Community College
Virtual Symposium

Connecting Curriculum, Assessment, and Treatment In Developmental Education

Page left intentionally blank.

Community College
Virtual Symposium

Connecting Curriculum, Assessment, and Treatment In Developmental Education

U.S. Department of Education
Office of Vocational and Adult Education

January 2012

U.S. Department of Education
Arne Duncan
Secretary of Education

Office of Vocational and Adult Education
Brenda Dann-Messier
Assistant Secretary

January 2012

Acknowledgements

Page left intentionally blank.

Contents

Page left intentionally blank.

Preface

America's competitive advantage in the global economy depends on a qualified, skilled workforce.

A troubling gap, however, currently exists between the skills and knowledge of the country's current and projected workforce and the demands of jobs expected to grow most rapidly during the next decade. Community colleges are ideally positioned to help close that gap. President Obama has acknowledged this reality by calling for increased college graduation rates and a commitment among students to complete at least one year of postsecondary education (Obama 2009).

Community colleges have a long history as leaders in workforce education, collaborating with business and industry to meet local employment needs. They offer affordable tuition, open admissions, flexible course schedules, and convenient locations. They provide opportunities not only for students leaving high school, but also for older students, low-income and minority students, and working adults. Several problems, however, must be addressed if community colleges are to succeed as engines of workforce development and economic prosperity. These challenges include low rates of student persistence and completion and insufficient alignment among education standards and workforce expectations.

This brief is one of a series of four prepared for the April 27, 2011, *Community College Virtual Symposium*, a project of the U.S. Department of Education, Office of Vocational and Adult Education, held at Montgomery College, Silver Spring, Md.[1] This series is intended to spur dialogue among state and institutional leaders and identify and disseminate policies and practices demonstrated effective in meeting the challenges mentioned above.

Studies estimate that 50 to 60 percent of entering community college students enroll in at least one developmental education course in community college (Roksa et al. 2009; Bailey, Jeong, and Cho 2009; Attewell et al. 2006). While developmental education is evolving and new approaches are emerging regularly, most developmental education programs still are not highly effective in diagnosing students' needs and then matching them with the services best suited to their individual abilities and goals. This brief describes recent changes in developmental education and explores promising practices that align curriculum, assessment, and treatment to more effectively tailor developmental education services and improve students' chances for success.

---

[1] The other three briefs include *Promoting College and Career Readiness: Bridge Programs for Low-Skill Adults*; *Aligning Secondary and Postsecondary Education: Experiences From Career and Technical Education*; and *Integrating Industry-Driven Competencies in Education and Training Through Employer Engagement*.

Developmental Education

Developmental education is one way community colleges assist underprepared students in gaining the reading, writing, and mathematics skills needed to succeed in postsecondary education and training. The cost of developmental education can be steep for families, colleges, and taxpayers, however, and there is limited evidence suggesting that it effectively supports student success.

Outcomes

Researchers have begun to question whether the benefits of developmental education are commensurate with the costs. One estimate placed the costs in tuition, fees, and subsidies between $1.88 and $2.35 billion in 2004–05 (Strong American Schools 2008).[2] Although students must pay tuition—and sometimes forego earnings—while enrolled in developmental education, they usually do not earn college credit for their work in these courses.

While studies indicate that students who *complete* their developmental education sequence will subsequently perform just as well as those who never needed it (Bahr 2010), there is no guarantee that students who *enter* developmental education uniformly benefit from it. Some may perform just as well without developmental education, while others will never complete developmental course work or make a transition into college-level classes. Many developmental sequences include multiple courses at different levels. For example, a developmental math sequence may include several courses, from lower-

level classes, like algebra I, through such higher-level courses as precalculus. Students start at different levels depending upon their skills. In 2008, Calcagno and Long found that, among students who were "on the margin" of needing developmental courses in math, those who took top-level developmental education courses performed no better in the long run than those who directly entered college-level courses.

In 2009, Roksa et al. found that students referred to lower levels of developmental education were very unlikely to complete their developmental sequence or subsequently enroll in college courses. They also had low rates of eventual enrollment in college-level "gatekeeper" courses—first college courses in math or English—suggesting that such students are at risk for not transitioning to postsecondary course work. Additionally, in an analysis of developmental education at Chabot College, Hern (2010) found that the more terms of developmental education a student is required to complete, the less likely that student is to complete college-level math and English courses successfully or to earn a degree.

Current Design and Delivery

Students are placed into developmental education largely on the basis of their performance on computer-adaptive skill assessments taken upon enrollment. Often, placement is determined solely on the basis of whether a score is above or below a certain cutoff. Two assessments dominate the market: the ACCUPLACER®, developed by the College Board, and the COMPASS®, developed by ACT, Inc.

While this process for determining whether students need developmental education or are college-ready is

---

[2] The authors assumed a developmental education course-taking rate of 42 percent at public two-year institutions, with students taking an average of two developmental courses. The range was calculated for students taking eight courses and those taking 10 courses per year.

almost universal among community colleges, it has serious limitations. These **assessments** are not reliably predictive, typically explaining less than 10 percent of the variation in student success in the first college-level math or English course (Hughes and Scott-Clayton 2011). Also, the tests do not fully and effectively diagnose what students need in a way that would allow colleges to place students into courses, services, or programs that are tailored to their particular needs (Hughes and Scott-Clayton 2011).

The **curriculum** taught in developmental courses, particularly in mathematics, is not always aligned with what students need to know to succeed in postsecondary education. For example, liberal arts students can often complete their college-level math requirement through a quantitative reasoning or introductory statistics course. Both of these courses require mastery of fairly basic mathematics and logic, but developmental mathematics requires students also to take courses that prepare them for college-level calculus.

Moreover, curriculum affects the **treatment** offered to students. That is, the need to include so much material in the developmental curriculum requires schools to have two or even three math courses in a developmental sequence. Research indicates that only about 10 percent of students referred to that third level will ever get through the sequence and successfully pass a college-level math course (Bailey, Jeong, and Cho 2009). That occurs not only because students may fail any given course, but also because many do not continue to the next course in the sequence. The current system offers too many opportunities for students' circumstances to interfere and prevent them from persisting (Hern 2010).

In addition, developmental education teaching methods appear to rely heavily upon remedial pedagogy—drills and practice on subskills, such as grammar rules, sentence-level writing, converting fractions to decimals, or solving standard rate-time-distance problems (Grubb 2010). According to Grubb, these approaches focus on eliciting correct answers from students, with little emphasis on why the answer is correct or how the subskills might be used in other areas of life or in the workplace.

The shortcomings of past and current assessment, curriculum, and treatment practices are only now being fully understood. Early research on developmental education was limited by reliance on descriptive statistics and correlation analyses, which did not provide evidence of relationships between services and student success (Zachry and Schneider 2010). According to Zachry and Schneider, these earlier studies conveyed an implicit acceptance of current practices and student outcomes by describing what seemed to be promising practices but failing to provide evidence of student achievement.

More recent research tends to use more rigorous analytical methods to mitigate the effects of differences in student characteristics that could bias results; to measure the effects of programs and services on achievement and attempt to isolate elements having a positive effect; and to be larger, using national or state databases to follow students over time to assess outcomes (Zachry and Schneider 2010). These studies form the foundation for a new approach to developmental education—one based on providing what students need, without requiring semester-length courses or using remedial pedagogy, and emphasizing greater understanding of how students progress through developmental education.

New Approaches to Developmental Education

The large numbers of students enrolling in college, taking placement exams, and testing into developmental education have led to a one-size-fits-all approach that may not work well for all students. Moreover, this system does not effectively align assessment (how colleges determine students' abilities and readiness for the next level); curriculum (what students are taught); and treatment (course work, tutoring, or other support).

In a recent analysis, Boatman and Long (2010) concluded that the effects of developmental education are nuanced and also vary according to student ability. Their findings suggest that different policies are required to address individual student needs and abilities; that fewer students may need developmental courses; and that better measures of student ability are needed to place students appropriately. The authors encouraged institutions to help students take college-level courses while completing developmental requirements, suggesting this could mitigate the negative impact of developmental education on credit accumulation.

Hughes and Scott-Clayton (2011) theorized that broader agreement on assessment type and implementation could improve student outcomes, and diagnostic and noncognitive assessments could provide more nuanced information about students' skill gaps in multiple areas. It will undoubtedly be challenging, however, to develop assessments and assessment systems that can address all of these issues.

Hughes and Scott-Clayton also suggested exploring alternative interventions, such as accelerated remediation and curriculum alignment, to better meet the needs of some students. Bailey (2009) offered several recommendations for researching and reforming developmental education. They included retooling assessment to focus on understanding different student needs, offering more students the opportunity to take college-level courses that incorporate academic support,[3] and minimizing time spent in developmental education for students not yet ready for college-level classes.

The Achieving the Dream (ATD) initiative was a catalyst for change, dedicated to helping community colleges begin to measure developmental student outcomes more clearly and systematically. These colleges developed a variety of strategies aimed at improving those outcomes (Collins 2009).

In a five-year evaluation of ATD, however, Rutschow et al. (2011) discovered that while colleges developed many different reforms, most were small scale, reaching less than 10 percent of their target student populations. Only about one-quarter of the strategies attempted to change the content and delivery of classroom instruction. Student outcomes changed very little, with the exception of small increases in the percentages of students who completed gatekeeper courses in college-level English as well as increases in courses completed. Rates of persistence in college-level courses and the percentage of students completing developmental courses were essentially flat.

---

[3] The researchers noted that academic support may take many forms, including, for example, supplemental instruction with peer tutoring and experiential learning,

The ATD initiative was significant in highlighting the importance of data analysis and research, spotlighting some of the challenges and barriers that developmental students face, and developing new programs to address some of those challenges. The experiences of the ATD colleges, which have been broadly shared with other community colleges have helped encourage the growth of various promising developmental initiatives, such as those discussed below.

Promising Developmental Education Initiatives

The realization that improving and aligning assessment, curriculum, and treatment can promote better outcomes for underprepared students is leading to innovations in the way developmental education is delivered. Several initiatives are endeavoring to improve assessment, curriculum, and treatment, and a few are attempting to create better links among all three.

In terms of assessment, test developers are designing additional diagnostic assessments, although little is yet known about their potential effectiveness. **Early assessment** initiatives and **summer bridge programs**, however, may help improve student scores on placement exams and prepare them for college-level work. These programs help students build skills before college entry and assessment, with the intent of reducing or eliminating the need for developmental course work when students enter college.

Curricular alignment attempts to tie what students are taught in the classroom, particularly in developmental education courses, to what they will need to know to be successful in their intended field of study, their eventual career, and life.

Accelerated learning programs are a form of treatment that attempts to reduce the time students spend in developmental coursework and increase their likelihood of making a transition into college courses. **Course redesign**, which uses information technology to improve student learning and reduce the cost of education, .is another form of treatment that may have some promising elements.

System redesign is not yet widespread, but it incorporates all three elements. For example, one state is redesigning its developmental math programming and linking new assessments, modified curriculum, and alternative treatments to better serve students.

Research outcomes to indicate how effective these initiatives will be over time is forthcoming.. The information provided here derives primarily from descriptive studies available at the time of this writing.

Early Assessment

Early assessment efforts are aimed at helping students assess their college readiness while still in high school and improve their skills before graduating. These efforts may entail local partnerships between school districts and postsecondary institutions or statewide policies.

The goal of California's Early Assessment Program (EAP) is to prepare students who graduate from California high schools to begin college-level course work when they enter a California State University (CSU) (California State University n.d.). The EAP

allows students to complete an optional set of questions and a writing exercise while taking the 11th-grade California Standards Test.

A 2010 study explored EAP outcomes for California State University, Sacramento, students. The findings suggest that participating in the EAP lowers the likelihood that a student who enters CSU will need developmental English or math (Howell, Kurlaender, and Grodsky 2010).

Summer Bridge Programs

Summer bridge programs are designed to help incoming college students, and sometimes students still in high school, succeed in postsecondary education. Students spend several weeks on the college campus during the summer building their skills, with the aim of reducing their need for developmental education upon college entry (Barnett and Hughes 2010).

Some summer bridge programs, like the City University of New York's (CUNY) program, are intended to introduce all students to the college environment (The New Community College Initiative 2010). CUNY's program offers students an opportunity to learn about institutional expectations and the requirements for postsecondary success. At the same time, faculty members focus on understanding students' abilities and motivations. CUNY committees are currently creating design principles for foundation courses, models for assessment, and strategies for managing enrollment and increasing persistence.

Other summer bridge programs target incoming college students who are underprepared, to help them raise their skills to the college level by the time they enter in the fall. The National Center for

Postsecondary Research (NCPR) is conducting an evaluation of developmental summer bridge programs in Texas. Eight postsecondary institutions established summer bridges for recent Texas high school graduates, offering developmental course work for several hours per day over four to five weeks in the summer of 2009 (Wathington, Pretlow, and Mitchell 2011). Each summer bridge incorporates multiple strategies to prepare students for college, including accelerated learning in academic area(s) they need and information about social and academic expectations. Additional support services included assistance developing course and degree plans, information and counseling on financial aid, and college tours. Students who completed the programs received small stipends.

Preliminary findings suggest there was no difference in the rates of fall enrollment between students who took a developmental summer bridge program and students in the control group (Wathington, Barnett, and Pretlow 2011).[4] Students did not differ significantly in the total number of fall credits attempted, or in the types of fall credit attempted (college versus developmental).

Curricular Alignment

Rather than preparing all students for the same college-level reading, writing, and mathematics courses, curricular alignment identifies the skills needed for success in different educational pathways and focuses developmental education courses on helping students attain those skills.

In an effort to align developmental mathematics curriculum with the skills students need to know to

---

[4] Students were recruited based on placement test results and randomly assigned to the summer bridge or the regular services group.

be successful, the Carnegie Foundation for the Advancement of Teaching and the Charles A. Dana Center at the University of Texas at Austin launched a new curricular alignment initiative called Statway. It is designed to help community college students complete a college-level mathematics course in one year while building skills for college success (Cullinane and Treisman 2010). Statway focuses on improving statistical literacy and core mathematics skills and is designed for students pursuing career and technical and academic programs, such as health, liberal arts, and business.

Statway designers theorized that developmental education sequences concentrated too heavily on algebra and pre-calculus skills that students are not likely to use in the workplace or their daily lives. Instead of completing a specific course sequence culminating in calculus, Statway students are expected to master important statistics content and the basics of middle and early high school mathematics, which are essential to success in the workplace. By aligning curriculum with the skills students need to be successful in their college programs and eventual careers, Statway attempts to improve students' chances of completing developmental courses successfully, enrolling in and completing college math courses, and eventually obtaining a credential or degree.

Statpath is another experimental curricular alignment initiative, started by a faculty member at Los Medanos College. Statpath enables non-STEM (science, technology, engineering, and math) students who will take statistics as their college-level math class to complete all math requirements in a single year without participating in the traditional developmental math sequence. There is no minimum placement score, and instructors and students address gaps in arithmetic and algebra skills as they arise, while

performing data analysis, developing regression models, and using simulations to draw conclusions (Hern 2010).

Initial data indicate that the Statpath may have positive results, although rigorous research is still needed to evaluate its effectiveness. Early results have indicated that pass rates for the college-level statistics course were higher for students who took Statpath than for those taking a traditional algebra sequence (Hern 2010).

Accelerated Learning

Educators increasingly are turning to accelerated learning, or "acceleration," to help students complete developmental education faster and increase their likelihood of making a transition into postsecondary courses. Edgecombe (2011) identified two general categories of acceleration: course restructuring and mainstreaming. Course restructuring approaches alter the time that students spend in the classroom or change curriculum by compressing multiple courses into one term or pairing related developmental and college-level courses. Mainstreaming places underprepared students in college-level courses and offers students additional instruction support or integrates basic skill instruction directly into the content of the college course.

The Community College of Baltimore County Accelerated Learning Program (ALP) provides an example of a community college program using the mainstreaming approach, relying upon supplemental instructional support to promote student success. In the ALP, a small group of upper-level developmental writing students take an introductory English 101 class together. At the same time, those students receive extra academic help through a support course that meets immediately after the college course class

time and is taught by the same instructor (Jenkins et al. 2010).

The Community College Research Center (CCRC) analyzed the effects of ALP participation on student pass rates in English 101 and 102, rates of persistence, and pass rates of college-level courses in subjects other than English (Jenkins et al. 2010). The researchers found that developmental writing students participating in ALP were more likely to complete English 101 and 102 than students who did not participate. In addition, ALP appears to be more cost-effective than traditional English developmental education courses: the cost per successful ALP student was $2,680, compared with $3,122 for those participating in regular developmental English sequences. ALP students who completed English 101 and 102, however, were not more likely to persist in college or successfully pass subsequent college courses.

Course Redesign

Course redesign attempts to change the way course content is delivered. There are different approaches to course redesign, although most include some reliance on technology to deliver content and provide teaching and learning opportunities online (Twigg 2005a).

The National Center for Academic Transformation (NCAT) and 30 postsecondary partner institutions, supported by The Pew Charitable Trusts, have developed a course redesign methodology that uses technology in an attempt to improve student learning and reduce costs (Twigg 2005a). The effort is not targeted at developmental education students; instead it focuses on introductory courses with large enrollments to reach the most students and, thus, realize the highest cost savings. Advocates contend that course redesign will result in decreased

instructional costs and improved student learning and retention (Twigg 2005b).

In partnership with NCAT, the Tennessee Board of Regents (TBR) conducted a course redesign effort between 2006 and 2009. Six institutions received competitive grants to implement course redesign initiatives, and four of the institutions implemented their redesigns in spring 2009.

Tennessee's Cleveland State Community College replaced several hours of class time each week in its developmental and college math courses with an hour of computer instruction and two hours of computer lab (Squires, Faulkner, and Hite 2009). Students receive instruction and related attention from faculty in the computer labs and in class. In the computer lab, curriculum is modularized and students learn independently by watching videos, doing homework, and taking a quiz that they must pass to move on to the next module in the sequence.

Cleveland State designers expected to achieve a replicable and scalable model for multiple settings, improve the quality of learning and assessment, realize cost savings, increase retention, decrease time to completion, and maintain access for students.

While rigorous research is not yet available, anecdotal evidence suggests that the outcomes for these course redesigns were positive. An NCAT summary of institution-reported results indicated that three institutions demonstrated improved student learning and all four had better course completion rates (Twigg n.d.).

A study conducted at Victoria College in Texas explored outcomes for developmental math students who took a traditional-lecture format math course or a computer-mediated course. The computer-mediated

developmental math courses used multimedia software to deliver content. Students learned the content on their own, and instructors provided individual assistance when needed.

The researchers found that students in both types of courses performed at essentially the same level and recommended that the college help students select the format that works best for them. While the study reviews data from 1996 through 2005, it did not account for differences in the students who self-selected into the different types of courses.

System Redesign

In 2008–09, the Virginia Community College System (VCCS) examined its developmental education system as part of a statewide strategic planning initiative. VCCS found that half of entering first-time students needed developmental education, only about a third of developmental math students enrolled in a gatekeeper college-level mathematics course within four years, and developmental students were only about half as successful in attaining a postsecondary award as nondevelopmental students (Virginia Community College System 2009).

In response, VCCS set three goals for improving developmental education and student success: reduce the overall need for developmental education; keep the time needed to complete developmental reading, writing, and mathematics to one year for most

students; and increase college graduation and transfer rates for developmental students from one in four to at least one in three (Virginia Community College System 2010).

Following a review of curriculum, program requirements, delivery modes, structure, and services, and in consultation with faculty, the state is redesigning its developmental math system. The existing sequence included high school courses and ended with calculus, but the redesign team found that not all students needed to take calculus to be successful in postsecondary education and training.

To provide the appropriate treatment to each student, the state is dividing developmental mathematics into nine precollege units and determining which topics a student needs to know to enter and complete various programs at the college (Virginia Community College System 2011). Assessments will diagnose student abilities in relation to each unit. Students will take only those precollege units they need for their selected college program and in which they are deficient. Virginia also is planning a revision of their developmental English system, although specific plans have not yet been announced.

While the initiative is too new to have generated measurable outcomes, it is one of the first to focus on aligning curriculum with program requirements, assessments, and delivery models.

Discussion

It appears that inadequacies in and misalignment among the three core areas of assessment, curriculum, and treatment may contribute significantly to the problems with developmental education. Educators need to enhance the assessment systems by more adequately preparing students through programs like summer bridges and creating more diagnostic output—as Virginia is doing with their nine-unit assessment.

Curriculum should be tailored to teach what students actually need to succeed in college, their careers, and lives. Initiatives like Statway, Statpath, and Virginia's system redesign serve as models. Treatment may be improved by helping students move into college-level work as quickly as possible and implementing strategies to support their success, much like the ALP program does. In addition, there is a need for research into more effective teaching strategies and structured professional development for community college faculty.

For any of these changes to have real positive effects, however, they need to be synchronized throughout the national education system. It does no good to have scattered initiatives, particularly if each affects only a small proportion of students. These components need to be built into one coordinated system that supports all students, monitors outcomes, and pursues continuous improvement.

References

Attewell, Paul, David Lavin, Thurston Domina, and Tania Levey. 2006. New Evidence on College Remediation. *Journal of Higher Education* 77 (5): 886–924.

Bahr, Peter Riley. 2010. Revisiting the Efficacy of Postsecondary Remediation: The Moderating Effects of Depth/Breadth of Deficiency. *The Review of Higher Education* 33 (2): 177–205.

Bailey, Thomas. 2009. *Rethinking Developmental Education in Community College.* New York: Community College Research Center, Teachers College, Columbia University.

Bailey, Thomas, Dong Wook Jeong, and Sung-Woo Cho. 2009 (Original 2008). *Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges.* CCRC Working Paper No. 15. New York: Community College Research Center, Teachers College, Columbia University.

Barnett, Elisabeth, and Katherine Hughes. 2010. *Issue Brief: Community College and High School Partnerships.* Prepared for the White House Summit on Community Colleges, Oct. 5, 2010.

Boatman, Angela, and Bridget Terry Long. 2010. *Does Remediation Work for All Students? How the Effects of Postsecondary Remedial and Developmental Courses Vary by Level of Academic Preparation.* NCPR Working Paper. New York: National Center for Postsecondary Research.

Calcagno, Juan Carlos, and Bridget Terry Long. 2008. *The Impact of Postsecondary Remediation Using a Regression Discontinuity Approach: Addressing Endogenous Sorting and Noncompliance.* New York: National Center for Postsecondary Research.

The California State University. N.d. Early Assessment Program. Accessed July 12, 2011. http://www.calstate.edu/eap/.

Collins, Michael Lawrence. 2009. *Setting Up Success in Developmental Education: How State Policy Can Help Community Colleges Improve Student Outcomes.* Boston: Jobs for the Future.

Cullinane, Jenna, and Philip Uri Treisman. 2010. *Improving Developmental Mathematics Education in Community Colleges: A Prospectus and Early Progress Report on the Statway Initiative.* New York: National Center for Postsecondary Research.

Edgecombe, Nikki. 2011. *Accelerating Academic Achievement of Students Referred to Developmental Education.* CCRC Working Paper No. 30. New York: Community College Research Center, Teachers College, Columbia University.

Grubb, Norton W. 2010. *The Quandaries of Basic Skills in Community Colleges: Views from the Classroom.* New York: National Center for Postsecondary Research.

Hern, Katie. 2010. *Exponential Attrition and the Promise of Acceleration in Developmental English and Math.* Hayward, CA: Chabot College.

Howell, Jessica S., Michal Kurlaender; and Eric Grodsky. 2010. Postsecondary Preparation and Remediation: Examining the Effect of the Early Assessment Program at California State University. *Journal of Policy Analysis and Management* 29 (4): 726–748.

Hughes, Katherine L., and Judith Scott-Clayton. 2011. *Assessing Developmental Assessment in Community Colleges: A Review of the Literature.* CCRC Working Paper No. 19. New York: Community College Research Center, Teachers College, Columbia University.

Jenkins, Davis, Cecilia Speroni, Clive Belfield, Shanna Smith Jaggars, and Nikki Edgecombe. 2010. *A Model for Accelerating Academic Success of Community College Remedial English Students: Is the Accelerated Learning Program (ALP) Effective and Affordable?* CCRC Working Paper No. 21. New York: Community College Research Center, Teachers College, Columbia University.

The New Community College Initiative. 2010. *The New CUNY Community College Second Round Working Committee Reports.* New York: Author.

Obama, Barack. 2009. *Remarks of President Barack Obama—As Prepared for Delivery Address to Joint Session of Congress Tuesday, February 24, 2009.* Accessed April 4, 2011. http://www.whitehouse.gov/the_press_office/ Remarks-of-President-Barack-Obama-Address-to-Joint-Session-of-Congress/.

Roksa, Josipa, Davis Jenkins, Shanna Smith Jaggars, Matthew Zeidenberg, and Sung-Woo Cho. 2009. *Strategies for Promoting Gatekeeper Course Success Among Students Needing Remediation: Research Report for the Virginia Community College System.* New York: Community College Research Center, Teachers College, Columbia University.

Rutschow, Elizabeth Zachry, Lashawn Richburg-Hayes, Thomas Brock, Genevieve Orr, Oscar Cerna, Dan Cullinan, Monica Reid Kerrigan, Davis Jenkins, Susan Gooden, and Kasey Martin. 2011. *Turning the Tide: Five Years of Achieving the Dream in Community Colleges.* New York: MDRC.

Squires, John, Jerry Faulkner, and Carl Hite. 2009. Do the Math: Course Redesign's Impact on Learning and Scheduling. *Community College Journal of Research and Practice* 33 (11): 883–886.

Strong American Schools. 2008. *Diploma to Nowhere.* Washington, DC: Author.

Twigg, Carol A. 2005a. *Course Redesign Improves Learning and Reduces Cost.* San Jose, CA: The National Center for Public Policy and Higher Education.

Twigg, Carol A. 2005b. *Increasing Success for Underserved Students: Redesigning Introductory Courses.* Saratoga Springs, NY: National Center for Academic Transformation.

Twigg, Carol A. n.d. *Tennessee Board of Regents: Developmental Studies Redesign Initiative: Improving Learning and Reducing Costs, A Summary of Project Outcomes.* National Center for Academic Transformation. Accessed March 31, 2011. http://www.thencat.org/States/TN/ TN%20Outcomes%20Summary.htm.

Virginia Community College System. 2009. *The Turning Point: Developmental Education in Virginia's Community Colleges.* Richmond, VA: Author.

Virginia Community College System. 2010. *Developmental Mathematics Education in Virginia's Community Colleges.* Richmond, VA: Author.

Virginia Community College System. 2011. *Curriculum Guide for Developmental Mathematics: Units 1–9, with Basic Skills Unit on Whole Numbers.* Richmond, VA: Author.

Wathington, Heather, Elisabeth Barnett; and Joshua Pretlow. 2011. *The Impact of Developmental Summer Bridge Programs on Students' Success.* Presentation at the Council for the Study of Community Colleges, April 8, 2011.

Wathington, Heather, Joshua Pretlow, and Claire Mitchell. 2011. *The Impact of Developmental Summer Bridge Programs on Students' Success.* 2011 SREE Conference Abstract.

Zachry, Elizabeth M., and Emily Schneider. 2010. *Building Foundations for Student Readiness: A Review of Rigorous Research and Promising Trends in Developmental Education.* National Center for Postsecondary Research.

Page left intentionally blank.

The Department of Education's mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access.

www.ed.gov