# Fiscal Considerations of Statway® and Quantway®:

## We Should Be Doing This Anyway, But Here's How it May Help the Bottom Line

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OVERVIEW

This report introduces Statway and Quantway, explores their fiscal considerations, and shares the results of some efficiency studies. The report provides a backdrop for work designed to improve transfer mathematics achievement rates. It also examines why it's important to do things differently, including the implications for society of success (or lack thereof) in developmental education.

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# Introduction

## The landscape of developmental education mathematics

in the community college and broad-access state college sectors has changed over the past five years. An influx of innovative programs is starting to achieve notably higher levels of student success—a positive step for these colleges and, more importantly, the students that they serve. The awareness of and need for these programs has never been more pronounced. Calls for accountability are on the rise and the moral and economic imperative to help students achieve their goals at higher rates has moved to the forefront of our developmental education missions. While recent baseline data on developmental education students' achievement in the traditional mathematics sequence may not show large-scale improvement, what has markedly changed is the desire by colleges, legislatures, foundations and the public to see notable advancements in these numbers.

The Carnegie Foundation for the Advancement of Teaching commissioned the National Center for Inquiry and Improvement (NCII) to highlight one such effort to strengthen outcomes for developmental math students (see sidebar for more information on NCII). The Carnegie Foundation's work on its two related initiatives—Statway® and Quantway®—is designed to improve the progression rates of community college and university students through developmental mathematics and promote their success in transfer-level courses. The early achievements of these approaches have been noteworthy (see pp 6-11, *Introduction to Statway and Quantway* and *Community College Pathways: 2011-12 Descriptive Report*).

Many community college and four-year institutions are seeking to build on this preliminary success by either launching or expanding their own Statway and Quantway programs. This paper aims to underscore for higher education leaders and practitioners the fiscal implications of implementing these initiatives, including return-on-investment to colleges, cost per completer to colleges, student tuition and books savings and wage gain improvements for students. Ultimately, readers will discover that in addition to moral and ethical reasons for scaling programs such as Statway and Quantway, there are significant fiscal motivations for doing so that impact both colleges and their students.

**Specifically, this paper will:**

- Provide a backdrop for the work designed to improve transfer mathematics achievement rates (p. 4)
- Examine why it's important to do things differently, including the implications for society of success (or lack thereof) in developmental education (p.5)
- Introduce Statway and Quantway, including early data on results in the field (p.7)
- Generally explore the fiscal considerations of Statway and Quantway (p.9)
- Describe the return-on-investment (ROI) approach to Statway and Quantway (p.11)
- Share results of the ROI model in action at six colleges (p.15)
- Describe the cost efficiency, student cost savings and wage gain approaches to Statway and Quantway (p.19)
- Share results of the cost efficiency, student costs savings and wage gain approaches in action at six colleges (p.21)
- Provide concluding remarks (p.24)

**We expect that this paper will be useful for a range of higher education professionals, including:**

- Senior leadership at community colleges and four-year colleges and universities seeking a fiscally sound and promising model to meet accountability calls for increasing student outcomes
- Mid-level management looking to make the case for innovation both to their senior leaders and to their departments
- Mathematics department chairs looking for support to make a fiscal as well as a moral argument to launching or expanding such programs
- Faculty in departments who are concerned that their innovations will not scale because of fiscal considerations
- Institutional research professionals looking for a model they can customize to their unique college dynamics to assess programs such as Statway and Quantway
- Business officers attempting to ensure fiscal stability with college innovations
- Policymakers and foundations looking for a complete picture of innovations such as Statway and Quantway
- Leaders of other innovative and scalable programs in developmental education who can use the thought capital underlying this paper and considerations of scale to adapt for their innovations

# Backdrop to Doing Things Differently

To set the stage, a vast majority (55% to 85%) of first-time freshmen in US community colleges require some form of developmental education mathematics. **More striking, less than half (30% to 50%) of these students successfully complete a transfer-level mathematics course**. For those learners starting two levels below transfer mathematics, the transfer-level success rates are often closer to 20% to 25%, and for those starting three or more levels below, the success rates are most commonly in the 6% to 12% range.

Clearly, these data scream for change and many colleges have attempted to improve these outcomes. However, most higher education institutions across the country continue implementing the dominant instructional paradigm in pre-transfer mathematics that came into existence well over half a century ago. This model can be described as one where a "traditional" sequence of courses specifically directs students toward completion of calculus. This sequence generally includes pre-transfer offerings such as arithmetic, pre-algebra, introductory algebra and intermediate algebra and leads to transfer-level courses such as pre-calculus and/or trigonometry. Most often, this curricular structure is implemented in conventional ways, with one instructor working with one classroom to deploy a curriculum that is somewhat devoid of real-world context. Finally, students increasingly experience a limited suite of support services and faculty struggle to have the time, resources or support structures to use classroom-level data for improvement of pedagogy or the program structure.

If we have proved anything in our decades of using this traditional model of developmental education mathematics, it is that **without *significant* structural changes, we will obtain exactly the same depressing outcomes we note above**. We do have examples of innovative programs around the country moving the needle—even significantly—with alternate approaches. Most of these nontraditional strategies have remained isolated and small in scope for a host of reasons, including:

- A lack of historically detailed and cohort-focused institutional research to evaluate program effectiveness against the traditional model
- A "pilot mentality," often without institutional commitment to expand or scale an innovative approach
- Limited awareness about the literature and its findings

- Need for paradigm shifts in the thinking of campus administrators, faculty and staff
- Organizational change and political obstacles associated with scaling structurally different approaches

In the end, while all of these issues are certainly factors, the single biggest reason may very well be the *perceived* cost of implementing such innovative programs at scale with many, most or all students. Before we get to the central thesis of this paper—that **we may actually make incorrect assumptions about the cost of these innovative programs to both the college and its students**—let's examine the implications for society of our limited success in developmental education.

# Why It's Important to Do Things Differently

Extensive research underscores the myriad of economic and societal benefits of an educated, highly-skilled populace. According to the Bureau of Labor Statistics, in 2012 high school graduates earned an annual income of $33,904, an associate's degree holder earned $40,820 (20% higher), and a bachelor's degree holder earned $55,432 (63% higher than HS). The ability to meet educational needs has also been made more challenging by a rapidly evolving workplace. It has been estimated that 70% to 80% of new jobs require advanced or superior skills (McCabe, 2000).

McCabe (2000) also notes that economists and educators have identified a number of potential consequences of the relative lack of achievement of students in college, including:

- Massive failure rates, which could lead to declines in educational standards
- Fierce competition for a limited number of unskilled jobs
- Significant increases in unemployment rates and concomitant expenditures on dependent individuals
- A socioeconomic stratification of "haves" and "have-nots" with a dwindling middle class
- Increased crime rates associated with unemployment and/or limited economic opportunity
- Lack of a skilled workforce to compete in a global economy

Beyond well-documented economic benefits, individuals exposed to higher education also experience a number of societal benefits. These societal benefits have been identified in a variety of studies, whose findings include the following.

- Compared to high school graduates, college completers were more likely to have a higher level of personal savings, experienced greater personal/professional mobility, exhibited better consumer decision-making and participated in more hobbies and leisure activities (Institute for Higher Education Policy, 1998).
- Individuals with some postsecondary education were more likely to be open-minded, culturally aware, make rational decisions, exhibit consistency in their behavior and were less authoritarian than individuals who had not been exposed to postsecondary education (Rowley and Hurtado, 2002).
- Furthermore, the same studies and others have also found that the societal benefits of postsecondary education extend beyond the individual, positively affecting family and offspring with an improved quality of life, higher health levels and lower mortality rates for the offspring of college graduates.

A final note on the societal impact of higher education participation is perhaps the most important point. The push to improve developmental education is inextricably intertwined with the agenda to increase equity for students from historically underserved populations. Unfortunately, one place that students from underrepresented populations are actually *overrepresented* is in the ranks of developmental education. For example, in the California Community College system, 8% of the 2008-09 overall population of 2.7 million students was African-American and 30% was Hispanic; yet, 11% of the students in developmental education coursework were African American and 41% were Hispanic. While just a snapshot, the data do suggest that the community colleges' efforts to enhance developmental education truly are even more important for ensuring equitable outcomes for every learner.

The conditions that lead to students arriving at the community college doorstep "underprepared" are outside the scope of this inquiry. However, the work that community colleges undertake in developmental education is, at its heart, an attempt to create the optimal conditions for learning for *all* of students—with the ultimate goal of increased student goal attainment. The moral imperative to foster innovation that leads to this increased student success is made exponentially more important when the equity agenda is layered on top of it.

So in the end, the societal, economic and moral reasons to fundamentally and significantly improve the rate at which students successfully complete developmental education—and by extension, completion of degrees, certificates, or transfer—are quite clear and immediate. Fortunately, programs such as the Carnegie Foundation for the Advancement of Teaching's Statway and Quantway initiatives have been designed to substantially improve these outcomes, at scale, for the entire range of students that need them.

# Back to our Intrepid Adventure… an Introduction to Statway and Quantway

To begin addressing this critical issue, the Carnegie Foundation for the Advancement of Teaching has engaged networks of faculty members, researchers, designers, students and content experts in the creation of two new pathways.

1. **Statway**: a one-year pathway focused on statistics, data analysis and causal reasoning that leads to completion of transfer-level statistics

2. **Quantway**: a pathway focused on quantitative reasoning; aims to promote success in college mathematics and culminates in college-level quantitative reasoning or an equivalent course

Carnegie's goal is to dramatically increase the percentage of students who earn college math credit within a year of continuous enrollment. It aims to put college students on a pathway to success, not just in college, but in their lives and careers as well. In addition to major curricular and structural changes, Carnegie's Statway and Quantway are also unique in their focus on the instructional system surrounding these curricular changes. Notable features of this system include:

- **Ambitious learning goals** leading to deep and long-lasting understanding
- **Lessons and out-of-class materials** to advance these goals
- **Formative and summative assessments**, including end of module and end of course assessments
- **A focus on productive persistence** operationalized through 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
- **A language and literacy** component that integrates necessary literacy supports in instructional materials and classroom activities

- **Professional development** designed to provide instructors with the knowledge, skills and habits necessary to experience efficacy in their initial use of the Pathways approach while developing increasing expertise over time
- **Rapid analytics** to support continuous improvement of teaching and materials

Carnegie's approach with Statway and Quantway is fundamentally different from other such national models, as it:

- Acts as a steward for networked improvement communities (NIC) focused on developmental education mathematics
- Joins together the worlds of research and practice, making faculty co-developers and research partners
- Focuses on continuous, evidence-based improvement
- Learns from practice to continuously advance
- Believes that much more can be accomplished together than even the best can accomplish alone

## Promising Results

Carnegie's Statway completed its first full year of implementation in the 2011-12 academic year in 19 community colleges and two state universities in five states. First-year results were notably promising. Quantway had its first full year of implementation in 2012-13 with eight colleges in three states after a one-semester launch in spring 2012. Early results are similarly positive. A report summarizing the results of the first year is available at www.carnegiefoundation.org/sites/default/files/CCP_Descriptive_Report_Year_1.pdf.

However, one result stands above the rest: **over 51% of Statway students successfully completed the entire pathway including the transfer-level statistics course in one year, compared to 6% of a baseline comparison group attempting the traditional sequence in a year**. Even when expanding the timeframe of the traditional group to three years, only 20% of the entering cohort achieved transfer-level success, again compared to the Statway rate of 51%. These results represent a 250% increase in success over the conventional approach.

For the eight colleges starting Quantway in spring 2012, early results were equally promising. 56% of Quantway students passed their "Quantway 1" course in their first semester; with a predicted rate of second semester success similar to Statway, we would expect over 40% of these students to complete Quantway 2 within two semesters. This compares quite favorably to the expected or "baseline" rate for traditional developmental math students in the absence of Quantway – 20% of whom would complete their developmental math sequence in 1 year, and 33% who would complete it over a 4-year period. Carnegie will report on the full-year Quantway data with the entering cohort of fall 2012 late in 2013.

These results are quite remarkable in the first year of a program such as Statway or Quantway, and one might expect that as the initiative further evolves, initiative- and college-level learning will result in further improvement of these rates over time. Taking a cue from our exploration of the societal, economic and equity issues associated with a call to improve developmental education, it can be said that Statway and Quantway appear to be extremely promising approaches to significantly enhancing our students' lives by facilitating their achievement of success in developmental education at both markedly higher and notably faster rates.

# Fiscal Considerations of Statway and Quantway

While programs such as Statway and Quantway may very well demonstrate an impressive improvement in student outcomes, a significant concern still emerges from a college standpoint: **Can we afford to do this at scale**? Of course, educators are sympathetic to the societal, economic and moral considerations cited above. Yet, at the end of the day colleges have to pay their bills, and they must do so in an environment where resources available to them are generally shrinking, not expanding. Many colleges have examples of innovative "boutique" programs—expensive efforts that usually serve a fraction of the students who need the intervention, with no concrete plans for scaling them to serve many, most or all students.

Thus, this significant question of economic viability arises even more so when a program is as extremely successful as the early returns on Statway and Quantway suggest. Given its focus on a redesigned curriculum, pedagogy and instructional support within the classroom, Statway and Quantway are nowhere as costly as many of the boutique programs that exist in developmental education across the country. However, in the resource-strapped environment that colleges find themselves today, institutions must consider the fiscal ramifications of any structural change that has incremental costs—even as modest as those of Statway and Quantway.

There are numerous ways to address these fiscal considerations. The following list, while not exhaustive, suggests that such approaches fall into six categories.

1. **Cost Analysis Approaches**: An analysis of what it costs to "do things differently" versus the traditional model. This analysis usually includes costs such as incremental salaries, release time for faculty, stipends, support from institutional research, additional student services support, tutors, subscription costs, travel, supplies, etc. Note that colleges are often quite good at identifying these incremental costs—usually to identify how expensive something is—which often hinders its expansion and adoption.

2. **Cost Effectiveness Approaches**: An investigation of not only the incremental costs to the college but also the potential for *incremental revenue* that may be generated to offset the costs. This approach is also commonly referred to as "return-on-investment", or ROI analysis. ROI analyses are fairly common in other sectors, but have been relatively absent from conversations in higher education. Not without challenges, ROI approaches must deal with differential costs and returns by programs, interdependency with the level of efficiency found in the college and/or related departments, enrollment caps and state funding issues.

3. **Cost Efficiency Approaches**: An assessment of the effect of the program and its incremental costs on key outcomes such as completion, transfer and graduation. These approaches are also referred to as "cost per graduate", "cost per completer" or "cost per transfer". These are extremely important analyses when accountability or institutional effectiveness calls for improvement in key outcomes, and even more so when there are performance-based or incremental funding streams in place or emerging at a college or in a state system.

4. **Cost Savings for Students**: Determination of what savings students can realize through participation in a particular intervention or innovation. As colleges become more efficient at creating structures that enable students to finish their degrees more quickly, there are direct cost savings to the student that include tuition savings and the cost of books.

5. **Wage Gains for Students**: Identification of increased income resulting from program enrollment. Similar to cost savings, as students finish degrees earlier, they will experience incremental wage gains by entering the workforce earlier than under the traditional model. This quicker time-to-credential has a dual effect: it increases the colleges' efforts to increase wages for their students, but perhaps more importantly, produces a net wage gain for the student.

6. **Economic Impact to Community**: Assessment of how an innovation affects the broader community. As more students get credentials and degrees, local, state and national economies are catalyzed. These outcomes are naturally hard to estimate, but they are important to call out as a fiscal impact of innovative programs such as Statway and Quantway.

In the remainder of this paper, we will provide an order-of-magnitude demonstration of the fiscal effects of Statway and Quantway by addressing the first five considerations listed above. We will explore the economic impact to community at a later date. To conduct this demonstration, we developed a series of simple models in Excel that colleges can customize for their own student population, proposed outcomes and funding mechanisms. Ultimately, **we developed these models to support the case that colleges should seek to offer innovative, successful and nontraditional approaches such as Statway and Quantway at scale, to the entire range of students** who desperately need the benefit of such programs' improved outcomes.

# The ROI Approach to Statway and Quantway

*In this first model, we address two of the six fiscal considerations listed above—* ***Cost Analysis*** *and* ***Cost Effectiveness****. We need to complete the cost analysis work to be able to assess the cost effectiveness or ROI of programs; in turn, these two analyses are inextricably intertwined.*

To begin, we should note that colleges are most commonly set up to think in terms of fiscal periods such as fiscal years. Simplistically, colleges aim to determine how this year's salaries, fixed costs and variable costs will be offset by revenues generated by apportionment, tuition, property tax and other general fund sources. The fixed sources of funding primarily consist of local levies and/or other tax measures which operate as fixed amounts in a given year. There is a wide variety of funding models across the states. In nearly all of them, the "variable funding" of state apportionment revenue, tuition and fees—the funding that increases proportionately as enrollment increases—comprises at least 50% to 60% of the total general fund revenue. In California, variable funding is essentially the only source of general fund revenue; the percentage of funding contributed by apportionment is over 90% at most colleges. It is this variable funding that we target in the approach described below.

If Statway and Quantway programs are successful, they have the following outcomes:

- Increased course retention
- Increased course success rates
- Increased persistence from term to term (or in school)

- Increased progression to and through college-level work
- Increased overall units attempted and earned
- Reduced time to degree or certificate

Clearly, these outcomes are desirable from the standpoint of the mission of the college and the entire system; but they are also associated with tangible economic benefits to be realized for individual campuses. Specifically, as these students successfully progress through their developmental education work, persist, achieve college-level work and graduate and/or achieve transfer readiness at higher rates, these more successful and persisting students produce a financial side benefit—an increase to the college in full-time equivalent students (FTES). The two main sources of variable funding available to a college are both driven by this FTES figure: (1) tuition revenue and (2) apportionment revenue.

Here is the crux of the incremental revenue approach. **The additional FTES generated from newly successful students in Statway and Quantway produces additional apportionment, tuition and fee revenue to the college.** Note that this incremental FTES is not available under the "traditional" model of developmental education, with its lower levels of success and retention. Thus, this amount can be applied to offset much, if not all, of the incremental costs of these nontraditional programs.

## How to Apply these ROI Models

To support colleges in determining ROI, we built a relatively simple ROI model in Microsoft Excel that can estimate the potential revenue generated to offset the incremental costs of Statway and Quantway. This Excel model is available at http://www.carnegiefoundation.org/developmental-math/fiscal-considerations and consists of five worksheets.

1. **Model Inputs:** This sheet lists all the values that can be customized for each college's unique Statway and/or Quantway implementation and that are necessary for the models found on the *ROI Model* and *Other Models* worksheets described below. Default values are listed for all of the model inputs; a college can choose to either customize values to its own estimates or actual values, or it can leave the inputs at their default values.

2. **Instructions:** This worksheet provides detailed instructions for each of the *Model Inputs* described above.

3. **ROI Model**: This worksheet combines information from the *Model Inputs* worksheet above with calculations designed to determine the incremental costs, funding

assumptions, incremental FTES/revenue and eventually "profit" and return on investment (ROI) for Statway and Quantway cohorts.

4. **Other Models**: This worksheet also uses information from the *Model Inputs* worksheet and calculates a cost per degree/completion, student cost savings and student wage gains.

5. **Charts:** This worksheet includes charts for a couple of the key outcomes from worksheets 3 and 4 above, including cost per degree/completion and student tuition and books cost savings.

The ROI model uses a number of inputs that allow a college to customize it to their local situation, including:

- Salaried personnel costs
- Hourly personnel costs
- Other incremental fixed costs for Statway and/or Quantway implementation (e.g., Carnegie subscription fees, travel to a summer forum and winter regional meetings, supplies, recruiting, etc.)
- College tuition
- State-level apportionment funding per FTES
- Number of students in Statway and/or Quantway at the college, either as a pilot or at scale
- Predicted increase in FTES from Statway and/or Quantway
- Discounting percent for "profit" available from incremental revenue

## Considerations for these Models

Using these inputs, the model calculates both an absolute potential revenue number associated with a Statway or Quantway implementation for a given student population size and a ROI percentage. Without going into a deep exploration of the model's mechanics, we present a few items worth considering.

First, the potential revenue associated with students who are retained and progress farther than their traditional counterparts is not without its costs. That is, while some of these students may fill under-enrolled classrooms in transfer-level math and general education and program-specific courses, colleges will also likely need to open additional sections of such offerings to meet the increased demand of the more successful students. These additional sections have an instructional cost for which we need to account. In addition, there are also overhead and infrastructure costs associated with increased student retention and persistence. Given these factors, we need to "discount" the potential revenue that is generated by the incremental FTES. This discount is similar to the "cost of sales" or "cost of goods" rates applied to such ROI models in industry.

In turn, the model uses a "discounting rate" for the incremental revenue. In discussions with business officers and others familiar with the economics of colleges, we estimate this discounting percentage to range from 40% to 60%. For our initial set of models, we set a default rate for this discounting percentage at 45%, which represents our best estimate of how much potential revenue a "standard" college would need to use for the additional course sections and/or infrastructure costs associated with more successful and retained students. In using the model, a college could simply leave this model input at 45%, or change it to a customized value to reflect its own unique situation and/or conservativeness or aggressiveness in making such estimates.

Second, this ROI approach is problematic in states that have "enrollment caps", where apportionment stops at a certain level of FTES. That is, if a college in such a state has an enrollment cap for a year of 14,000 FTES, and they serve 15,000 FTES, they are not funded for the extra 1,000 FTES they generated. Such a system clearly has some perverse incentives, and fortunately there are only a handful of states where such a system is in place (most notably California). In these states, we suggest looking at the cost per completer, student savings and wage gain measures described below; at the same time, if a college is well below its cap, the incremental revenue/ROI approach still has value.

Finally, this is not a sophisticated economic model. It does not take into account concepts such as net present value or economic rates of return. It is designed as an order-of-magnitude demonstration, primarily to provide a counterpoint to the all-too-common perception that programs such as Statway and Quantway are too expensive to implement at scale.

# The Statway and Quantway ROI Model in Action

To demonstrate the ROI model and provide some initial data to serve as a point of departure for colleges considering customizing the model to their own parameters, we conducted an hour-long interview with six Statway and Quantway schools and customized this particular model to their local parameters. These institutions were American River College (CA), Capital Community College (CT), Cuyahoga Community College (OH), Mount San Antonio College (CA), Tacoma Community College (WA) and Valencia Community College (FL). They represent a variety of state funding models and local conditions related to their Statway and Quantway implementation. We worked through the costs unique to each college associated with Statway and/or Quantway, applied their local tuition and state funding amounts and calculated a net revenue amount and program return-on-investment (ROI).

Overall, program sizes ranged from 60 to 200 students. For the most part, the interviewees chose to focus the ROI models on the current size of their Statway or Quantway implementations. Interviewees and/or other colleges using the model could also calculate an ROI model “at scale” with 500 or 1000 or more students who might benefit from such a program moving forward. The colleges were fairly conservative in their estimates of the increase in incremental FTES from the more successful students associated with Statway and Quantway; they used a tight range of conservative estimates from an increase of 10% to 12%. Of course, when three years of data are accumulated, we will be able to calculate the actual FTES difference for Statway and Quantway students.

For context, the author of this work previously calculated actual incremental FTES figures using real-world data from four California community colleges in a similar ROI model associated with a major California developmental education initiative. The incremental three-year FTES percentages associated with the more successful students from innovative developmental education programs were 6%, 18%, 36% and 47% for the four colleges’ innovative program groups. That is, students in the innovative developmental education program at College 1 experienced a 6% increase in their three-year downstream FTES compared to a control group’s three-year FTES, while College 4 experienced an impressive 47% increase in the three-year downstream FTES versus their control group. As such, the 10% to 12% estimates used in these Statway and Quantway models are likely extremely conservative, given that Statway and Quantway have produced notably higher pathway completion rates than did the programs modeled in California at the time. These outcomes suggest that when we have actual Statway and Quantway three-year downstream results, the percentage increase is very likely to be at least toward the higher end of this 6% to 47% range, and could in fact even exceed the highest value. The impressive ROI results that are modeled below with the conservative estimate are likely to be even more remarkable when the actual rates are used and when the data becomes available in two to three more years.

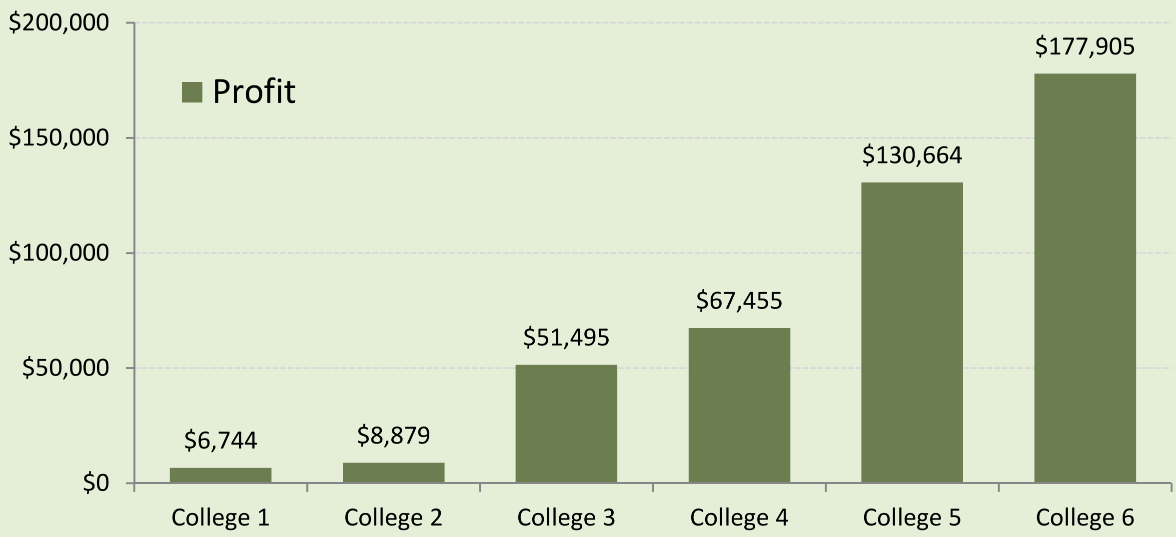
As a side note, the findings from the abovementioned California study combat a widely-held belief found in many institutions. Namely, we often hear (usually quietly and off the record) that colleges are benefitting from the revenue associated with students swirling through long sequences of developmental education courses. Further, it is whispered that when students need to retake these courses one, two or three times, the college also generates revenue. The data cited above throws a significant wrench into this argument, finding that even with a minimal intervention, the three-year FTES or revenue generated from the innovative group was higher than the traditional control group. This makes sense from a logical standpoint, as students in the innovative group are more successfully persisting and taking a host of transferable math, general education and program-specific courses. However, it is comforting to have data supporting the logical argument. Given the even stronger results found with Statway and Quantway than in the programs cited above, one would expect the downstream FTES to be at least comparable to, and perhaps even higher than the previously mentioned results.

When we observe our six colleges who participated in the ROI modeling exercise, we find that even with the relatively conservative estimates cited above, the model generated a positive return on investment with an associated positive net revenue figure every time**. Figure 1 below provides the modeled net revenue figures over a three-year period for each of the six colleges associated with a single Statway or Quantway cohort, ranging from $6,744 to $177,905**.

In a sense, this net revenue is the "profit" to the college associated with a single Statway or Quantway cohort, modeled at a size between 60 and 200 students. That is, using an estimated modest 10% to 12% increase in downstream three-year FTES from Statway or Quantway students over a control group, the chart reports the "profit" that is remaining after (1) taking into account all of the associated incremental costs of Statway or Quantway and (2) additionally discounting the net revenue by 45% to account for the cost of additional sections and/or increased infrastructure associated with the more successful students in Statway or Quantway.

These figures are impressive given the small size of these cohorts as well as the conservative estimates on the incremental revenue associated with the successful Statway and Quantway students. It is also important to note that these figures are for one entering cohort of Statway and Quantway students; while the model tracks their downstream revenue for three years, incremental costs are only recorded in the first year. Another entering cohort of students will start in Year 2 at a college implementing Statway or Quantway, and their revenue can also be tracked for three years. In the end, once at scale, a college will receive downstream benefits from multiple cohorts of students while amassing only Year 1 cohort costs in any given year.

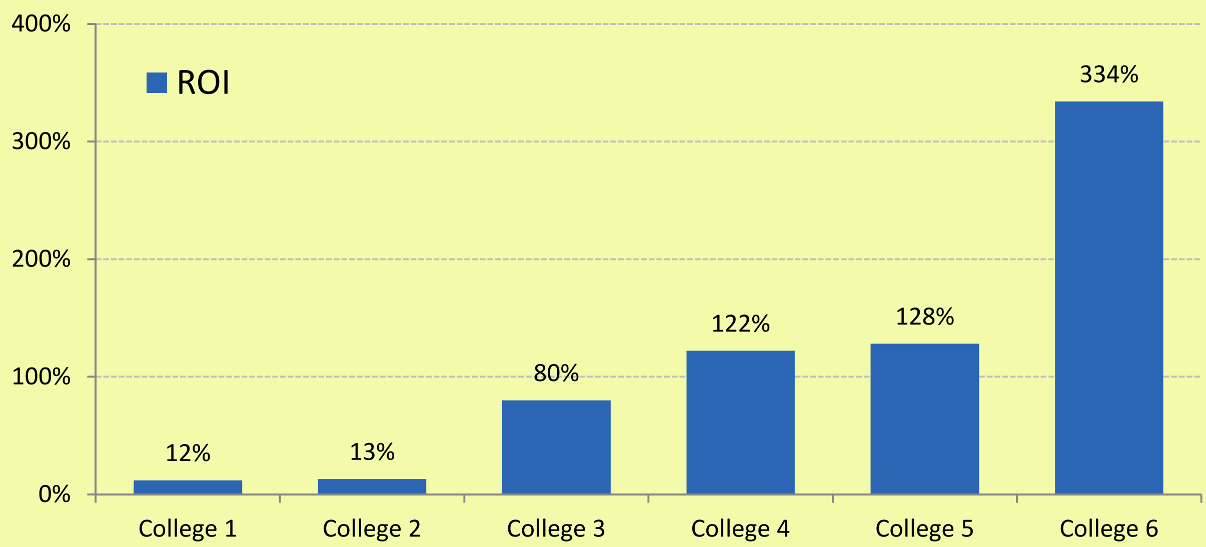
**Figure 1. Modeled Three-Year Profit from Each Statway/Quantway Cohort, by College**



After calculating these incremental net revenue figures using the model noted in Figure 1, we can also calculate a classic ROI rate. ROI is calculated by taking the incremental net revenue associated with a program and dividing it by the total incremental program costs.

The ROI rates are summarized in Figure 2 below.

**Figure 2. Modeled ROI Rates for Six Statway / Quantway Colleges**




**The ROI rates were all positive, and ranged from 12% to 334%.** Note that even the 12% ROI indicates that the college generated net revenue that is 12% higher than the incremental program costs. From industry standards, ROI rates that are above 50% are considered quite high and those over 100% are extremely high.

Taken together, the results of these ROI models are quite positive**. In addition to the more important outcome of getting 2.5 times as many students to succeed in transfer-level mathematics in one year as a traditional group did in three years, the ROI models suggest that Statway and Quantway were likely able to achieve this outcome at a net revenue gain to the college.** As an institution considers the expansion of Statway and Quantway to scale, the ROI model described here and its strong results suggests there may also be a financial benefit to the college for such an expansion.

# The Cost Efficiency, Student Cost Savings and Wage Gain Approaches to Statway and Quantway

*In this second set of models, we explore **Cost Efficiency Approaches, Student Cost Savings** and **Student Wage Gains**.*

## How to Apply these Models

This second set of models is calculated from the same set of *Model Inputs* found on the first sheet in the Excel file mentioned above. The results for these three approaches are included on a separate worksheet in the Excel file titled *Other Models*.

Overall, the cost efficiency, student cost savings and wage gain approaches are somewhat simpler than the ROI approach. In the cost efficiency/cost per completer model, we calculate the costs associated with a cohort of students annually for the first five years of their tenure with the college, adjusting for attrition and eventually graduation and completion rates. For the student cost savings and wage gain approaches, we simply estimate these figures based on (1) a decreased time to completion for Statway and Quantway students, (2) the per semester tuition and book costs and (3) an estimate of incremental wage gains associated with completing a certificate and/or degree.

## Considerations for these Models

Most of the calculations necessary to complete these sections of the model are already collected in the ROI model, with a couple of notable exceptions. First, we need to calculate a time to degree/completion improvement for Statway and Quantway students for use in the student cost savings and wage gain approaches. As previously highlighted, the early data on Statway and Quantway suggests a notable improvement not only in the number of students achieving success through the transfer-level course in the pathway (51% vs. 20%) but also in the time to accomplishing this milestone (51% completed in one year vs. 20% in three years). Therefore, it seems reasonable to suggest that Statway and Quantway students will be able to improve on the median community college completion time of 4.5 years. We have utilized a one-year improvement of the median completion time to 3.5 years as the default in our model. This seems justified due to the significant decrease in time to finish developmental education and the transfer-level math course noted above, but this is another data point for which we eagerly await the actual results for the initial Statway or Quantway cohorts in a couple of years.

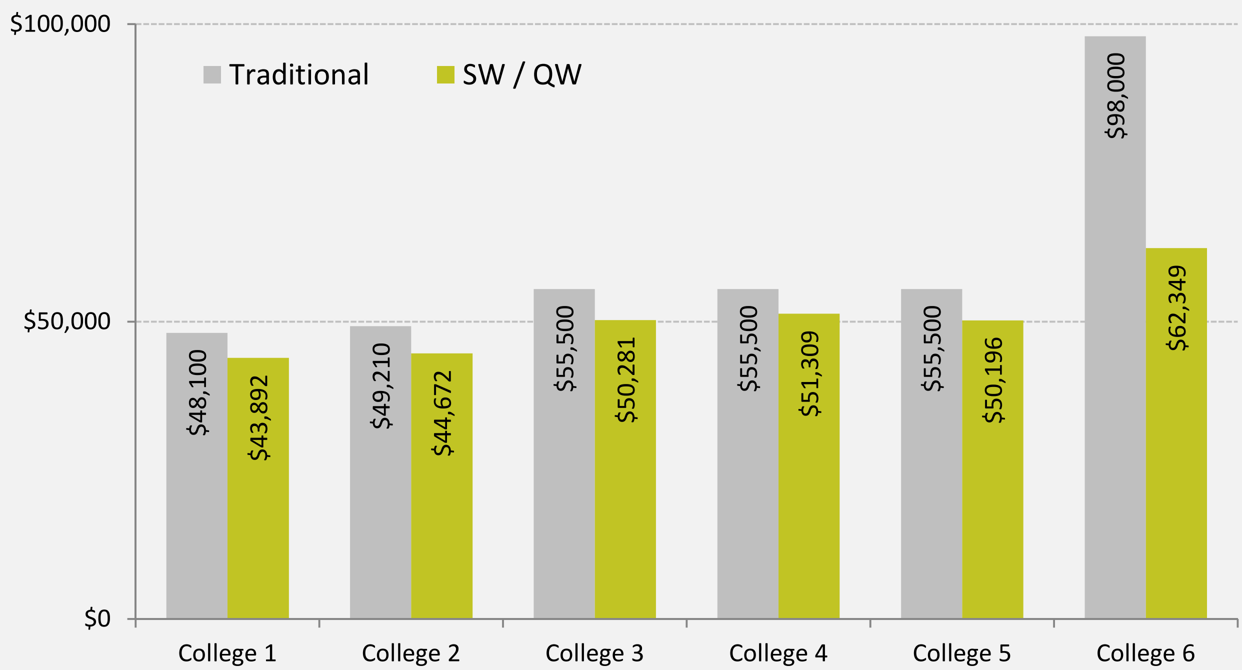
Second, we need an overall estimate of spending per student at the college under the traditional model, so we can compare the institution's spending per student under the Statway and Quantway model with its additional up-front costs. There are many ways to get this figure; for example, one could divide the total annual institution budget by the unique headcount to get a college spending per student figure. There are also national projects that have estimated this number to be around $10,000 per student. For the model we applied a default of college spending of $9,250 per student based on a study in California.

Finally, two keys to the cost efficiency/cost per completer model are the third-semester retention rate, and the two-year, three-year, four-year and five-year completion rates for entering cohorts of students under the traditional model. These can be relatively easily obtained at most colleges through standard accountability reports or a request to the institutional research department. We need these rates to associate costs with the students who remain after one year, two years, three years, etc. to calculate the cost per completer.

# The Statway / Quantway Cost Efficiency, Student Cost Savings, and Wage Gain Models in Action

Overall, the six colleges that went through the initial modeling exercise accepted many of the default estimates we established for these particular models, although they of course could change these going forward when using the model on their own. The net effect of using common estimates is that the outcomes were very similar for the six colleges on these three modeled outcomes. One key example of this result is that the six colleges applied an estimated one-year improvement on time-to-degree for their Statway and Quantway students. Figure 3 below shows the cost per completer under both the traditional model and the Statway and Quantway model at the six colleges. With one exception, the amounts saved are extremely similar.

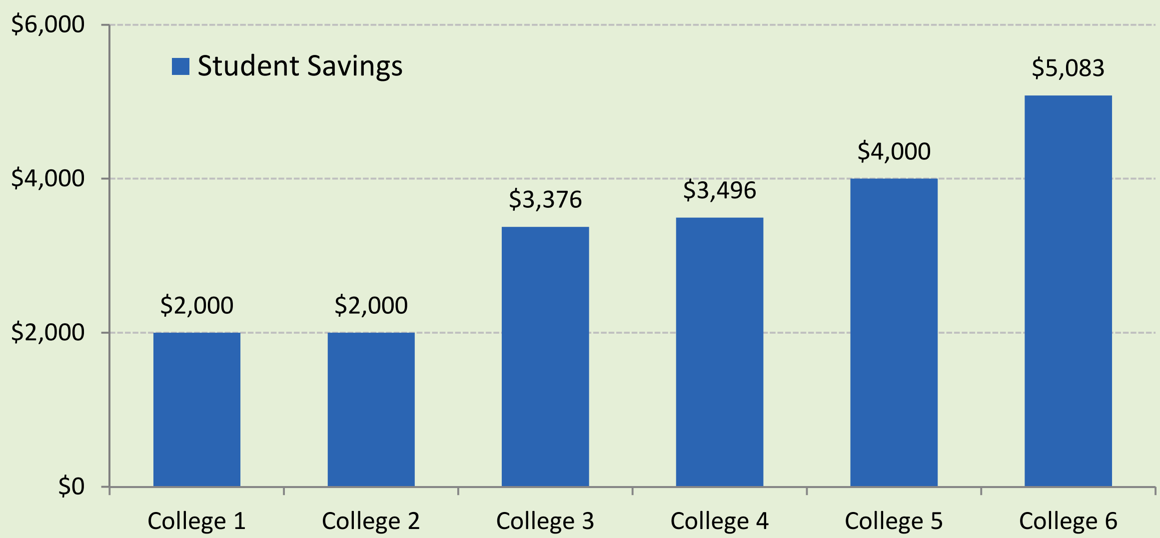
**Figure 3.** **Cost per Completer at Six Statway/ Quantway Colleges, Traditional & Statway/Quantway Students**



**The relative improvement in the cost per completer for the six colleges ranged from 8% to 10% for the first five colleges to 36% for College 6**. This marked difference is due to the increased customization of College 6's model inputs, including notably lower retention and graduation rates in the control group versus the Statway and Quantway group. As the colleges obtain more hard data on the actual outcomes of their Statway and Quantway students, we would expect more results to resemble College 6 versus the more conservative estimates in place for Colleges 1 through 5.

**Figure 4 shows a wide range of savings to students from $2,000 to over $5,000**. This range results from the wide variety of tuition rates at the six colleges, even with a consistently modeled one-year improvement in time to degree.

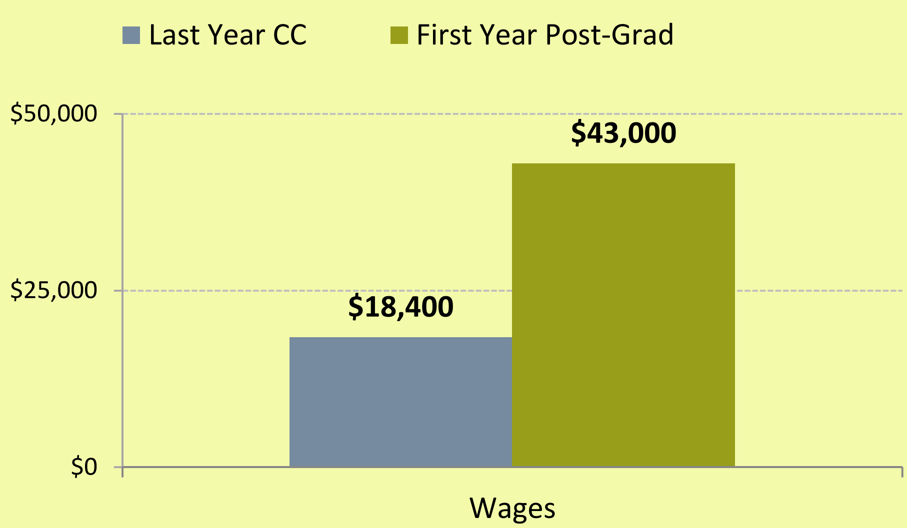
**Figure 4. Student Tuition & Books Savings at the Six Statway/Quantway Schools**




Finally, we estimated the wage gains associated with students completing their degrees earlier. Note that for many of the students, this wage gain would not be realized at the end of their community college trajectory; if they transfer a baccalaureate level institution, their wage gain would come at the completion of the bachelor's degree. However, the net wage gain still remains, as completing a community college degree or certificate or the courses required for transfer preparedness still nets them full entry into the workforce one year earlier. The wage gain model uses real-world data from California's 115 community colleges using a *Wage Gain Tracker* provided by the California Community College Chancellor's Office (http://datamart.cccco.edu/Outcomes/College_Wage_Tracker.aspx). In this model, the median wages for students across the California Community Colleges system in the final year of their community college trajectory was $18,400; in their first year post-completion, the median wage was $43,000, for an increase of $24,600 for each year that Statway and Quantway students complete earlier.

Given the length of many developmental education sequences in the comparison groups, it seems quite reasonable to estimate a time to degree improvement of a year for Statway and Quantway students. Figure 5 visually displays the difference for a group of Statway and Quantway students finishing a year earlier than their comparison group counterparts.

**Figure 5. Statway / Quantway Student Wage Gains Assuming a One-Year Improvement in Time to Degree**




Certainly this number will vary by state as well a region within a state; as wage gain calculators become more readily available nationally, we will be able to customize this data based on a region or state in which a college sits. For now though, it is a notable finding that **if Statway and Quantway can help get students through their community college pathway one year sooner, these students are estimated to register a nearly immediate $24,600 wage gain**. Clearly, the catalytic effect of this gain to transform our students' lives and accelerate their momentum upward on their career path is remarkable.

# Conclusion

Certainly, the results of the modeling conducted at the six Statway and Quantway colleges are incredibly encouraging from a fiscal standpoint. **All six programs estimated a net positive return in terms of revenue and all six experienced a decreased cost per completer**. Further, **student tuition savings and wage gains would also be realized at all six colleges**, associated with the quicker time to completion and the positive momentum of Statway and Quantway. While a small subset of the range of situations Statway and Quantway could be implemented or scaled under, **this order-of-magnitude demonstration at these six colleges suggests that the oft-cited cost concerns linked with implementation or expansion may actually be unfounded**.

It should be noted that while the initial results on Statway and Quantway's student outcomes are amazingly impressive, it is possible that these programs will experience some decrease in incremental success as they are expanded past their current limited reach. This circumstance might occur for a couple of reasons. For example, the small size of the program may be contributing to its success. There might be an effect of students in the current programs being more motivated, and it is also possible that faculty currently in the program are more comfortable with the innovations they often helped create. From a fiscal standpoint, the flip side of a potential decrease in incremental success is that costs do not scale up proportionally, likely a positive factor for colleges as economies of scale emerge. At a minimum, it is possible that these forces may very well balance each other—at least from a fiscal standpoint. It is more likely that the economies of scale would provide more of a benefit than the decrease in success rates associated with larger programs. However, these future results remain to be seen. Hopefully, as more Statway and Quantway programs scale to become systemic approaches, additional data will become available for further analysis of this issue.

In the end, we feel strongly that colleges should be looking to expand more successful nontraditional developmental education programs such as Statway and Quantway for the moral, ethical and societal reasons mentioned above. Certainly, college and state accountability and institutional effectiveness efforts as well as performance-based funding initiatives provide a significant further incentive for improvement. The fiscal considerations described here simply suggest that colleges may also have a financial incentive for doing so. Taken together, one can easily see a brighter future for our community colleges' developmental education students, where programs such as

Statway and Quantway serve the entire range of students in need of support, rather than the handful currently receiving these successful interventions.

**For more information on Statway and Quantway, visit**
http://www.carnegiefoundation.org/developmental-math

**For additional information on the Carnegie Foundation for the Advancement of Teaching, visit** http://www.carnegiefoundation.org/

**To learn about the National Center for Inquiry and Improvement, visit the NCII website or contact Dr. Rob Johnstone, Founder & President, at** rob@inquiry2improvement.com

# Author's Note

Much of the thought capital for this project was developed over a host of projects, starting with my tenure in industry developing ROI models for a wide range of companies in a variety of sectors, including healthcare, financial services and retail. In the higher education world, the primary driver for the development of such approaches came from California's Basic Skills Initiative and a landmark publication I worked on with colleagues from The RP Group titled *Basic Skills as a Foundation for Success in the California Community Colleges*—affectionately known as the "Poppy Copy". Credit and gratitude goes to my colleagues who co-developed and supported this work. Subsequently, the models from the original *Poppy Copy* were expanded through fiscal analyses of excellent projects such as the Metro Academies project co-directed by San Francisco State and City College of San Francisco and the California Acceleration Project. Each of the financial models developed for these projects has a slightly different flavor, and NCII will release publications in late 2013 to support the fiscal work on both of these initiatives.

The work has also been informed by a small-but-growing group of national professionals dedicated to shedding light on these fiscal considerations of innovation in higher education, including Dr. Jane Wellman, Executive Director of the National Association of System Heads and formerly of the Delta Cost Project, Dr. Davis Jenkins of the Community College Research Center at Columbia University Teacher's College, Dr. Terri Manning of Center for Applied Research at Central Piedmont Community College in North Carolina and Dr. Chip Hatcher, economic consultant.

Finally, I'd like to express my gratitude to the Carnegie Foundation for the Advancement of Teaching for sponsoring and providing the venue for this work, but more importantly for serving as a beacon of hope for transformational improvement in developmental education mathematics in the US higher education system. I fundamentally believe that students entering most—if not all—of our colleges in fall 2017 are going to encounter a markedly different experience than did those entering in fall 2012 or earlier, and part of this more streamlined, customized and structured experience will be a completely redesigned developmental education system. At the end of the day, significantly more of the students entering in fall 2017 will earn degrees of high quality with market value—and they will do so much faster than their earlier counterparts.

Dr. Rob Johnstone
Founder & President
National Center for Inquiry and Improvement
October 15, 2013

National Center for Inquiry & Improvement

# Appendix A

## Inputs and Instructions for the Carnegie Statway/Quantway

## Fiscal Considerations Excel Model

The following list of inputs can be customized in the Excel Model on the *Model Inputs* page; the rest of the values on the *ROI*, *Other Models*, and *Charts* pages are calculated automatically and should not be manually overridden. Following this list is a table with the instructions and considerations for providing customized values on each of these model inputs.

**Table 1: General Information**

- Number of students in the Statway/Quantway program
- Apportionment funding per FTES
- Tuition cost per unit
- Estimated increase in FTES for the Statway/Quantway group
- Operating cost/discounting percentage
- Benefits percent for salaried personnel
- Cost per student

**Table 2: Incremental Salaried Personnel Costs**

- FTE for each salaried personnel
- Annual salary for each salaried personnel

**Table 3: Incremental Hourly Personnel Costs and Incremental Fixed Costs**

- Number of incremental employees at each hourly rate
- Hourly rate for incremental hourly employees
- Average number of incremental hours per employee per year
- Incremental fixed costs (e.g., travel, network subscription cost, supplies, recruiting, etc.)

**Table 4: Completion Inputs**

- Average time to degree for control group completers
- Average time to degree for Statway/Quantway completers
- Control group 3rd semester retention rate
- Control group 3-year completion rate
- Control group 4-year completion rate
- Control group 5-year completion rate
- Statway/Quantway 3rd semester retention rate
- Statway/Quantway 2-year completion rate
- Statway/Quantway 3-year completion rate
- Statway/Quantway 4-year completion rate
- Statway/Quantway 5-year completion rate

# Table 1. Instructions for the Carnegie Statway/ Quantway Fiscal Considerations Excel Model

| | |
|---|---|
| #1 - Number of Students in Program | Enter the number of students in a single annual cohort of the Statway or Quantway (SW/QW) program. This can either be an analysis of the program's current size, or you can model the program size at scale. |
| #2 – Apportion-ment Funding per FTES | Enter the state apportionment funding per FTES (full-time equivalent student). Your business officer likely will have this number, or it may be available from state sources. |
| #3 – Tuition Cost per Unit | Enter the student tuition cost per unit; the model will calculate student tuition for 2, 12-unit semesters. If tuition is a fixed amount for 12 units, you will need to enter this fixed amount directly on the "Statway CC ROI" worksheet in cell C42. |
| #4 – Estimated Increase in FTES for SW/QW Group | Enter the estimated increase in 3-year downstream FTES by SW/QW students over a control group. This is a key metric in the model; when collecting real-world data on developmental mathematics interventions in the mid-2000s in California, this metric ranged from 6% to 50% at 4 schools. The default increase of 12% is extremely conservative. Given SW/QW results from Year 1, one might expect this number to be nearer the higher end of the range. |
| #5 – Operating Cost / Discounting Percentage | This is likely the most difficult metric to grasp in the model. It is necessary because the potential downstream revenue identified in the ROI model is not without incremental costs. The more successful students who persist more than those in a traditional/control group will not always fill empty seats in transfer-level math or GE courses. That is, there will be incremental costs associated with these more successful students—usually opening new sections to serve them. There also exists some infrastructure costs associated with increased retention as well. Given these factor, in discussions with those familiar with the economics of community colleges, we estimate that we need to discount the potential revenue by 45%. |

| | |
|---|---|
| | Estimates of how much to discount the revenue range from 30% to 60%. If you desire to be more conservative (or aggressive), you can change the default from 45%. |
| #6 – Benefits % for Salaried Personnel | Enter the benefits percent for salaried personnel (usually faculty). This will be used to fully estimate salaried personnel costs in the ROI model. |
| #7 – Cost per Student | This metric estimates the spending per student at the college under the traditional model, so we can compare the spending per student under the SW/QW model with its additional up-front costs. There are many ways to get this figure; for example, one could divide the total annual community college budget by the unique headcount to get a spending per student figure. There are also national projects that have estimated this number to be in the $10,000 per student range. For this model, we applied a default of $9,250 per student based on a study in California. |
| #8a-8f – FTE & Annual Salary for Salaried Personnel | For up to 6 salaried personnel, you can enter the percent FTE and annual salary associated with the incremental cost of their participation in the SW/QW project. Note that if they are simply teaching SW/QW sections versus traditional sections, this is not an incremental cost but rather the same cost. Most commonly this section would be used to cover release time for faculty, or a portion of your IR professional's time. The ROI model will automatically add the benefits and sum the total salaried personnel costs. Simply leave these values at 0 if you have no salaried personnel who are incrementally associated with the SW/QW project. Note that if you are giving a fixed stipend, you would leave these values blank on the "Model Inputs" Sheet and enter the fixed amount in cells E7, E8, E9, E10, E11 or E12. |
| #9a-9c Incremental Hourly Personnel | These items are to cover any hourly personnel costs associated with the incremental costs of implementing SW/QW. Most commonly this would be student tutors or part-time classified staff. You can enter the number of employees you'd like to model (9a or 10a), their hourly wage (9b or 10b) and the number of hours per year (9c or 10c). These can be left at 0 if you have no incremental hourly personnel costs. |
| #11a-11e – Incremental Fixed Costs | These items cover the incremental fixed costs associated with SW/QW. We've listed common ones here: Travel to the Summer Forum (11a) or Winter Training (11b), Network Subscription Costs (11c), Supplies (11d), or Recruiting (11e). Of course, you can enter any other ones not listed here in one of these five cells. |

| | |
|---|---|
| #12a-12b – Average Time to Degree | These inputs are used to estimate the time to degree for both traditional community college students and SW/QW students. The projected improvement to this outcome drives the student tuition and book savings as well as the student wage gains. Note that we should have good estimates of time to degree for the traditional students, and that we must project time to degree for SW/QW students until we are 3-4 years into each cohort's data. Given that SW/QW students move through developmental education math more quickly, the default projected decrease in time to degree of 1.0 years seems appropriate. |
| #13a-13e – Control Group Retention / Completion Rates | These items are used to calculate the cost per completer metrics. Enter the 3rd semester retention rate for entering traditional students (13a), and then the 2-year (13b), 3-year (13c), 4-year (13d) and 5-year (13e) completion rates. We would suggest using the following positive outcomes in the numerator of this rate: certificates of 1 year or more, AA/AS degree and/or transfer without degree. You will need to use an old enough cohort to estimate these, and we would suggest simply using the rates for all entering first-time students in a cohort year. The defaults provided are actuals from a SW college, if this data isn't available. |
| #14a-14e – SW/QW Retention / Completion Rates | These inputs are the same as in 13a-13e, but we are now estimating these values for the SW/QW students. A college might have actuals for the 3rd semester retention rate, but as of yet, 2-year to 5-year completion rates aren't available. The default progression provided in the template estimates an ultimate increase in the 5-year graduation rate from 50% to 60%. |