

## BACKGROUND

The Madison area is a hot spot of growth for biotechnology and laboratory-based industries. In 2007, Madison Area Technical College (MATC) was awarded a \$1.9 Million Community Based Job Training Grant (CBJTG) from the Department of Labor to develop career pathways to prepare workers to advance in these increasingly important fields.

As a critical part of this pathway, MATC developed and piloted a Science/Math Bridge in order to increase opportunities for lower-skill individuals to access—and to succeed—in the college's science-based postsecondary programs. The Science/Math Bridge pairs together General Chemistry (806-134) with a mathematics course and a technical reading course that are specifically designed to support learning of chemistry content.

The Bridge is designed for students who are seeking to complete the math and chemistry coursework needed for acceptance into science-based programs, but who may lack the necessary math and/or literacy skills. Traditionally, students are unable to take General Chemistry until they have completed a sequence of math remediation—a path that can take some students up to three semesters—or have scored a 30+ on the Algebra COMPASS test. Students participating in the Science/Math Bridge must have a 30+ Pre-Algebra COMPASS score to participate; this is significantly lower than the cut-off score for regular General Chemistry.<sup>1</sup>

MATC's Science/Math Bridge incorporates various innovative elements to help improve postsecondary transitions and outcomes for lower-skilled individuals. The Bridge: 1) applies basic math and reading skills within the context of chemistry, 2) accelerates remediation time, 3) blends credit and non-credit coursework, and 4) follows a 'learning community' model in which a cohort of students takes various classes together and works towards a common goal. These types of innovative approaches—which are increasingly being adopted across the country, with increasing support from private foundations and the federal government—are proving successful in terms of improving postsecondary transitions for lower-skill adults.<sup>2</sup>

## EARLY SIGNS OF SUCCESS: 2008-2009 SCIENCE/MATH BRIDGE PILOTS

The first Science/Math Bridge was piloted at MATC in Fall 2008, and a second round of the Bridge was delivered in Spring 2009. Altogether, 18 students completed the Bridge—11 in the Fall 2008 cohort, and 7 in the Spring 2009 cohort.

Outcomes for these first two cohorts of students are extremely promising:

- **All Bridge students markedly improved their math and reading competencies over the course of the semester.** Students took a variety of Math and Reading assessment tests before and after the Science/Math Bridge was administered. All students took the Math and Reading TABE (Test for Adult Basic Education) and showed dramatic improvement in both competency areas upon completion of the course (Table 1a). In addition, the 10 students who took the Math COMPASS assessment both before and after the Bridge **all improved their scores to levels that may allow them to bypass any further developmental math courses** (Table 1b). Developing better math and reading skills will help these students succeed in their future postsecondary coursework at MATC.

The Center on Wisconsin Strategy (COWS) is a policy center and field laboratory for high road economic development – a competitive market economy of shared prosperity, environmental sustainability, and capable democratic government. Housed at University of Wisconsin-Madison, COWS has been supporting progressive policy innovation since 1991. For more information, visit [www.cows.org](http://www.cows.org).

COWS serves as Project Evaluator for Madison Area Technical College's Laboratory Technician Skills Career Ladder Project. The Science/Math Bridge discussed in this report is a key component of this project. Valuable data analysis for this report was provided by MATC's Institutional Research and Effectiveness Department. For more information, contact Jessa Lewis Valentine, [jessa@cows.org](mailto:jessa@cows.org), 608.263.9984.

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- 17 out of 18 Bridge students passed General Chemistry with a C or higher. 17 out of the 18 students who completed the Bridge passed Chemistry, and all but two of these students passed with an A or B. This is noteworthy considering that none of these students had scored high enough on their assessment tests to take General Chemistry, and it underscores the promise of alternate approaches to basic skills remediation. The passing rate of the Science/Math Bridge students (94%) was actually higher than the passing rate of students completing traditional General Chemistry (89% passing rate, on average, for Fall 2007, Spring 2008, and Fall 2008 cohorts). (Tables 1a, 1b, & Table 2)

Table 1a  
CHEMISTRY GRADES AND MATH/READING TABE ASSESSMENT SCORES  
FOR SCIENCE/MATH BRIDGE STUDENTS

<i>CBJTG Bridge Students Fall 2008</i>	<i>Final Chem Grade</i>	<i>Pre-course Math TABE</i>	<i>Post-course Math TABE</i>
1	A	12.9+	12.9+
2	A	12.9+	12.9+
3	AB	10.4	12.9+
4	AB	3.2	12.9+
5	AB	9	10.9
6	AB	11.2	12.9+
7	B	9.2	10.3
8	B	9.6	12.9+
9	B	10.1	12.9
10	B	10.6	12.9+
11	C	7.4	9.5

<i>CBJTG Bridge Students Spring 2009</i>	<i>Final Chem Grade</i>	<i>Pre-course Math TABE</i>	<i>Post-course Math TABE</i>	<i>Pre-course Reading TABE</i>	<i>Post-course Reading TABE</i>
12	AB	7.1	10.5	6	9.1
13	B	6.7	12.2	10.8	11.1
14	B	10.5	11.8	9.6	12.9+
15	B	12.9	12.9+	12.9+	12.9+
16	B	5	11.8+	9.6	9.1
17	C	9.5	10	9.6	12.9+
18	D	4.8	12.9+	9.6	n/a

Note: Students in Fall 2008 cohort did not take pre/post Reading TABE

Table 1b

## COMPASS MATH SCORES FOR SCIENCE/MATH BRIDGE STUDENTS

<i>Students From Fall 08/Spring 09 Bridge Cohorts</i>	<i>Pre-Course Compass Math Score</i>	<i>Post-Course Compass Math Score</i>
1	Pre-Algebra 34	Pre-Algebra 73
2	Pre-Algebra 47	Algebra 27
3	Pre-Algebra 69	Algebra 57
4	Pre-Algebra 30-42*	Algebra 42
5	Pre-Algebra 30-42*	Algebra 45
6	Pre-Algebra 30-42*	Algebra 41
7	Algebra 32	Algebra 41
8	Algebra 26	Algebra 31
9	Algebra 31	Algebra 42
10	Algebra 28	Algebra 55

\*ACT Equivalent

Table 2

## FINAL GRADES FOR TRADITIONAL CHEMISTRY 134 STUDENTS

<i>Chem 134 grade</i>	<i>FALL 2007</i>		<i>SPRING 2008</i>		<i>FALL 2008</i>		<i>TOTAL</i>	
	<i>Number of Completers</i>	<i>% of Completers</i>						
A-C	150	88%	140	92%	198	86%	488	89%
D-F	20	12%	12	8%	31	14%	63	11%
Total	170	100%	152	100%	229	100%	551	100%

The success of the Science/Math Bridge pilots comes across clearly in statements made by participating students and instructors (see next page). The Center on Wisconsin Strategy (COWS), who is evaluating various aspects of MATC's Community Based Job Training Grant, conducted interviews with Bridge students and instructors upon conclusion of each semester.

Students reported that receiving the basic skills instruction—particularly the math—within the context of chemistry, and being able to apply it immediately, was instrumental to their success. They also expounded on the benefits of working together as a cohort towards a shared goal. Many of the students who lacked confidence in their math abilities gained the skills and knowledge they will need to more confidently pursue their desired program and career path.

Instructors commented on how well the students worked together as a group, and on the high level of student commitment to a rigorous program. They enjoyed being part of their students' success. Instructors also spoke at length about the benefits—as well as the challenges—of teaching as part of a team of instructors.

## Quotations from Bridge Students

"My advisor told me how to [get into the class]. And at first, I thought, are you kidding? Three classes in one? I am going to kill myself! But, she told me, 'No, it is designed for people to succeed.' Soon as I heard that, I investigated it. That's what I wanted. I was signed up for another Chemistry class, and I left that to come to this one because it was much better. And I even had a waiver to be in that other Chemistry class, but this is what I wanted. And I am so glad I did, so glad."

"I hope it [the Bridge] continues. It was a really, really good idea. And, I think that if more people become aware of it, more departments hopefully will be accepting of this. It's another way to get more people through that certainly would make good candidates for a program, but that would need just a little extra [help], you know, or a different style."

"It would have set me back at least two years [had I not taken the Bridge]...in terms of going for my second career...I lack Chemistry and Biology and the Math...[it would have been two years before] I would be accepted into my program."

"I actually understand it, and it doesn't just fly through my head...and it will stick with me for awhile for once...and I really enjoy that, that I can remember little tidbits of information that are from the beginning of the semester that I probably would have never ever remembered."

"For me, the Math really helped a lot. I wasn't good at Math—I know that. But from the beginning of the semester until now, there is a very big difference. You can't compare my Math [ability] before and what I know now. It's a very big change for me. And it makes me feel more confident when doing Math problems because I feel like I can tackle anything. It really helped."

"This kind of program really gets you back into the school sense. All of a sudden you remember how you studied, you remember how to study and get things done, and understand and comprehend. It really helps get you back into that mentality."

"You get more comfortable with each other - you feel more open to asking questions to each other. You don't feel dumb about not understanding something someone else does. Everybody gets to participate in a group. If you don't know something, somebody else will show you how to approach the problem."

"Everything we learned built on something else so [the instructors] could say 'remember when we did this?' and we could piece it together."

## Quotations from Chemistry, Math, and Reading Instructors

"I discovered that having somebody else teach math was an absolute joy! I would find myself sort of stutter-stepping in lecture or in [Chemistry] labs when I realized I didn't have to do as much math instruction in the classroom because they were already working on it."

"I saw a number of the quiet, shy folks start to ask more questions as they got more comfortable with me. And I think that will allow them to be more forward in their other classes. I think they have a greater shot at being a stronger, interacting student as opposed to a quiet student which can get you into trouble sometimes."

"It's exciting to see people starting out and getting into doing something where they can make a decent living. I think that is so important, especially with the economy. I think there are going to be more and more students who need the training and want to move into something relatively quickly. So, I am 100% behind that."

"I just want to tell you how much I am enjoying doing this. It has been for me, professionally and personally, such a tremendous learning experience. I like the fact that I am a part of a program where the students complete these three content areas and now they can go on and work on their degree. That gives me great satisfaction."

"This particular group [of students] taught me a lot about myself too. I learned along with them. They challenged me to make sure that my presentation was fun, understandable. I had a blast! I really had fun with this group."

"They [the students] really worked together beautifully. They would meet after class and before class and try to help each other with the Chemistry and with the math and the reading. I think they made some good friendships out of this. That was a very positive thing about this group of students."

"I think there are certain instructors that are pushing it [Bridges and other innovative programming]. I've been asked by our associate dean and dean to look into different opportunities, in terms of other programs. We're looking at trying, because of the economy, to accelerate developmental education...they'll be able to get into their programs sooner and not get discouraged where they have to wait a year or take a year and a half of remedial math ...they will be able to get a job."

"A lot of people are interested in team teaching and different, innovative techniques. And, I think there's a push now by certain people within our department to really look into these things, and not just keep the status quo. One math instructor sent out an email this week and she had all these different ideas for Bridge programs for other occupational areas. I think it's starting to happen...everybody's at least open to looking into this."

## BRINGING THE SCIENCE/MATH BRIDGE TO SCALE AT MATC

Given the promising results of the Science/Math Bridge pilots, key faculty and administrators are considering what is needed to bring the Bridge model to scale at MATC. The benefits for the cohorts of students who have completed the Bridge to date are clear. However, taking a closer look at MATC student data—and where students are falling through the cracks—underscores the importance of expanding the Science/Math Bridge to reach a far greater number of students.

Research on developmental education at the national level<sup>3</sup> reveals that nearly 60% of community college students enroll in at least one developmental course at some point during their college experience. However, less than half of these students complete their recommended developmental sequence. Furthermore, many students that are referred to developmental coursework as a pre-condition to postsecondary enrollment become discouraged and drop out of the system altogether—without taking a single class.

A closer look at MATC data highlights some of these same trends. With the help of MATC's Veterinary Tech program administrators and the Institutional Research and Effectiveness Department (IRE), we discovered that **nearly two-thirds of students denied from the Vet Tech program due to insufficient preparation disappear from the system; in other words, they fall through the cracks.** On average, approximately two-thirds of students denied from the Vet Tech program for academic years 05-06, 06-07, and 07-08 had not taken any classes at MATC as of February 2009 (Table 3). Many of these students were likely referred to a developmental sequence that seemed either too unattractive, long, onerous, or unaffordable.

Table 3

**INDIVIDUALS DENIED TO MATC VET TECH PROGRAM WHO SUBSEQUENTLY TOOK CLASSES AT MATC**

	YEAR DENIED							
	2005-06		2006-07		2007-08		Total	
Took Class at MATC After Denial (as of Feb 2009)	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes	47	37%	33	31%	50	41%	130	37%
No	81	63%	72	69%	73	59%	226	63%
Total	128	100%	105	100%	123	100%	356	100%

More closely examining outcomes for students who do enroll in developmental coursework provides further insight into where and how the developmental pipeline is failing to retain individuals. As explained above, students are traditionally unable to take General Chemistry until they have scored a 30+ on the Algebra COMPASS test or have completed a sequence of math remediation.

Tables 4 and 5 display outcomes data for cohorts of students enrolled in two developmental math courses. These tables reveal that students rarely follow the sequential math remediation path of Developmental Math Level 1, followed by Developmental Math Level 2, followed by an introductory college level math course. For example, on average only 13% of students completing Developmental Math Level 1 went on to take the Level 2 developmental math course (Table 4, Figure 1).

More distressingly, these tables show that **fewer than 2 in 10 students who enroll in and complete these developmental math courses are eventually accepted into a postsecondary program.** Looking at nine cohorts of students between Fall 2003 and Summer 2006 who enrolled in and successfully completed Developmental Math Level 1, on average only 13% of students had been accepted into a postsecondary program as of May 2009 (Table 4, Figure 1). Looking at similar data for Developmental Math Level 2 cohorts, only 15% of students had been accepted into a postsecondary program on average to date (Table 5).<sup>4</sup>

## PLUGGING THE LEAKS IN THE POSTSECONDARY EDUCATION PIPELINE

The leaks in the developmental-to-postsecondary pipeline are not unique to MATC or to Wisconsin's system of technical colleges.<sup>5</sup> In fact, Wisconsin stands out as a leader on many key transition measures.<sup>6</sup> Nevertheless, too many students are falling through the cracks, students that could be successful if offered the right supports and a different approach to remediation.

MATC's Science/Math Bridge is a promising, innovative model that could serve to plug leaks in the pipeline and provide more students with opportunities for postsecondary success. Expanding the Science/Math Bridge and institutionalizing the model within MATC are crucial steps that should be taken before the Department of Labor grant concludes in 2010. This will require strong leadership and ownership from MATC's academic, advising, and basic skills departments.

Figure 1  
AVERAGE OUTCOMES FOR STUDENTS ENROLLING IN DEVELOPMENTAL MATH LEVEL 1  
FALL 2003 THROUGH SUMMER 2006

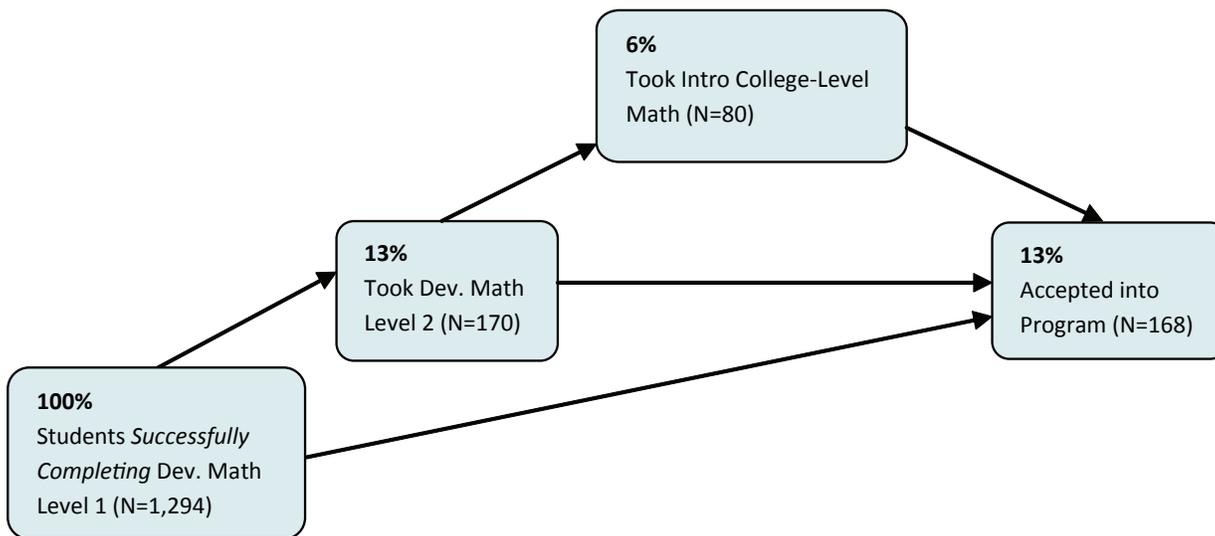


Table 4

## OUTCOMES FOR COHORTS OF STUDENTS ENROLLED IN DEVELOPMENTAL MATH LEVEL 1

<i>Academic Year</i>	<i>Class Term</i>	<i>Course Success in Dev. Math Level 1</i>	<i>Dev. Math Level 1 Students</i>	<i>Taking Dev. Math Level 2</i>	<i>% Taking Dev. Math Level 2</i>	<i>Taking Intro College-Level Math</i>	<i>% Taking Intro College-Level Math</i>	<i>Accepted into MATC program</i>	<i>% Accepted into MATC Program</i>
2003-04	Fall	Successful Completion	165	17	10.3%	7	4.2%	8	4.8%
		Withdraw or Unsuccessful	16	1	6.3%	3	18.8%	6	37.5%
	Spring	Successful Completion	169	15	8.9%	5	3.0%	22	13.0%
		Withdraw or Unsuccessful	14	1	7.1%	1	7.1%	1	7.1%
	Summer	Successful Completion	85	6	7.1%	2	2.4%	7	8.2%
		Withdraw or Unsuccessful	7	0	0.0%	0	0.0%	1	14.3%
2004-05	Fall	Successful Completion	226	31	13.7%	16	7.1%	33	14.6%
		Withdraw or Unsuccessful	6	0	0.0%	0	0.0%	1	16.7%
	Spring	Successful Completion	143	16	11.2%	9	6.3%	20	14.0%
		Withdraw or Unsuccessful	5	0	0.0%	0	0.0%	1	20.0%
	Summer	Successful Completion	104	14	13.5%	6	5.8%	14	13.5%
		Withdraw or Unsuccessful	2	1	50.0%	0	0.0%	0	0.0%
2005-06	Fall	Successful Completion	181	38	21.0%	8	4.4%	28	15.5%
		Withdraw or Unsuccessful	17	0	0.0%	0	0.0%	2	11.8%
	Spring	Successful Completion	165	28	17.0%	22	13.3%	21	12.7%
		Withdraw or Unsuccessful	25	2	8.0%	2	8.0%	2	8.0%
	Summer	Successful Completion	56	5	8.9%	5	8.9%	15	26.8%
		Withdraw or Unsuccessful	2	0	0.0%	0	0.0%	0	0.0%
Total		Successful Completion	1,294	170	13.1%	80	6.2%	168	13.0%
		Withdraw or Unsuccessful	94	5	5.3%	6	6.4%	14	14.9%

\*Table reports on student outcomes as of May 2009

Table 5  
OUTCOMES FOR COHORTS OF STUDENTS ENROLLED IN DEVELOPMENTAL MATH LEVEL 2

<i>Academic Year</i>	<i>Class Term</i>	<i>Course Success in Dev. Math Level 2</i>	<i>Dev. Math Level 2 Students</i>	<i>Taking Intro College-Level Math</i>	<i>% Taking Intro College-Level Math</i>	<i>Accepted into MATC program</i>	<i>% Accepted into MATC Program</i>
2003-04	Fall	Successful Completion	161	9	5.6%	15	9.3%
		Withdraw or Unsuccessful	10	0	0.0%	0	0.0%
	Spring	Successful Completion	67	5	7.5%	7	10.4%
		Withdraw or Unsuccessful	12	0	0.0%	1	8.3%
	Summer	Successful Completion	21	0	0.0%	3	14.3%
		Withdraw or Unsuccessful	0	n/a	n/a	n/a	n/a
2004-05	Fall	Successful Completion	106	11	10.4%	15	14.2%
		Withdraw or Unsuccessful	3	0	0.0%	0	0.0%
	Spring	Successful Completion	71	8	11.3%	13	18.3%
		Withdraw or Unsuccessful	6	0	0.0%	0	0.0%
	Summer	Successful Completion	27	1	3.7%	3	11.1%
		Withdraw or Unsuccessful	1	0	0.0%	0	0.0%
2005-06	Fall	Successful Completion	147	31	21.1%	25	17.0%
		Withdraw or Unsuccessful	6	1	16.7%	0	0.0%
	Spring	Successful Completion	131	25	19.1%	30	22.9%
		Withdraw or Unsuccessful	18	2	11.1%	0	0.0%
	Summer	Successful Completion	42	2	4.8%	8	19.0%
		Withdraw or Unsuccessful	3	0	0.0%	0	0.0%
<b>Total</b>		Successful Completion	773	92	11.9%	119	15.4%
		Withdraw or Unsuccessful	372	3	0.8%	1	0.3%

\*Table reports on student outcomes as of May 2009

## ENDNOTES

1. Both the Pre-Algebra and Algebra COMPASS scores range from 1 to 99; a student scoring 100 on the Pre-Algebra questions is automatically moved to the Algebra questions.
2. For example, see: Jenkins, D., Zeidenberg, M., & Kiezl, G. (2009). *Educational Outcomes of I-BEST, Washington State Community Technical College System's Integrated Basic Education and Skills Training Program: Findings from a Multivariate Analysis* (CCRC Working Paper No. 16), New York: Columbia University, Teachers College, Community College Research Center; Mazzeo, C., Rab, S, & Alssid, J. (2003). *Building Bridges to College and Careers: Contextualized Basic Skills Programs at Community Colleges*, Workforce Strategy Center; Center for Student Success/RP Group & The Academic Senate for CA Community Colleges (2009), *Promising Practices for Transitioning Students from Adult Education to Postsecondary Education*; Bailey, T. (2008). *Challenge and Opportunity: Rethinking the Role and Function of Developmental Education in Community College* (CCRC Working Paper No 14), New York: Columbia University, Teachers College, Community College Research Center.
3. Bailey, T. (2008). *Challenge and Opportunity: Rethinking the Role and Function of Developmental Education in Community College* (CCRC Working Paper No 14), New York: Columbia University, Teachers College, Community College Research Center.
4. When 'undecided' students are included, these percentages jump to 22% and 21% for Developmental Math Level 1 student cohorts and Developmental Math Level 2 student cohorts, respectively.
5. Bailey, T., Jeong, D.W., & Cho, S.W. (2009). *Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges* (CCRC Working Paper No. 15). New York: Columbia University, Teachers College, Community College Research Center.
6. For example, state and national data show that the WTCS's rate of ABE/ELL students transitioning to postsecondary (71%) was more than twice the national average (34%). [*AEFL National Reporting System Annual Report Card*, Wisconsin Technical College System, 2005 (<http://systematic.wtcsystem.edu/reports/AdultEd/AEFL2005/AEFL.xls>); *Adult Education Annual Report to Congress*, US Department of Education, 2007 ([http://www.nrsweb.org/reports/congress\\_report.aspx](http://www.nrsweb.org/reports/congress_report.aspx)). The National Reporting System transition measure is based on students who have set a goal of making the transition to postsecondary study.