC's staff bring an unusual combination of research and organizational experience to their work, providing expertise on the latest in qualitative and quantitative methods and on program design, development, implementation, and management. MDRC seeks to learn not just whether a program is effective but also how and why the program's effects occur. In addition, it tries to place each project's findings in the broader context of related research — in order to build knowledge about what works across the social and education policy fields. MDRC's findings, lessons, and best practices are proactively shared with a broad audience in the policy and practitioner community as well as with the general public and the media.

Over the years, MDRC has brought its unique approach to an ever-growing range of policy areas and target populations. Once known primarily for evaluations of state welfare-to-work programs, today MDRC is also studying public school reforms, employment programs for ex-offenders and people with disabilities, and programs to help low-income students succeed in college. MDRC's projects are organized into five areas:

- Promoting Family Well-Being and Children's Development
- Improving Public Education
- Raising Academic Achievement and Persistence in College
- Supporting Low-Wage Workers and Communities
- Overcoming Barriers to Employment

Working in almost every state, all of the nation's largest cities, and Canada and the United Kingdom, MDRC conducts its projects in partnership with national, state, and local governments, public school systems, community organizations, and numerous private philanthropies.