BEYOND READY, FIRE, AIM

NEW SOLUTIONS TO OLD PROBLEMS IN COLLEGE REMEDIATION

Angela Boatman

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College completion remains a major problem in the United States. Less than 60 percent of students enrolling in four-year colleges graduate within six years, and only 30 percent of students seeking an associate’s degree who enroll full time in a community college receive that degree within three years. Some estimates suggest that only one-third of high school graduates complete high school ready for college coursework, and far fewer adult students are ready for postsecondary study.

In response, American high schools have begun experimenting with a variety of new interventions designed to identify students’ academic needs earlier, and colleges have adopted new strategies to help students advance more efficiently and effectively to help shorten their time to degree. Many of these interventions have occurred in and around remedial (developmental) education and attempt to better support students’ academic needs through improved instructional practice, often through the use of technology such as self-directed learning labs, online-learning models, and high-tech classrooms.

The size and scope of these interventions in remedial and developmental education have garnered a great deal of attention recently, particularly on those efforts that are dependent on emerging technologies. A growing body of research has emerged studying the effects of these new interventions on student outcomes such as persistence, credit accumulation, grade-point average in college-level courses, and degree attainment. While there is evidence to suggest that certain practices are promising, these evaluations tend to exist only in isolation. Despite all the new activity in the market, our understanding of “what works” to help educate underprepared students has not always kept pace with the development of new approaches. We have no shortage of solutions, but are they actually addressing the right problems?

This paper takes an early look at several new interventions in developmental education and provides a structure to help institutional leaders and policymakers evaluate these efforts and the challenges they may face. Most importantly, we must do a better job of identifying the problems developmental education aims to solve and of ensuring these problems are matched with appropriate solutions specific to the needs of individual students and institutions.
A primary obstacle to college completion is inadequate academic preparation for college-level coursework. Estimates suggest that only a third of students graduating from American high schools are at least minimally academically prepared for college.\(^1\)

To confront this challenge, postsecondary institutions have traditionally relied on remedial (developmental) courses.\(^2\) These courses target underprepared students with the purpose of improving their abilities to handle college-level material. Incoming students are typically assessed on a battery of skills and content knowledge deemed necessary for success in credit-bearing courses, and those who do not reach an institution’s academic benchmarks are placed into developmental courses in math, English, or writing, depending on their needs. Current estimates suggest that 50 percent of all undergraduates and 70 percent of community college students take at least one developmental course while in college.\(^3\)

While developmental courses are intended to increase college access and bridge the gap between K–12 and higher education, they have historically been costly to students, institutions, and taxpayers. Developmental courses are the gateway to college-level courses: students typically have to succeed in their assigned developmental course before moving on to the next course in the sequence. Therefore, students in need of multiple developmental courses in the same subject can, in some cases, end up taking courses for more than a year before fulfilling their remedial requirements. However, developmental course credits rarely count toward a college degree even though students are required to pay tuition for them. Given the high attrition rates commonly observed in these courses, many students end up paying for courses that they either do not complete, do not need, or both.

All of this is especially troubling given the nation’s current economic state. The cost of attaining a college degree has grown substantially in recent years. Rising tuitions coupled with declining government support has led to dramatic increases in attendance costs.\(^4\) Since 2008–09, the average published tuition and fees for in-state students at public four-year colleges has increased 27 percent, yet real average family income in the United States has dropped over the past 10 years.\(^5\) The largest declines in income have been for families in the bottom 20 percent of the income distribution. The mounting cost of college attendance is particularly troubling for students assigned to developmental education, as they end up paying for courses that rarely count toward a degree and that may even lower their probability of ever completing a degree.

**Innovations in Developmental Education**

Research suggests that developmental courses have at best had mixed effects on student success. The majority of large-scale studies have found that students assigned to remediation fare no better on measures of persistence and degree attainment than academically similar students placed directly into college-level courses.\(^6\) In fact, remediated students sometimes have worse outcomes than their peers who are placed into college-level courses. As a result, American high schools have begun experimenting with a variety of new interventions designed to identify remedial needs before a student gets to college. In conjunction, colleges are continuing to develop new academic programs to help students move through remediation.

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more efficiently and effectively in an effort to shorten their time to degree.

These efforts have garnered increased attention in recent years as a completion agenda has taken root in higher education policy debates. The current explosion of technological advances inside and outside the classroom is unprecedented in higher education. In institutions of all types, faculty and administrators are questioning traditional approaches and are looking for ways to leverage new ideas and technologies in the remediation process. This typically involves strategies targeted to students before they enter college, such as interventions that shorten the timing or content of students’ courses, programs that combine basic skill attainment with college-level coursework, or supplemental programs such as tutoring or advising.

In the past decade alone, technology-enhanced instruction has evolved significantly with the inclusion of computerized adaptive learning, digital textbooks, open-source content, virtual labs, and more. Examples of new efforts include Khan Academy, which provides free online instructional videos on dozens of topics ranging from history to genetics to computer programming, and the massive open online course (MOOC) efforts of firms like Coursera, edX, and Udacity. Pearson’s development of programs such as MyMathLab and McGraw Hill’s web-based learning system ALEKS (Assessment and Learning in Knowledge Spaces) have given colleges the opportunity to eliminate traditional class lectures and replace them with courses offered in computer labs that deliver course content online, with faculty serving as tutors rather than instructors. In 2012, the Bill & Melinda Gates Foundation funded multiple $50,000 grants to support the development of MOOCs in basic and remedial courses. Furthermore, the Institute of Education Sciences will be launching a new $10 million national research and development center in 2014 to identify the most promising new instructional methods and assessments in developmental education.

This reform energy is a welcome sign. However, it remains unclear whether these efforts will lead to higher levels of learning or lower costs of education for students and institutions. To take full advantage of this groundswell, reformers need to carefully link problems to solutions, measure costs and benefits of these efforts, and identify the proper role for and limits of technology. A more intentional consideration of the relationship between the problems and the solutions will help lead decision makers to a more effective allocation of scarce resources to academically under-prepared students.

Measuring the Effectiveness of Remedial and Developmental Interventions

Though ideally all reform efforts in developmental education would improve student learning and persistence outcomes while also reducing costs to students and institutions, success in either of these areas may be a vast improvement over the traditional delivery model. Administrators must first consider the effectiveness, or benefits, of a program for improving student outcomes. This information should then be weighed against the cost-effectiveness of implementing such a program before deciding which developmental programs are worth pursuing or continuing. This can be particularly challenging when programs are new and little cost data is unavailable, as is the case for many of the examples cited in this paper. As such, I do not directly assess the cost-effectiveness of particular programs here, but instead focus on providing a framework by which we can consider the benefits and costs of an intervention as part of a more comprehensive analysis of its effectiveness.

Since 2008–09, the average published tuition and fees for in-state students at public four-year colleges has increased 27 percent, yet real average family income in the United States has dropped over the past 10 years.

Estimating the Causal Effects of Interventions Is Difficult. Placement into developmental education is plagued by “unobservable characteristics,” making it
impossible in many cases to know what role remedial and developmental programs have had in student success (or lack thereof). Simply contrasting the average outcomes of students who enrolled in a remedial course with the outcomes of those who did not ignores the problem of selection; moreover, it tells us nothing of whether differences in student outcomes were actually caused by students’ enrollment in these remedial programs, or whether these differences can be explained by factors such as academic preparation and motivation or institutional factors that may have also changed over time. Much of the existing research on the effects of new remedial programs tends to be descriptive or correlational, meaning we cannot assume that the student outcomes we observe are a direct result of the intervention. While advances in experimental and quasi-experimental research have greatly aided our ability to examine some of these complex relationships, conducting quality causal research on developmental education programs remains a challenge.

**The Outcomes Used to Measure Student Success Are Not Universal.** While calculating outcomes (benefits) such as grades or graduation rates can seem relatively straightforward, little is known about what really goes on in college classrooms, and even less is known about what effective learning looks like. Given the wide range of student outcomes used to measure effectiveness, it can be difficult to compare the effects of interventions across institutions. Without any agreement on which outcomes signal success in remediation, we run the risk of incorrectly assuming that improved outcomes in one program makes a compelling case for institutionalization in others.9

**The Cost Data Are Often Low Quality.** Even if researchers can measure causal effects, the absence of quality cost data greatly hinders efforts to assess cost-effectiveness.10 Many programs do not provide an accurate documentation of the costs of their interventions, meaning considerable effort and institutional knowledge is needed to create cost estimates. The costs for a new online program, for example, include far more than just the technology. Additional costs typically include personnel costs for training faculty and instructional designers, facilities costs, the purchasing and development of new instructional materials, maintenance, and student support services costs, including guidance counselors and tutors.11 While some of these costs are incurred only in the start-up phase of a program, many present substantial recurring costs that must be considered as part of an ongoing analysis, not a one-time snapshot. Additionally, one must be careful when assessing the cost-effectiveness of a program across multiple sites, as cost ratios are likely to vary considerably based on context and community.12 By ignoring or relying on incomplete or outdated data, decision makers could end up promoting interventions that have small positive effects on student success but incur very high costs.

In the past decade alone, technology-enhanced instruction has evolved significantly with the inclusion of computerized adaptive learning, digital textbooks, open-source content, virtual labs, and more.

**Matching the Problems to Potential Solutions**

The traditional model of developmental education needs improvement, and there is a growing menu of potential solutions. However, settling on a solution requires a clear definition of the problem that decision makers in a given state or on a given campus are trying to solve. By first choosing an existing approach to remedial education and only later identifying the problem, reformers run the risk of choosing an intervention seemingly out of thin air.

There are five critiques of remedial education that we hear again and again: it comes too late, students do not actually need it, it takes too long, it is not fine-tuned enough, or it is too expensive. Many of these problems are related; remediation is expensive on a per-outcome basis, in part because many students do not successfully complete their remedial sequence. It may also take too long because it is not appropriately tailored to students’ needs. However, identifying such
problem(s) early on in the design phase of a new program can help reformers map possible solutions onto the particular challenges they face.

In the sections that follow, I discuss these critiques and offer potential solutions. I also highlight a handful of existing interventions to illustrate how specific programs can offer solutions to these commonly cited problems. While these examples are in no way a comprehensive list of recent interventions, I hope this general framework helps practitioners, policymakers, and researchers better understand the rapidly changing landscape of developmental education today.

Problem #1: Remediation Comes Too Late to Make a Difference. The majority of research on the effects of remedial courses on student persistence and degree completion find negative or null effects for college students at the margin of passing out of remediation. For instance, several causal studies have found that students enrolled in traditional remedial courses are no more likely to persist through college or to graduate at higher rates than their academically similar peers enrolled in college-level courses. Furthermore, the majority of students who enroll in remedial courses fail to complete their course requirements, much less move on to college-level coursework. One explanation for these discouraging findings is that college is too late in the educational process to be addressing issues of underpreparedness.

Solution: Reach Students While Still in Middle or High School. One way to better address the needs of underprepared students is to address those needs earlier. Early-warning systems and high school–college collaborations are increasingly popular strategies designed to help students avoid remedial courses in college. For

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<th>Commonly Cited Problems</th>
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<tr>
<td>1. It comes too late to make a difference.</td>
<td>Reach students while still in middle or high school</td>
<td>Early testing; test-preparation programs; Summer Bridge programs</td>
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<td>2. Students do not actually need it.</td>
<td>Improve the assessment and placement process; make developmental co-requisites instead of prerequisites; make remediation optional</td>
<td>Multiple-measure assignment policies (including standardized test scores and high-school GPA); mainstreamed developmental and college-level courses</td>
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<td>3. It takes too long.</td>
<td>Shorten the time students spend in developmental education</td>
<td>Emporium models or modularization</td>
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<td>4. It is too general.</td>
<td>Allow for more customization and personalization; allow for more competency-based learning; combine basic skill attainment with college-level courses; provide supplemental supports</td>
<td>Diagnostic assessments; Learn on Demand; Tennessee Colleges of Applied Technology; Integrated Basic Education and Skills Training</td>
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<td>5. It is too expensive.</td>
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example, California’s Early Assessment Program, which informs high school juniors about their academic readiness for college-level work at all California State University campuses, has helped students address their academic challenges while still in high school, leading to lower rates of placement into remedial courses once those students get to college. Students who participated in the program in high school were 6.1 percentage points less likely to be placed in remedial English and 4.1 percentage points less likely to be placed into remedial math when compared to students who did not participate. 

Currently, more than 100 high schools in Tennessee are offering the Seamless Alignment and Integrated Learning Support program, which identifies high school juniors with low remedial placement-test scores and allows those students to, during their senior year of high school, complete the same remedial math course they would eventually take in college. 

As of 2011, Florida began requiring high school students to take its Postsecondary Education Readiness Test in math, reading, and writing in 11th grade. High school students who do not pass the test are required to take courses during their senior year that are designed to address their remedial needs. And in Long Beach, CA, a program called College Promise helps high school students stay on track for college by providing college visits and guidance counseling as early as elementary school. 

Too often when students arrive on campus they are not aware they need to take a remedial placement test and are therefore not prepared for the exam. This leads some students to score lower than they might have had they been able to adequately prepare. In the last several years, placement-test preparation strategies have sprung up. Santa Monica College offers an online orientation to its placement test, Prep2Test, in which it explains the content and format of the tests and offers tips on how to best prepare. In 2012 the Community College of Denver published a 20-page workbook for students to review the material on the Accuplacer placement test and set up free tutoring sessions for interested students. Guilford Technical Community College in North Carolina created COMPASS Review 2.0, an Internet-based course to prepare students to take or retake the COMPASS placement test. These test-preparation programs are generally easily scalable and provide a cost-effective tool to help students refresh their skills before taking the remediation placement exam.

More colleges are now encouraging their students to complete their developmental courses in the summer before arriving at college, either online, on campus, or at a local institution. Summer Bridge programs offer students an opportunity to complete their remedial requirements before beginning their freshman year. The California State University (CSU) system recently enacted a policy known as Early Start, requiring incoming first-time freshmen who do not demonstrate readiness for college-level math or English to begin remediation during the summer before enrolling in the CSU. The CUNY Start program enrolls students who have been accepted to a City University of New York college but are in need of remediation in math or reading and writing. For $75, students spend the entire semester before beginning college taking developmental classes and working to improve their reading, writing, and math skills. The program provides full access to all campus resources during the semester and allows students to save their financial aid money for college-level courses down the road. A 2013 evaluation suggests the program has been successful in helping students avoid remedial courses once enrolled in college and to earn more college credits than a similar group of students who did not enroll in the program.

Problem #2: Students Do Not Actually Need Remediation. The placement process used to assign students to developmental courses can be overly simplistic and, as a result, misdiagnose student ability. Two recent studies from the Community College Research Center found that a large proportion of students are placed into courses that they either do not need or are not academically prepared to take. The poor predictive
validity of the placement tests may be the result of using a single instrument to measure students’ knowledge of the material.  
If the placement tests used to assign students to developmental courses are flawed, then some students may be unnecessarily placed into developmental education when they could be successful in college-level courses.

Solution: Improve the Assessment and Placement Process. Administrators typically base developmental course assignments on placement exam cutoff scores, with students scoring below a given threshold assigned to a developmental course and students above the threshold assigned to a college-level course. However, the variability in cutoff scores can be quite large, with little agreement across colleges about what it means to be “academically prepared.” Furthermore, debates exist as to whether the assessment process effectively sorts students according to their academic needs. In one community college system, approximately 40 percent of students who were placed in remedial math using a single placement exam likely could have earned a C or better in the corresponding college-level course without remediation. A separate study found that high school grade-point averages (GPAs) are better predictors of student success than placement tests.

As a result, many institutions and state systems have started to focus more on their remediation placement process. Among public two- and four-year institutions, 27 percent now use criteria other than a single placement test. Advanced Placement scores, courses taken in high school, and high school GPAs are among the most popular additional variables considered in placing students into developmental courses. The North Carolina State Board of Community Colleges recently adopted a new multiple-measures placement process. Beginning in 2015, students who graduated from high school less than five years ago can use their high school GPA or SAT and ACT scores to be placed directly into college-level classes. If a student's high school GPA is greater than or equal to 2.6, he or she can enroll in college-level classes. If it is below 2.6 but the student scored high enough on the SAT or ACT, he or she can enroll in college-level classes. If the GPA, SAT, and ACT scores are not high enough, then the student will have to take a placement test.

Among other colleges that assign students to remediation using a single placement test, some report using additional information such as GPAs only for students with test scores that fall within a “decision zone” of several points on either side of the cutoff. These more comprehensive placement processes are intended to fix the problem of misdiagnosing students’ academic needs using a one-time placement test with the goal of reducing the number of students who are mistakenly placed into developmental courses. These measures, however, rarely apply to older, nontraditional students whose high school records may be long out of date.

In one community college system, approximately 40 percent of students who were placed in remedial math using a single placement exam likely could have earned a C or better in the corresponding college-level course without remediation.

Solution: Make Developmental Courses Co-Requisites Instead of Prerequisites. If we believe that students do not actually benefit from developmental education and could be equally successful in college-level courses with a few additional academic supports, one solution would be to eliminate the standalone developmental course altogether and place students directly into college-level courses with a parallel remedial component. This process, known as mainstreaming, shifts remediation from a prerequisite to a co-requisite, and allows students to begin their college-level courses while still receiving some support for their remedial needs, but outside the classroom.

In fall 2008, Austin Peay State University in Tennessee combined its developmental and college-level math courses. Both the basic and intermediate developmental math courses (Algebra I and Algebra II) were eliminated entirely, and enhanced sections of the two core college-level courses were created for students whose ACT exam scores placed them in developmental math.
These college-level courses were linked to structured Learning Assistance workshops where students received additional tutoring and assistance for any course material with which they were struggling. Research on these efforts suggests that, among students on the margins of the cutoff score, those who were exposed to mainstreamed math courses had slightly more positive short-term outcomes than their peers in traditional developmental math courses during the same period. These results should be interpreted with caution, however, as they do not apply to students with very low math scores.

**Problem #2: Remediation Takes Too Long.** One potential barrier to student success in developmental courses is the length of time required for most students to complete them. As mentioned earlier, because students typically have to succeed in their assigned remedial course before moving on to the next course in the sequence, students in need of multiple remedial courses in the same subject can, in some cases, end up taking courses for more than a year before fulfilling their remedial requirements. A study of 250,000 community college students found that only 20 percent of students referred to developmental math and 37 percent of students referred to developmental reading go on to pass the relevant college-level course. The longer it takes students to select and begin a program of study, the less likely they are to complete a credential.

**Solution: Make Remediation Optional.** If we believe that some students assigned to developmental courses do not really need them, one solution is to make remediation optional. In 2013, the Florida Senate passed a bill allowing students in any of Florida’s 28 community colleges the opportunity to skip remediation and enroll directly in credit-bearing courses, even if college advisers or placement tests indicate they have remedial needs. In a small community college in Oregon that requires students to take a math placement exam, the administration regards the exam as only a guideline for the student’s placement. These solutions encourage students to use their knowledge of their math preparedness along with information from their placement test to decide the best course of action for addressing their remedial needs.

When making remediation optional in this way, however, colleges must remain careful not to abandon their standards of college readiness in the process. Allowing students to assess their own developmental needs may lead to more informed self-placement, but it may also lead to higher rates of course failure if students overestimate their prior academic preparation or underestimate their academic needs. Because these efforts are still new, there is a dearth of research on the effects of optional placement policies. There is likewise a risk that these solutions could lead to greater problems down the road for students who are not aware of their academic difficulties and find themselves in challenging academic situations.

**Solution: Shorten the Time Students Spend in Developmental Education.** Many of the recent efforts to reform
remediation have aimed to shorten the time students spend in developmental courses, enabling them to move more quickly into their college-level courses. Common acceleration strategies include the use of computer-assisted technology designed to allow students to move through their remedial course(s) at their own pace, individualized programs of study that require students to complete only the remedial content areas necessary for their major, and compression courses, or those that combine multiple levels of remediation into one course.35

**Institutional systems of higher education must consider their own unique population when developing a reform agenda.**

The New Mathways Project at the University of Texas at Austin provides three accelerated math pathways along with a supporting Student Success course. Each of the pathways allows students to complete their remedial requirements while also earning credit for a college-level statistics course taken during an intensive yearlong program in what formerly took two years. To date, the pathways have been implemented at select community college campuses in Texas, with the goal of having all 50 Texas community colleges adopting the pathways by 2016.36 FastStart at the Community College of Denver combines multiple semester-length courses into a single intensive semester, while providing case management, career exploration, and educational planning services to students in remedial education.37

An emporium model is another increasingly popular strategy designed to move students through course material more quickly. Students typically attend class in a computer lab and use digital tutorials to move through the material at their own pace. Some students might finish the coursework in just a few weeks, while others will take multiple semesters. Professors track student progress online and answer individual questions both online and in the lab. When students fail to master a concept in these programs, they are allowed to complete the module again, with new problems replacing the old. Descriptive research on the effects of this model suggests that technology-assisted classrooms can increase the percentage of students successfully completing both developmental and college-level math while dramatically reducing the cost of instruction.38

**Problem #4: Remediation Is Too General and One-Size-Fits-All.** Though new college students arrive on campus with a diverse array of prior experiences and academic needs, most approaches to remediation are one-size-fits-all: if you test into remediation, you take the same course with the same content and assessments whether you need a small dose of help to brush up on a particular topic or a more comprehensive review of the subject. This approach is unlikely to have the intended effect on students with varying levels of academic need. Research dictates that many educational interventions have had varying effects on students of different genders, races, and socioeconomic statuses, and so it is plausible that remedial courses may also have varying effects on different types of students.39 Traditional approaches to remediation may not work well because they are not tailored to the different students they serve.

**Solution: Allow for More Customization and Personalization of Learning through Technology-Aided Instruction.** Rather than have all students take the same course, digital learning presents opportunities to build a more customized learning experience targeting a student’s particular needs. In May 2012, the Texas Higher Education Coordinating Board approved a contract with The College Board for the development of a new diagnostic testing system to inform students not only of their placement into developmental courses, but also of what specifically they do not understand about the material. After receiving their diagnostic, students will only be required to take the modules addressing their specific academic needs. The Open Learning Initiative (OLI) at Carnegie Mellon University offers another example of how customizable learning software can be used to address student needs through free online courses for anyone in the world. In OLI courses, assessments are embedded into every instructional activity, and through the collection of students’ real-time data on their successes and mistakes in these assessments, the software can provide corrections, suggestions, and...
cues that are tailored to the individual students’ current performance.40

Arizona State University recently began an effort to transform its developmental classrooms into laboratories designed around the idea of adaptive learning. By partnering with Knewton and Pearson, two companies focused on education analytics, students complete all of their coursework in computer labs, and instructors are given real-time data on how well each of their students understands each concept. The company’s data-collection engine measures the amount of time students spend on particular text, video, and graphical objects, and ties that to how well they do on the subsequent tests and assignments. The software can then make recommendations for content a particular student ought to see and when.41 While the research on adaptive learning is still in its infancy, opportunities to move away from a one-size-fits-all approach to developmental education offer promising solutions.

Solution: Allow for More Competency-Based Learning. By focusing on the demonstration of specific skills or competencies rather than credit hours completed, institutions may be better able to help students pursue a degree or credential. In 2012, the University of Wisconsin system announced a new competency-based degree that involves taking an exam that allows students to demonstrate mastery of college-level competencies they may have learned in high school or on the job. This model provides some students with an opportunity to accelerate and allows others to take as much time in their online courses as they need. Competency-based programs have the potential to greatly benefit working adults who may have developed some of the skills they need to attain a degree but are not as prepared to take a traditional remedial placement exam.

StraighterLine—a for-profit organization founded in 2009—partners with several online universities including Western Governors University and the University of Phoenix to offer low-cost credits to students in a nontraditional manner. Although students eventually receive their degree from one of the partner institutions, they begin taking courses through StraighterLine. In addition to earning credits through online entry-level college courses, students are also able to earn credits for prior knowledge. The company offers prior-learning assessments that allow students to earn college credit for knowledge and life experiences that they already possess. Another example of allowing students to design their degree program based on prior experiences is in Kentucky. The Learn on Demand program, developed in 2011 by the Kentucky Community & Technical College System, gives students the flexibility to choose the courses or modules that best meet their educational goals, allowing students to tailor their degree course by course or module by module.

Solution: Combine Basic-Skill Attainment with College-Level Coursework. In a contextualized course, remedial units are embedded in the technical content of the course. Academic coursework is adapted to fit the identified career path of the student and incorporates training in the technical aspects of that field to prepare students for future employment. The Technology Centers of Applied Technology are an oft-cited example of such efforts where students learn remedial content through a lab-based course taken in their first year. In this course, students learn by doing in environments that are closely modeled on real work environments and expectations. The centers do not offer any traditional remedial courses. Instead, the Technology Foundations course offers self-paced curricula of basic and intermediate skills, including applied math and writing. Students then apply the math skills learned in this course to their own individual occupational and technical programs such as automotive technology or graphic design.

In Washington State, the Integrated Basic Education Skills Training (I-BEST) program is another example of an effort to combine basic-skill instruction with college-level material at the state’s community and technical colleges. Each I-BEST classroom has two instructors, one to teach technical content and the other to teach basic skills in math, reading, writing, or English language. Students learn basic skills through real-world job training. Results from a recent evaluation of this program suggest higher rates of credit accumulation for participants over time and persistence to the second year, with the largest gains found for adult basic education students and English language learners.42 The costs of these programs tend to vary widely and depend on several factors including field of study,
Problem #5: It Is Too Expensive. Students must pay tuition for remedial and developmental courses, but those courses rarely count for degree credit. As a result, many students in developmental courses end up spending additional time and money in college as they work through their developmental requirements. By staying in college longer than they might otherwise have done because of these requirements, students are restricted from taking alternative paths such as beginning a new job, which may have additional financial costs. Developmental education is also expensive for taxpayers and policymakers as low rates of student success raise developmental education’s cost per successful outcome. With the cost of college increasing across the board, the additional high costs associated with developmental courses are particularly problematic for today’s underprepared students.

Solution: Lower the Cost of Delivery by Letting Technology Do Some of the Work. In institutions of all types, faculty and administrators are questioning the traditional approach to educating college students and are instead looking for ways to reduce cost by utilizing and leveraging digital content and online instruction in the remediation process. The most common argument in favor of increasing the use of technology is that it can keep costs down while improving college access by providing flexibility in course format and scheduling. Online programs are often able to serve new groups of students such as those living in remote places with limited physical access to a campus. This flexibility may be especially important for underprepared students for which traditional course formats might not have been effective in the past. While online and hybrid (courses that incorporate online components into the traditional-style classroom) courses appear to offer significant cost savings in higher education, they present both opportunities and potential challenges in developmental education.

Despite the apparent potential of online learning to deliver high-quality remedial instruction at reduced costs, there is little rigorous evidence on learning outcomes for students receiving online instruction. A 2013 literature review of 30 recent studies examining the impacts of online or hybrid learning on student outcomes concluded that there is little evidence to suggest
that online or hybrid learning is on average more or less effective than face-to-face learning.\textsuperscript{49} A separate study using a dataset containing nearly 500,000 courses taken by more than 40,000 community and technical college students in Washington State estimated that males, younger students, black students, and students with lower levels of prior academic performance had more difficulty adapting to online courses.\textsuperscript{50} This latter group of students is the very group most likely to be enrolled in developmental courses. Courses delivered entirely online may be appropriate for more high-achieving students but inappropriate for struggling students who need more personalized student-faculty interactions.\textsuperscript{51}

Alternatively, it may very well be the case that a “do no harm” online course (with comparable outcomes) may be superior to a traditional course simply because it is more cost effective. In a recent study of six public universities, the authors found that there were little to no differences in pass rates, final-exam scores, college GPA, or performance on a standardized assessment among 605 students who were randomly assigned to take a statistics course either online (with supplemental in-class review sessions) or in the traditional classroom format.\textsuperscript{52} By including the size of the courses and the salaries of the instructors, they estimated savings in compensation costs for the online model ranging from 36 to 57 percent. As the research literature on the effects of online courses continues to develop, colleges seem committed to continue experimenting with online and technology-enabled learning as a cost-savings measure.

**Solution 5.2: Explore the Intersection of Remediation and MOOCs.** Platforms such as Coursera, EdX, and Udacity have the potential to provide university-level education for free or very low cost and on an enormous scale. MOOCs are being widely explored as alternatives and supplements to traditional university courses, and their adoption is rapidly growing. As of 2012, only 2.6 percent of higher education institutions offered a MOOC, but another 9.4 percent reported having a MOOC in the planning stages.\textsuperscript{53} From February 2012 to March 2013, Coursera offered 325 courses and Udacity offered 26 courses.\textsuperscript{54} Udacity’s Computer Science 101 course is the largest MOOC to date, with an initial enrollment of more than 300,000 students. While very few colleges currently accept course credits for MOOCs, in 2013 the American Council on Education announced that five Coursera courses, including one course in developmental math at the University of California–Irvine, had passed their credit review process and were recommended to receive college credit, and additional courses are currently under review.\textsuperscript{55}

To date, most MOOCs have tended to focus more on advanced topics rather than basic skills. Recently, however, more institutions have begun to realize the potential for MOOCs to assist in their remedial courses. Colleges such as San Jose State University and Wake Technical Community College recently partnered with Udacity to offer a developmental algebra course, which takes all the technology of the MOOC and imports it onto a traditional college campus. In this way, institutions can shift the burden of preparing and teaching their remedial courses to an outside provider, resulting in these courses being offered at a larger scale and lower cost. These institutions are still able to preserve some flexibility and offer additional support given that the students are their own.

A concern often raised about MOOCs is that although thousands enroll in the courses, a very small proportion actually completes them. Across all existing MOOCs, the completion rate is generally less than 10 percent.\textsuperscript{56} Given the high attrition rates with MOOCs and the academic challenges facing many students in need of developmental courses, it remains unclear if these courses will lead to increased success for underprepared students. MOOCs as currently designed are unlikely to move the needle on remediation, but perhaps some of the institutional attention on the use of alternative teaching methods might promote improvement.

**Implications and Considerations for Decision Makers**

Improving the design and delivery of developmental education is a complicated policy process that extends beyond identifying problems and selecting appropriate solutions. To lead a new generation of developmental education, administrators and policymakers must also consider the following hurdles.
1. **Administrative Challenges.** Many of the more innovative programs in developmental education require a dramatic departure from the traditional manner of offering courses in college settings. As a result, administrative offices must reinvent the ways they coordinate student scheduling, distribute financial aid, and assign faculty to courses. The use of an emporium model, for example, requires that registration in developmental courses be made more flexible, as students often complete one developmental course and immediately begin another, often in the midst of the semester. These changes can be difficult in determining faculty workloads as well, given that several of these innovations require an entirely new format and style of teaching.

2. **Data Challenges.** Across the board, we need more and better data on the level of need for developmental education by subject across different student groups. Institutions must be able to disaggregate information by income, ethnicity, prior academic background, and current level of proficiency. These data should then be used to inform institutions of the rates at which different student populations progress through developmental education, complete college-level courses, and earn credentials and degrees.

3. **Infrastructure Challenges.** Most institutions cite technology infrastructure as one of the biggest barriers to entering the online education market. With numerous open-source platforms now available, institutions need not worry about bandwidth, but instead must shoulder the cost of equipment and maintenance. However, the increasing reliance on online courses also presents opportunities to buy remedial content and instruction, freeing institutions from the pressure to develop their own. Online learning also raises questions about the integrity of assessment and the potential for cheating. Most institutions are not equipped to deal with student identity issues in online courses, and these measures are likely to be quite costly.

Despite these challenges, encouraging continued innovation remains a highly worthwhile endeavor. Decision makers will continue to experiment with and refine new, lower-cost modes of delivery for under-prepared students, even if these new models are still evolving. The key is to couple these efforts with rigorous evaluation to learn more about what works and what is cost effective. By focusing on both the costs and the benefits of new initiatives and sharing these results (positive and negative) with the broader public, institutions of all types will be better positioned to make changes to their own developmental programs.

What is more, the appetite for reforming developmental education is already bringing about major changes in how faculty and students engage in the educational process writ large. Indeed, acceleration efforts, co-requisite courses, and technology-assisted learning are poised to address the learning needs of all students, not just those in developmental courses. Many of the interventions described in this paper are likely to influence the academic enterprise well beyond the boundaries of developmental education.

Of course, the current problems in developmental education do not exist in silos. In reality, all five of the problems described in this paper and their recommended solutions are interrelated. While it may be true that developmental education takes too long for some students, it is also likely to be just as true that developmental courses are too broad for many students’ specific needs. Given that these are multifaceted problems, institutional leaders, policymakers, researchers, entrepreneurs, and foundations must consider multifaceted solutions.

Given the diversity of campuses and communities in the United States, leaders should first specifically define the unique problems facing remedial education within their institution or system. Which students have the most trouble succeeding in their developmental courses? Which classes, sequences, or transitions are the most problematic? Are there similar patterns observed for those students on the margins of needing remediation? Faculty and student perspectives will be essential in helping define the pressing issues(s); classroom and institutional-level data can help identify the students or points in the semester of greatest concern. After identifying the specific problem(s) that need addressing,
administrators will be better positioned to select from a menu of solutions more targeted to these issues, rather than reaching for solutions in the dark.

Institutions must take care to maintain academic rigor when adopting reforms to developmental education. While reforms should be progressive and innovative, colleges and programs must anticipate that the mounting frustration with remedial education could unintentionally lead to a relaxing of institutional standards. When moving more students into college-level courses, colleges must clearly communicate passing requirements and strictly enforce those standards. Insisting on academic rigor means that some developmental students will still struggle while others excel. Additionally, these efforts require buy-in and support from the faculty. The voice of the faculty must be present not only in discussions of whether to use technology in their developmental courses, for example, but also in discussions of where technology can be useful within the curriculum and where more traditional methods are a better fit.

Finally, institutional systems of higher education must consider their own unique population when developing a reform agenda. It is not always necessary or helpful to create a centralized policy at the state or system level. Institutions should first consider the subject areas and opportunities for reform within a specific department or college. By focusing on a more coherent reform agenda—one that connects solutions directly to problems—universities will hopefully begin to foster more innovation, improvement, and scalability among their developmental education programs.

Notes

1. See Jay Greene and Greg Foster, “Public High School Graduation and College Readiness Rates in the United States” (working paper, Manhattan Institute, Center for Civic Education, New York, NY, September 2003). Being minimally “college ready” is defined as graduating from high school; having taken four years of English, three years of math, and two years of science, social science, and foreign language; and demonstrating basic literacy skills by scoring at least a 265 on the National Assessment of Educational Progress reading exam. Data from the National Center for Education Statistics indicate that in 2004 only 26.8 percent of high school seniors had completed the same “high-level” academic coursework.

2. 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, no. 2 (2010): 255–70. The terms “remedial” and “developmental,” however, are often used interchangeably in the literature and similarly throughout this paper.


20. Clive Belfield and Peter Crosta, “Predicting Success in College: The Importance of Placement Tests and High School Transcripts” (working paper, Community College Research


22. Six nationally available standardized tests were consistently identified as being used by postsecondary education institutions: the ACT and SAT admissions tests, the ACCUPLACER elementary algebra and college-level mathematics placement tests, the Computer Adaptive Placement Assessment and Support System (COMPASS) algebra and college algebra placement tests, and the Assessment of Skills for Successful Entry and Transfer test for reading skills. The most popular tests were the ACT math test and the COMPASS reading test, respectively. See Ray Fields and Basmat Parsad, Tests and Cut Scores Used for Student Placement in Postsecondary Education: Fall 2011 (Washington, DC: National Assessment Governing Board, November 2012), http://files.eric.ed.gov/fulltext/ED539918.pdf.


25. Belfield and Crosta, “Predicting Success in College.”


28. See Angela Boatman, “Evaluating Institutional Efforts to Streamline Postsecondary Remediation: The Causal Effects of the Tennessee Developmental-Course Redesign Initiative on Early Student Academic Success” (working paper, Community College Research Center, Teachers College, Columbia University, New York, NY, 2012), www.postsecondaryresearch.org/i/a/document/22651_BoatmanTENFINAL.pdf. For students in the redesigned courses, the likelihood of being enrolled in the second semester was 7.6 percentage points higher than it was previously. Students assigned to either level of developmental math had completed 2.4 more college-level credits after two years as a result of mainstreaming and had nearly three more total credits after two years.


30. In a separate study, researchers concluded that the ALP is a more cost-effective pathway through the required college-level English courses than the traditional developmental sequence, as measured by the cost per successful student. See Paul Davis Jenkins et al., “A Model for Accelerating Academic Success of Community College Remedial English Students: Is the Accelerated Learning Program Effective and Affordable?” (working paper, National Center for Postsecondary Research, Teachers College, Columbia University, New York, NY, 2010), http://ccrc.tc.columbia.edu/media/k2/attachments/remedial-english-alp-effective-affordable.pdf.


33. Bailey, Jeong, and Cho, “Referral, Enrollment, and Completion.”

34. Charles A. Dana Center et al., Core Principles for Transforming Remedial Education: A Joint Statement (December 2012), www.jff.org/sites/default/files/publications/RemediationJointStatement-121312update.pdf; and Paul
Davis Jenkins and Sung-Woo Cho, “Get with the Program: Accelerating Community College Students’ Entry into and Completion of Programs of Study” (working paper, Community College Research Center, Teachers College, Columbia University, New York, NY, January 2012), http://ccrc.tc.columbia.edu/media/k2/attachments/accelerating-student-entry-completion.pdf.

35. Zachry and Schneider, Unlocking the Gate.

36. For more information available from the Charles A. Dana Center at the University of Texas at Austin, see www.utdanacenter.org/higher-education/new-mathways-project/the-new-mathways-project-in-texas/.

37. Nikki Edgecombe et al., Acceleration through a Holistic Support Model: An Implementation and Outcomes Analysis of FastStart at the Community College of Denver (New York: Community College Research Center, Teachers College, Columbia University, 2013), http://ccrc.tc.columbia.edu/media/k2/attachments/acceleration-through-holistic-support-model.pdf. Using transcript data for first-time students, researchers concluded that the FastStart math program is associated with higher rates of enrollment in and passing of college-level math courses, but had no relationship with student retention, transfer, or completion.


39. Bridget Terry Long and Juan Carlos Calcagno, “Does Remediation Help All Students? The Heterogeneous Effects of Postsecondary Developmental Courses” (working paper, Harvard University, Cambridge, MA, June 2010); and Boatman and Long, “Does Remediation Work for All Students?”

40. For more information on the Open Learning Initiative at Carnegie Mellon University, see www.oli.cmu.edu/.


42. Paul Davis Jenkins, Matthew Zeidenberg, and Gregory S. Kienzl, Building Bridges to Postsecondary Training for Low-Skill Adults: Outcomes of Washington State’s I-BEST Program (Brief No. 42, New York: Community College Research Center, Teachers College, Columbia University, 2009), http://academiccommons.columbia.edu/catalog/ac%3A146910.

43. Levin and Garcia, Cost-Effectiveness of Accelerated Study in Associate Programs.


50. Di Xu and Shanna Smith Jaggars, “Adaptability to Online Learning: Differences Across Types of Students and Academic Subject Areas” (working paper, Community College Research Center, Teachers College, Columbia University, New York, NY, February 2013), http://ccrc.tc.columbia.edu/media/k2/attachments/adaptability-to-online-learning.pdf. Students who took higher proportions of online courses were slightly less likely to attain a degree or transfer to a four-year college than those who took fewer online courses.


52. Bowen et al., “Online Learning in Higher Education.” This research was limited in that the researchers could not randomize instructors in either group, and the instructors in traditional-format sections were, on average, much more experienced than their counterparts teaching hybrid-format sections. (Median years of teaching experience were 20 and 5, respectively.)


55. The five courses are Precalculus and Developmental Algebra from the University of California, Irvine; Introduction to Genetics and Evolution and Bioelectricity: A Quantitative Approach from Duke University; and Calculus: Single Variable from the University of Pennsylvania.


57. Quint et al., *Bringing Developmental Education to Scale*.
