



**Carnegie Foundation** for the Advancement of Teaching

# Community College Pathways:

2011-2012 Descriptive Report

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Community College Pathways

## CCP Community College Pathways: 2011-2012 Descriptive Report

The United States is unique in the world in providing a redemptive path to postsecondary education through community colleges. Over 14 million students are enrolled in community college, seeking an educational pathway to further their education, prepare for a productive career, and engage in a better life. Community college students are more likely to be low income, the first in their family to attend college, an underrepresented minority, and underprepared for college (Bailey, Jenkins & Leinbach, 2005). Between 60 to 70 percent of incoming community college students typically must take at least one developmental mathematics course before they can enroll in college-credit courses (Achieving the Dream, 2006; Bailey, Jeong, and Cho 2010). However, 80 percent of the students who place into developmental mathematics do not successfully complete any college-level course within three years (Bailey, Jeong, & Cho, 2010). Many students spend long periods of time repeating courses and most simply leave college without a credential. As a consequence, millions of people each year are not able to progress toward their career and life goals. Equally important, these students lack command of the mathematics that matters for living in an increasingly quantitative age and to be critically engaged citizens.

### **Community College Pathways Program**

To address this national problem, the Carnegie Foundation for the Advancement of Teaching joined forces with the Bill and Melinda Gates Foundation, William and Flora Hewlett Foundation, Kresge Foundation, Carnegie Corporation of New York, and Lumina Foundation in 2009 to create an innovative, transformative strategy in undergraduate mathematics education, the Community College Pathways (CCP) program.

Carnegie formed a network of community colleges, professional associations, and educational researchers to develop and implement the Community College Pathways Program. The program is organized around two structured pathways, known as Statway™ and Quantway™. Both aim to simplify students' path through their development mathematics sequence. Rather than a seeming random walk through a maze of possible course options (Zeidenberg and Scott, 2011), Statway™ and Quantway™ reduce the number of courses required while improving the content and pedagogy for developmental mathematics.

The Pathways aim for ambitious mathematical learning goals that emphasize conceptual understanding and the ability to apply mathematical skills in a variety of authentic contexts. Student learning outcomes for both Pathways were established and vetted by a group of national experts and professional societies in the discipline. Statway™ integrates developmental mathematical skills and introductory statistics by focusing on data analysis and statistical reasoning. Quantway™ integrates developmental mathematical skills with quantitative reasoning and literacy to promote success in community college mathematics and to develop quantitatively literate citizens. These mathematics skills will help students understand the world around them and will be useful in a growing number of occupations and professions.

The Pathways employ a distinct instructional vision using three research-based learning opportunities to promote their ambitious learning goals:

1) *Productive struggle*. As detailed in Hiebert and Grouws (2007), students are more likely to retain what they learn when they expend effort “solving problems that are within reach and grappling with key mathematical ideas that are comprehensible but not yet well formed” (Schmidt & Bjork, 1992). Consequently each new subject matter topic begins with a rich problem that engages students’ thinking and stimulates this struggle to understand.

2) *Explicit connections to concepts*. Sometimes mathematics is taught with a focus on procedural competence at the expense of advancing real conceptual understanding (Boaler, 1998). Research suggests making explicit connections among mathematical or statistical facts, ideas, and procedures can improve both conceptual and procedural understanding (Hiebert & Grouws, 2007).

3) *Deliberate practice*. Classroom and homework tasks are designed to overcome gaps in understanding, apply what is learned, and deepen facility with key concepts (Ericsson, 2008; Ericsson, Krampe, & Tescher-Römer, 1993). Deliberate practice eschews rote repetition for carefully sequenced problems developed to guide students to deeper understanding of core concepts (Pashler, Rohrer, Cepeda, & Carpenter, 2007).

These three learning opportunities are actualized in the specific lessons, assessments, and out-of-class resources that form the curriculum for each Pathway. Both of the Pathways use face-to-face and online learning with an instructional system that includes:

- 1 *Ambitious learning goals* leading to deep and long lasting understanding;
- 2 *Lessons and out-of-class materials* to advance these goals;
- 3 *Formative and summative assessments*, including end-of-module and common end-of-course assessments;
- 4 *Productive persistence* — an evidence-based package of practical student activities and faculty actions integrated throughout the instructional system to increase student motivation, tenacity, and skills for success;
- 5 *Language and literacy* component which interweaves necessary supports in instructional materials and classroom activities so that learning is accessible to all;
- 6 *Advancing quality teaching* component to provide instructors with the knowledge, skills, and habits necessary to experience efficacy in initial use and develop increasing expertise over time; and
- 7 *Analytics to support the continuous improvement of teaching and of the materials*.

The most distinctive feature of the Pathways is their organization as Networked Improvement Communities (NICs), aiming to accelerate how educators learn to improve (Bryk, Gomez, and Grunow, 2011; Dolle, Gomez, Russell, & Bryk, 2012). These NICs are scientific learning communities distinguished by four essential characteristics: (1) *focused* on a well specified common aim, (2) *guided* by a deep understanding of the problem and the system that produces it, (3) *disciplined* by the rigor of improvement science, and (4) *networked* to accelerate the development, testing, and refinement of interventions and their effective integration into varied educational contexts.

The NIC model draws on over a half century of work on quality improvement efforts in the U.S. and abroad, and is the cornerstone of Carnegie's overall improvement strategy. The Quantway™ and Statway™ NICs join community college faculty with Carnegie's improvement specialists and national educational researchers. Together they engage in disciplined inquiry using common conceptual frameworks, measures, and inquiry protocols to advance measureable improvements in teaching and learning (Berwick, 2008, Langley et al., 2009). Network members test hypotheses, analyze local adaptations to ensure their effectiveness, and over time contribute to the continued modification of the Pathways.

The aim of the Quantway™ and Statway™ NICs is to increase the number of developmental mathematics students who successfully<sup>1</sup> earn college mathematics credit within one academic year. Statway™ is designed as a one academic year course that allows students to simultaneously complete their developmental mathematics requirements and receive college mathematics credit in statistics. Quantway™ is designed as two separate semester courses. Quantway™ 1, which is the focus of this report, is the first semester of this program and fulfills the requirements for students' entire developmental mathematics sequence. Quantway™ 2 is the subsequent semester course<sup>2</sup> that allows students to receive college mathematics credit. In addition to receiving college mathematics credit, the Pathways' learning goals and instructional approaches aim for more ambitious mathematical learning that will prepare students to persist to earn certificates and degrees. By gaining knowledge through this learning process, students can gain the skills to progress further in their mathematics learning and lives.

## Launch of Statway™

Colleges first launched the Community College Pathways Program during the 2011-2012 academic year. The first cohort of students began Statway™ in the fall of 2011. This initial cohort of students spanned 19 community colleges and two state universities across five states (see Appendix A for the complete list). In total, there were 50 faculty teaching 55 sections of Statway™ with 1,133 students enrolled.

The current report describes the rate of successful completion across the 2011-2012 academic year for the first cohort of students in Statway™.<sup>3</sup> In this report, successful Statway™ completion is defined as receiving a grade of C or higher in the final Statway™ term. The report describes the rate of successful completion across the 2011-2012 academic year for 18 community colleges and two state universities. These 20 institutions enrolled a total 1,077 students across 48 sections of Statway™ taught by 53

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<sup>1</sup> In this report, successful completion is defined as receiving a C or higher. A small percentage of the schools in this report use C- as part of their grading structure. For the purpose of this report, the few instances of C- are treated as a C.

<sup>2</sup> Colleges can use Quantway™ 1 in isolation to help students progress more efficiently through developmental mathematics or they may offer Quantway™ 2 subsequently.

<sup>3</sup> One college discontinued offering the program because its district mandated a district-wide developmental math program that had already been in place. The full analyses reported here do not include students in this college.

different faculty members. These 1,077 students constitute the analytic sample described in the current report (see Table 1).

### **Launch of Quantway™**

The first cohort of students began Quantway™ in the spring of 2012. The first cohort of students spanned eight community colleges across three states (see Appendix A for the complete list). In total, there were 23 faculty teaching 24 sections of Quantway™ 1 with 418 students enrolled.

The current report describes the rate of successful completion for the students who enrolled in the first cohort of Quantway™. In this report, successful completion of Quantway™ 1 is defined as receiving a grade of C or higher. Data from all eight community colleges are included, so our analytic sample described in the current report uses all 418 students (see Table 1).

### **Who Are the Students in Statway™ and Quantway™?**

Table 1 provides a description of the students in Statway™ and Quantway™ respectively<sup>4,5</sup>. Students' placement levels in reading and mathematics, gender, and race were obtained from institutional databases. To facilitate comparisons across institutions, we report placement level indicators (number of levels below college) that institutions assigned to students. Students also completed a student background survey upon their entry into the Pathways on which they reported their home language growing up and maternal education. Together these data sources provide a descriptive portrait of the students in the Pathways.

The vast majority of Statway™ students (78 percent) placed at least two levels below a college-level mathematics course and almost half would be required to take at least one developmental reading course as well. About 60 percent of the students are female and less than 30 percent were raised in families where the mother held a college degree. Over two-thirds of the Statway™ students are minorities and 45 percent grew up in an environment where a language other than English was spoken.

Similarly, over half (56 percent) of Quantway™ students placed into mathematics courses two levels or more below college-level mathematics and 39 percent placed into a developmental reading course as well. Sixty percent of Quantway™ students are female and about one third came from families where

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<sup>4</sup> Table 1 includes mathematics placement-level data from 807 students in Statway™ and 343 students in Quantway™, reading placement-level data from 663 students in Statway™ and 379 students in Quantway™, gender data from 1,074 students in Statway™ and all 418 students in Quantway™, and race data from 1,013 students in Statway™ and 389 students in Quantway™. Placement levels in both mathematics and reading were not provided by the two state universities in Statway™ and one community college in Quantway™. Placement levels in reading were not administered by one community college in Quantway™ and two community colleges in Statway™.

<sup>5</sup> The analytic sample in Table 1 varies because the first administration of the student background survey could not be matched at the student level to the institutions' completion data for all colleges. Thus the student background survey data includes some students who were not on the final official institutional course list. This limits the precision of the home language and maternal education data. The data are limited since we cannot distinguish between students who were officially in the course after their institution's drop date from the few students that took the survey at the beginning of the course and then dropped before their enrollment became official. Thus, these demographic variables include some students who were not included in the final analytic dataset for completion statistics. This data was collected from all 18 community colleges and both state universities in Statway™ and all eight community colleges in Quantway™. Table 1 includes home language information from 863 students in Statway™ and 434 students in Quantway™, maternal education information from 830 students in Statway™ and 418 students in Quantway™.

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the mother obtained a college degree. Quantway™ students are predominantly Caucasian (42 percent) and African-American (41 percent) with smaller percentages of other ethnic minorities and few students with a language other than English in the home. Overall, both Pathways enroll traditionally underserved populations but differ slightly in their ethnic compositions, likely reflecting the differences in the states in which the two Pathways are located.

Table 1  
*Demographic Data of Students who Enrolled in the First Cohort of Statway™ and Quantway™*

	Statway™	Quantway™
<i>Mathematics Placement Level</i>		
College Level	4.3%	0.3%
1 level below college level	17.6%	43.4%
2 levels below college level	51.8%	43.4%
3 or more levels below college level	26.3%	12.8%
<i>Reading Placement Level</i>		
College Level	51.9%	61.3%
1 level below college level	39.2%	28.7%
2 levels below college level	7.1%	10.0%
3 levels below college level	1.8%	0.0%
<i>Gender</i>		
Female	59.9%	60.3%
Male	40.1%	39.7%
<i>Race</i>		
Hispanic	33.1%	11.1%
Caucasian	29.2%	42.2%
African American	24.7%	40.9%
Asian	6.4%	2.3%
American Indian/Alaskan Native	0.7%	0.0%
Pacific Islander	1.1%	0.0%
Other	0.9%	2.3%
Multiple	3.9%	1.3%
<i>Home Language Growing Up</i>		
English only	55.5%	81.3%
English and another language	32.4%	12.9%
A non-English language only	12.1%	5.8%
<i>Maternal Education</i>		
Less than high school	16.0%	11.5%
High school graduate or GED	31.4%	31.1%
Some college but no degree	24.3%	20.3%
2-year college degree	8.0%	13.6%
4-year college degree	12.8%	15.3%
Graduate or professional degree	7.5%	8.1%

\*Placement levels, gender, and race were obtained from institutional databases provided by 18 community colleges from Statway™ and seven from Quantway™ and include: mathematics placement-level data from 807 students in Statway™ and 343 students in Quantway™, reading placement-level data from 663 students in Statway™ and 379 students in Quantway™, gender data from 1,074 students in Statway™ and all 418 students in Quantway™, and race data from 1,013 students in Statway™ and 389 students in Quantway™.

Home language and maternal education were obtained from a student background survey from students at all 20 Statway™ and eight Quantway™ institutions and include: home language information from 863 students in Statway™ and 434 students in Quantway™, maternal education information from 830 students in Statway™ and 418 students in Quantway™. See footnotes 4 and 5 for more information.

## Successful Completion for Statway™ Students

Statway™ aims to increase the percentage of developmental mathematics students who successfully complete a college-level mathematics course within one year of continuous enrollment. Working with institutional researchers, we were able to establish baseline data for the percentage of developmental mathematics students that successfully completed a college-level mathematics course<sup>6</sup>. Only 5.9 percent of their developmental mathematics students received credit for college-level mathematics in one year. Additionally, only 15.1 percent had achieved this goal after two years, 20.4 percent after three years, and 23.5 percent after four years.

After a full year of Statway™, 51 percent of Statway™ students had successfully completed the full Pathway (had a grade of C or higher in the final term) (see Table 2).

Table 2  
*Number of Students Who Successfully Completed Statway™ in the 2011-2012 Academic Year*

	Number of Schools	Initial Student Enrollment	Number of Students Completing* Pathway	Number of Students Successfully** Completing Pathway
Statway™	20	1,077	657 (61.0%)	550 (51.1%)

\*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

\*\*Successful completion is defined as receiving a grade of C or higher in the final term.

Statway™ was deliberately developed as a pathway for students to progress through developmental mathematics and to receive college mathematics credit within a year. Part of this design was inspired by the observation that many students get lost at the many critical junctures along normal developmental mathematics sequences. For example, many students enroll in developmental mathematics courses, but many do not complete them and of those who do, many do not complete the courses successfully. Another juncture where students get lost is reenrolling in a subsequent required course if and when they do successfully pass their first or second developmental mathematics course.

Statway™ reduces the number of critical junctures with a more streamlined program, but there still remain several critical junctures where students may fall from the Pathway. Thus we analyzed how many students persisted across each critical juncture throughout the year. In tracking student progress, the critical junctures included: completion of each term, successful completion each term (having a grade of C or higher), and enrollment into the subsequent term. Each of these junctures signifies a significant milestone in progressing towards successful Statway™ completion. Understanding the junctures where students get lost provides valuable information that can be used to further increase successful completion rates.

The structure of Statway™ differed slightly across institutions. Most community colleges (14 of the 18) and the two state universities offered Statway™ as a full academic year course spanning two semesters. Two community colleges offered Statway™ across two quarters and one offered Statway™ across three quarters. One community college offered Statway™ as a one semester intensive course. These

<sup>6</sup> Eighteen of the institutions provided baseline data for all developmental mathematics students who enrolled in 2008. Only the two state universities in Statway™ did not provide this data.

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differences in structures affected the number of critical junctures students needed to pass through to successfully complete the Pathway.

Progress rates were calculated by institution to better understand the institutional variation in how students persisted across each juncture. Table 3 and Figure 1 display the median, bottom quartile, and top quartile of the colleges' progress rates for each of the various junctures. The displays show results from the 18 schools that used a two-term path for Statway™. The community college that used a one-term path and one that used a three-term path showed similar trends to the other institutions.

The median completion rate for the first term of Statway™ for two-term programs was 93.3 percent and the median rate of successful completion was 68.3 percent. Also promising is the high percentage of students that enrolled in the second term of Statway™ after successfully completing the first term. The median rate of successful completion for the full Pathway was nearly half (45.3 percent). The most noticeable drop is the percent of students who completed the first term of Statway™, but did not do so successfully.

Table 3 and Figure 1 also show examples of the variation between colleges. For example, schools in the top quartile had every student complete the first term, where schools in the bottom quartile had at least 13 percent of their students withdraw before the completion of the first term. Schools in the top quartile had over 78 percent successful completion in the first term while schools in the bottom quartile had less than 62 percent of students successfully complete. Another example of variation is seen at the end of the second term where schools in the top quartile all exceeded the goal and had over 50 percent of students successfully complete Statway™ but schools in the bottom quartile all had successful completion rates under 43 percent. Our continuing goal is to drive our improvement efforts within and across institutions by better understanding the sources that cause this institutional variation.

Table 3  
*Percentage of Students Remaining in Statway™ at Each Juncture during the 2011-2012 Academic Year*

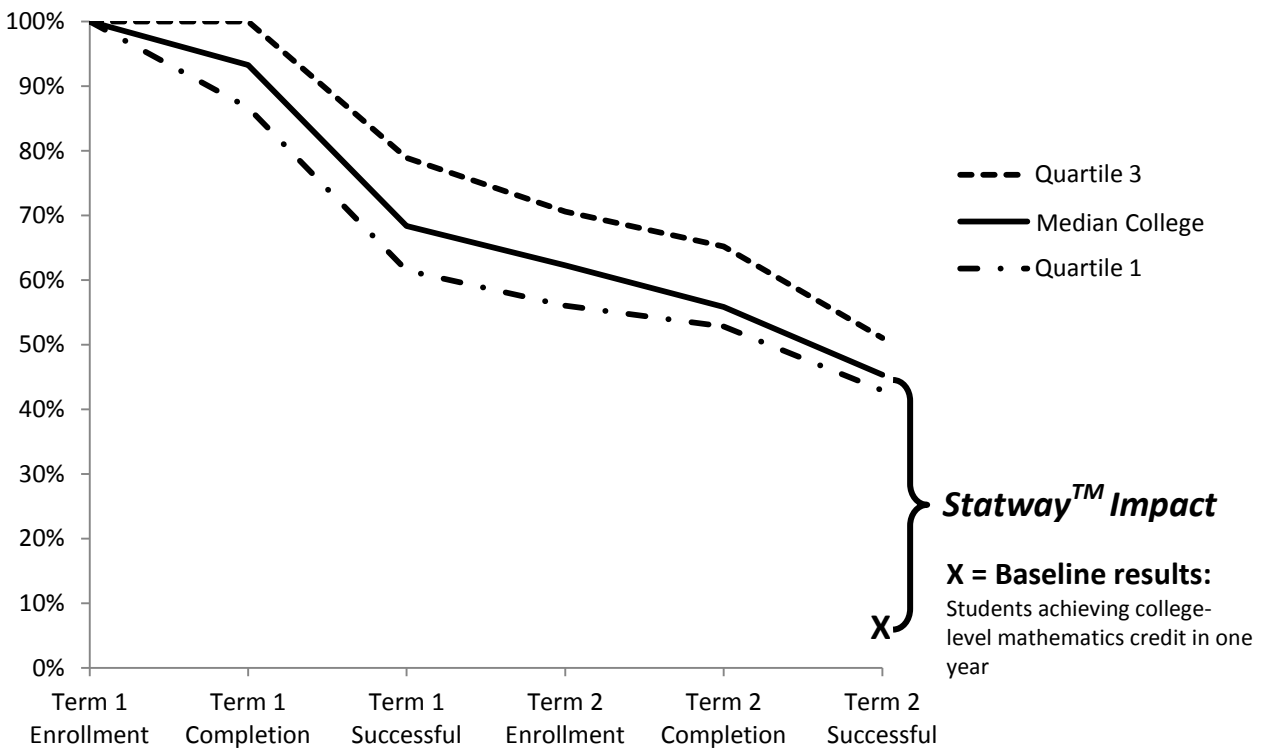
Students in Schools that Used a 2 Term Path for Statway™							
Quartile	Number of Schools	Term 1 Enrollment	Term 1 Completion*	Term 1 Successful**	Term 2 Enrollment	Term 2 Completion	Term 2 Successful
Top	18	100%	100%	78.9%	70.6%	65.2%	51.0%
Median	18	100%	93.3%	68.3%	62.3%	55.8%	45.3%
Bottom	18	100%	86.7%	61.5%	56.0%	52.8%	42.9%

\*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

\*\*Successful completion is defined as receiving a grade of C or higher in the final term.



### Completion Rate for the Statway™ Fall 2011 Cohort



\*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

\*\*Successful completion is defined as receiving a grade of C or higher in the final term.

Figure 1. Percentage of students remaining in Statway™ at each juncture in the 2011-2012 academic year for the 18 institutions who used a two-term path for Statway™.

## Successful Completion in Quantway™

Like Statway™, Quantway™ aims to increase substantially the number of students who complete a college-level mathematics course within one year of continuous enrollment. Implementation of Quantway™ began in the spring of 2012, however, this report presents results from only the first term. (See Table 4.) In the spring of 2012, 56 percent of all students enrolled in Quantway™ 1 successfully completed the course (i.e. had a grade of C or higher).

To place these first semester results in context, we worked with institutional researchers from six of the Quantway™ colleges<sup>7</sup> to establish baseline success rates for the percentage of students who completed their developmental mathematics sequences over different time periods. Only 20.6 percent were able to successfully complete the sequence within a full year. Additionally, 28.5 percent achieved this goal after two years, 31.6 percent after three years, and 33.3 percent after four years.

Judged against these baseline data, the first semester results from Quantway™ appear quite significant. In essence, Quantway™ 1 students experienced almost three times the success rate (56 percent versus 21 percent) in half the time (one versus two semesters).

Table 4

*Number of Students Who Successfully Completed Quantway™ 1 in the Spring of 2012*

Program	Number of Schools	Initial Student Enrollment	Number of Students Completing* Quantway™ 1	Number of Students Successfully** Completing Quantway™ 1
Quantway™	8	418	346 (82.8%)	234 (56.0%)

\*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

\*\*Successful completion is defined as receiving a grade of C or higher in the final term.

We analyzed the critical junctures of Quantway™ as we did with Statway™. This analysis looked at fewer critical junctures since only Quantway™ 1 was implemented during the 2011-2012 academic year. Quantway™ 1 was designed as a one-term course and seven of the community colleges offered it as a one semester course and one community college offered it as a single quarter course. Thus the only critical junctures include: completion of term 1 and successful completion of term 1 (having a grade of C or higher).

Progress rates were calculated by institution to better understand the institutional variation in how students persisted across each juncture. Table 5 and Figure 2 display the median, bottom quartile, and top quartile of the colleges' progress rates for each juncture. Each of these junctures signifies a significant milestone in progressing towards successful Quantway™ completion. Understanding where students get lost will inform the improvement of the Pathway.

<sup>7</sup> Colleges provided baseline data for all developmental math students who enrolled in 2008. One community college in Quantway™ did not provide this baseline data and one could only provide data from 2010 onward, which was not included.

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The median completion rate for Quantway™ 1 was 80.5 percent and the median rate of successful completion was over 60 percent. Also promising was the fact that the top quartile of colleges had a 70 percent or higher rate of successful completion. The percentage of students who successfully complete Quantway™ 1 and continue on to successfully complete Quantway™ 2 to earn college credit will be analyzed in a future report as the programming expands and when those data are available.

Table 5 and Figure 2 also show examples of the variation between colleges. For example, schools in the top quartile had 89 percent of students complete Quantway™ 1, where schools in the bottom quartile had at least 24 percent of their students withdraw. Schools in the top quartile had at least 70 percent successful completion of Quantway™ 1 while schools in the bottom quartile had less than 50 percent successful completion. Our goal is to advance further improvement efforts within and across institutions by better understanding the sources that cause this institutional variation.

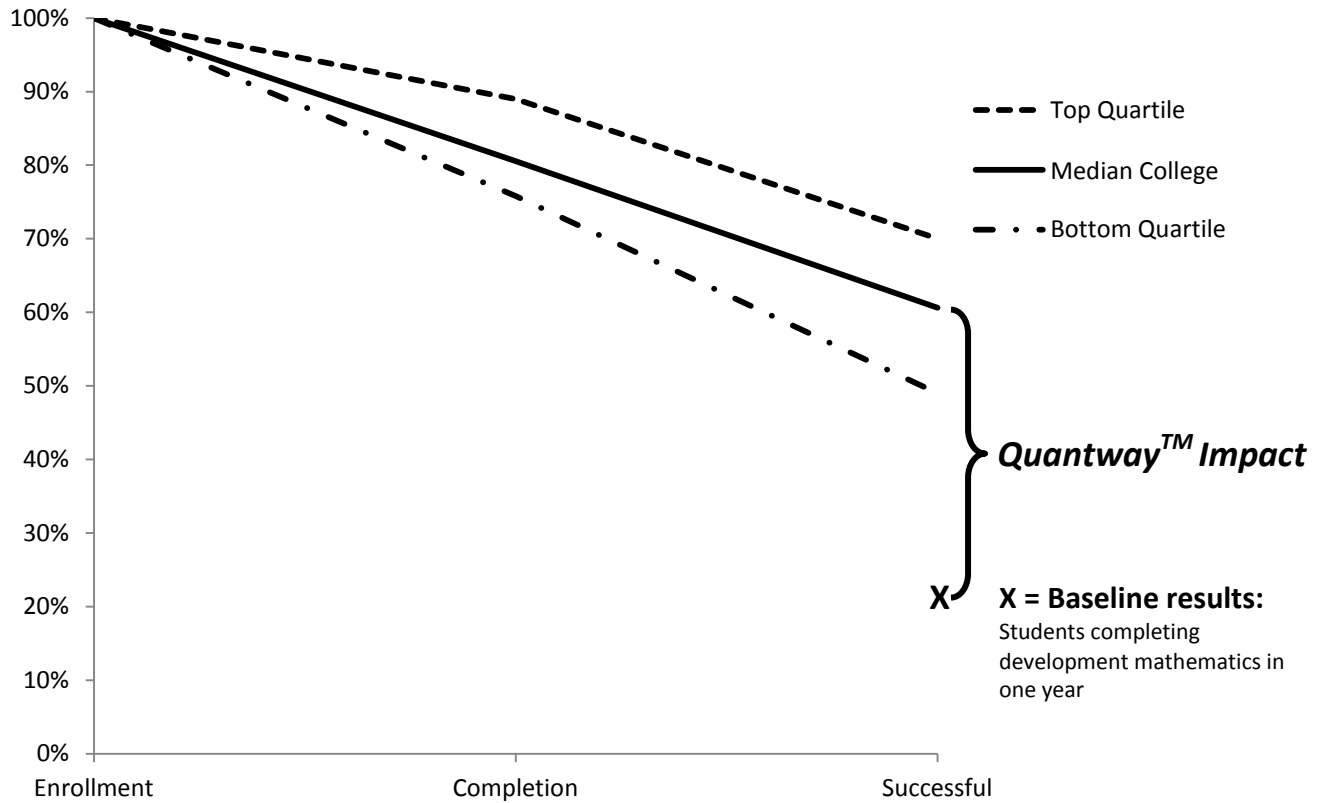
Table 5  
*Percentage of Students Successfully Completing Quantway™ 1 in Spring 2012*

Quartile	Number of Schools	Quantway™ 1 Enrollment	Quantway™ 1 Completion*	Quantway™ 1 Successful** Completion
Top	8	100%	89.0%	70.0%
Median	8	100%	80.5%	60.6%
Bottom	8	100%	75.8%	49.0%

\*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

\*\*Successful completion is defined as receiving a grade of C or higher in the final term.

### Completion Rate for the Quantway™ 1 Spring 2012 Cohort



\*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

\*\*Successful completion is defined as receiving a grade of C or higher in the final term.

Figure 2. Percentage of students successfully completing Quantway™ 1 in spring 2012.

## Conclusions and Next Steps

Results from the first year of implementation were very encouraging. Fifty-one percent of Statway™ students successfully completed the full Pathway, earning a college credit within one year. The majority of these students would otherwise have had to take two or more mathematics courses before enrolling in a college-level mathematics course and baseline data showed that only 23.5 percent of them would have successfully completed a college mathematics course within four years. In the first semester of Quantway™, 56 percent of enrolling students successfully completed Quantway™ 1 and successfully fulfilled their developmental mathematics requirement. In contrast, the baseline results from Quantway™ colleges indicate that only 20.6 percent of developmental mathematics students achieve this goal in a full year. This means that Quantway™1 almost tripled the success rate in half the time (one semester versus a full year.) Statway™ and Quantway™ succeeded in engaging students in ambitious and relevant mathematical learning while simultaneously shortening the time it took to complete their mathematics requirements.

This report has provided basic descriptive data of the percentage of students who successfully completed the new Pathways. The next report will undertake more sophisticated statistical analyses, seeking to isolate Pathway causal factors, college by college. A third report, also now in progress, will examine the variability in performance among students, classrooms, and institutions. Knowing what is and is not working, for whom, and under what set of conditions is key to informing the next round of Pathway quality improvements. It also informs further research around the long-term impact of the Pathways.

The ultimate goal of the Carnegie Pathways Networked Improvement Community is to engage practitioners and researchers in collective continuous improvement research. The results reported here are just the beginning. Network members are now initiating disciplined inquiries to further improve the instructional system, as well as student experience and faculty support associated with the Pathways. We aim to sustain (and improve upon) the promising initial results reported here, even as the Pathways initiative is taken up by many more faculty working under considerably more varied contextual conditions. The ultimate goal of the NIC is assuring efficacy with reliability at scale.

For more information on the Carnegie Community College Pathways Program, improvement research, and to see the list of founding institutions as well as the new institutions joining the Network, visit [www.carnegiefoundation.org](http://www.carnegiefoundation.org).

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**Appendix A: Participating Institutions in the 2011-2012 Academic Year**

**STATWAY™**

American River College  
Austin Community College  
Capital Community College  
El Paso Community College  
Foothill College  
Gateway Community College  
Housatonic Community College  
Houston Community College  
Los Angeles Pierce College  
Miami Dade College  
Mt. San Antonio College  
Naugatuck Valley Community College  
Northwest Vista College  
Richland College  
Sacramento State University  
San Diego City College  
San Jose State University  
Seattle Central Community College  
Tacoma Community College  
Tallahassee Community College  
Valencia College

**QUANTWAY™**

Borough of Manhattan Community College  
Cuyahoga Community College  
East Georgia State College  
Gainesville State College  
Onondaga Community College  
Sinclair Community College  
South Georgia State College  
Westchester Community College

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