Minneapolis Community & Technical College Charting Student Success II: Developmental Education

Final Report Summary

ASMUSSEN RESEARCH & CONSULTING LLC

March 19, 2012

ASMUSSEN RESEARCH & CONSULTING LLC
An Independent Research Firm

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Dr. O'Kane:

This report summary highlights the results from an extensive and complex analysis of developmental education programming at Minneapolis Community & Technical College. It applied a unique methodology that I believe is well-suited to the community college environment. Too often research studies on this topic simply measure whether students successfully have remediated any deficiencies in their reading, writing, or math skills to reach college-readiness status. That approach is flawed because it fails to acknowledge that many community college students have other goals in mind, such as enrolling in a career/technical education program that does not require the same prerequisite skills as students who wish to pursue an associate degree.

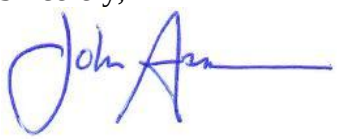
As a result of this new methodology, the study became quite complex. Accordingly, we have developed this more concise report summary that should satisfy the interests of many readers. It is available as a separate, stand-alone document. I appreciate your assistance in helping create and design it

In addition, a full-length version of the report is available with more detailed analyses. It may be of interest and value for developmental education experts who wish to look at the study results in more depth. Finally, I have provided you with a technical supplement that includes even more extensive detailed analyses.

I hope MCTC faculty, staff, and administrators find the study useful, as they contemplate strategies for serving students better.

Thank you for the opportunity to provide my services.

Sincerely,



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Minneapolis Community & Technical College
Charting Student Success II: Developmental Education
Report Summary (March 2012)

Developmental education is designed to help students improve their reading, writing, or math skills in order to be successful in college. All community college programs, however, do not require the same levels of reading, writing, and math skills. Although students must be "college ready"[1] to earn some academic awards, such as an associate in arts degree, many career/technical education programs do not require "college ready" skills. The need for developmental education, thus, depends on whether a student has demonstrated[2] the skill levels that a particular college[3] requires for the academic program that the student intends to pursue. Accordingly, measuring a student's need for developmental education depends on several factors:

- the student's Accuplacer test scores (the course placement assessment test endorsed for use by the MnSCU System),
- how the college interprets the test scores and categorizes students into placement levels for each of the three primary subjects,
- what prerequisite skill levels the college has established for its academic programs, and
- the academic program that the student chooses to pursue.

Furthermore, the rate at which students enroll in developmental courses may not be a true indicator of their need for developmental education. It understates the need because some students have test scores so low that they are not allowed to enroll in developmental courses. Students who do not meet the minimum test scores that a college requires for a subject area are referred to Adult Basic Education (ABE) courses, typically offered by the local K-12 school district, and may not begin the developmental course sequence until they have improved their skills sufficiently. Students placed at an ABE skill level may avoid the need for developmental education, however, if they choose an academic program that did not use that subject area as a prerequisite. For example, MCTC offered academic programs in 20 subjects that did not have math skills as a prerequisite. Enrollment in developmental education courses also may overstate the need when students enroll in developmental courses not required for their chosen academic program. Unnecessary developmental coursework may occur because students initially were uncertain about choosing an academic program, or later changed to a different academic program, or simply were confused about whether they needed to take a developmental course.

This study accounted for the various factors that contribute to the complexity of developmental education. It analyzed the academic records for 3,495 first-time[4] students who entered MCTC in the Fall 2005, 2006, or 2007 term. Records were analyzed for the four years subsequent to their initial enrollment at MCTC. The study included only students who had English as their primary spoken language. English language learners added another layer of complexity to developmental education that was not considered in the study.

College Readiness

Overall, very few first-time students who entered MCTC were "college-ready" (See Table S-1).

Only 78 of the 3,495 first-time MCTC students in the study were deemed "college ready" in math, reading and writing; the remaining 98% were not college ready and upon entry were assigned to a developmental placement level for one or more subjects.

- ✓ Only 78 of the 3,495 first-time MCTC students in the study were deemed "college ready" in math, reading and writing; the remaining 98% were not college ready and upon entry were assigned to a developmental placement level for one or more subjects. Of these, 98% of the students were placed at a developmental math level, 41% of them were placed at a developmental reading level, 36% of them were placed at a developmental writing level, and 30% of them were placed at a developmental level in all three primary subject areas.

Table S-1: MCTC Primary Subject Area Placement Levels

Subject Area	ACCUPLACER Subtest	Placement Level	Abbreviation
Reading	Reading Comprehension	Adult Basic Education [a]	R_{ABE}
		Reading 100	R_{100}
		Reading 200	R_{200}
		College-Level	R_{CL}
Writing	Sentence Skills [b]	Adult Basic Education [a]	E_{ABE}
		English 900	E_{900}
		College-Level	E_{CL}
Math	Arithmetic [c]	Adult Basic Education [a]	M_{ABE}
		Math 60	M_{60}
	Elementary Algebra	Math 70 [d]	M_{70}
	College Level Math	Math 80 [d]	M_{80}
		College-Level	M_{CL}

a) MCTC sponsors a free non-credit ABE math course on campus for students who score at least 22 on their Accuplacer Artithmetic subtest. It does not offer any ABE coursework on campus for Reading or Writing; students are referred to the Minneapolis public school system for such programs.

b) The Sentence Skills subtest was used for students enrolling during the Fall 2005, 2006, or 2007 terms, but it has since been eliminated as a separate subtests. MCTC now uses the Reading Comprehension subtest to determine Writing placements.

c) The Arithmetic subtest is not required by MnSCU Board Procedure 3.3.1, but was administered at MCTC's discretion.

d) Math 70 and 80 placements depend on the results from two math subtests: Arithmetic and Elementary Algebra scores determined Math 70 placements and Elementary Algebra and College Level Math scores determined Math 80 placements.

The magnitude of the challenge facing students who wished to reach college-readiness status depended on whether they met the requirements to enroll in developmental coursework and, if so, the number of developmental courses a student required (See Table S-2 for detailed analysis).

- ✓ 983 (28%) of the 3,495 first-time MCTC students were placed into an Adult Basic Education (ABE) math level based on their Accuplacer test scores, and, thus, were not eligible to register for MCTC developmental math courses unless they could improve their basic math skills. Only 5 of the 983 students who entered MCTC at the Math ABE placement level eventually progressed to being "college-ready."

- ✓ 1,166 (33%) of the 3,495 first-time MCTC students were placed into Math 60 based on their Accuplacer test scores. Although these students were eligible to begin the developmental math sequence, only 84 of them (7%) reached college readiness status.

- ✓ Overall, only about 13% of the first-time MCTC students reached college readiness status. The percentage of students reaching college readiness varied greatly depending on how many developmental courses they had to pass.

In sum, the majority of students (61%) placed at Math ABE or 60. Of these students, 72% of them never advanced beyond Math 60 and were limited to pursuing an academic award in one of the 20 subject areas that did not have a math requirement (MCTC offered academic awards in a total of 50 subject areas during the time period of the study).

Table S-2: Entering Placement Levels[5] of First-Time MCTC Students

Entering Math & Reading Placement Levels	Number of Subjects Students Can Earn Program Awards From These Placement Levels	Developmental Courses Needed to Reach College Readiness	Number of First-Time Students Who Entered at These Levels	Students Who Eventually Reached College Readiness	
				Number of Students	% of Entering Students
$R_{100}M_{ABE}$	2	5-6	371	0	0%
$R_{100}M_{60+}$	2	5-6	258	16	6%
$R_{200}M_{ABE}$	14	4	390	1	0%
$R_{200}M_{60+}$	14	4	481	25	5%
$R_{CL}M_{ABE}$	20	3	222	4	2%
$R_{CL}M_{60+}$	20	3	627	67	11%
$R_{200}M_{70}$	30	3	195	35	18%
$R_{CL}M_{70}$	38	2	534	89	17%
$R_{CL}M_{80}$	42	1	339	128	38%
$R_{CL}M_{CL}$	50	0	78	78	100%
All First-Time Students			3,495	443	13%

As shown in Table S-3, math placements were highly associated with reading placements, suggesting that an integrated approach to reading and math development may be warranted.

In fact, while a large number of students place at the lowest levels of both math and reading, the largest single grouping was students who placed into the lowest levels of math while placing into college-level reading.

- ✓ 1,207 of the 1,397 (86%) students who placed into a developmental reading level also placed into a low developmental math level (Math ABE or Math 60). Working adults, in particular, were prone to this pattern; 95% of working adults who placed in developmental reading also had low math placements.

- ✓ College-level reading skills, though, did not result necessarily in higher math placements; students with college-level reading skills only had about a 50/50 chance of placing in Math 70 or higher. As many students with college-level reading skills had low math placements as had higher math placements. Few students without college-level reading skills, though, had higher math placements (only about 16%). In fact, while a large number of students place at the lowest levels of both math and reading, the largest single grouping was students who placed into the lowest levels of math while placing college-level in reading. MCTC may wish to consider whether these two student segments may benefit from math instruction that takes into account their divergent reading levels.

Table S-3: MCTC First-Time Non-ESOL Students Entering in Fall 2005, 2006, or 2007: By Reading & Math Placements at Entry Term

	Math Placements						
Reading Placements	Math ABE	Math 60	Math 70	Math 80	College Level	Not Tested	All Students
Read ABE	24	5	-	-	-	2	31
Read 100	340	180	17	22	-	11	570
Read 200	313	345	100	50	1	26	835
College Level Reading	299	629	569	347	79	108	2,031
Not Tested [1]	11	9	12	3	3	23	61
All Students	**983**	**1,166**	**694**	**422**	**82**	**148**	**3,495**

[1] Includes students who did not have either Reading or Writing placements at entry. As a result, the details for some Reading sub-cohorts do not sum to the subtotals shown in this schedule.

MCTC served substantially more students who had developmental skill levels than other community colleges. The following statistics show the gravity of the academic challenge faced by first-time students who entered MCTC:

- ✓ A recent national study on community colleges[6] found that 66% of new entering community college students reported that their assessment tests placed them in a developmental level for at least one subject. In contrast, nearly all (98%) of the first-time

MCTC students would have reported being placed at a developmental level in one or more subject area.

- ✓ A Minnesota study[7] reported that of 59,011 students who graduated from Minnesota public high schools from 2005 to 2007 and enrolled in a MnSCU two-year college, 51% of them took at least one developmental course. In the current study, 1,750 of the 3,495 first-time MCTC students were recent high school graduates (most of them would have been graduates from Minnesota public high schools during the same period as the students included in the Minnesota study), and 70% took at least one developmental course.

Disproportionate Impact on Under-represented Students

Disproportionate numbers of first-time MCTC students who were from groups typically under-represented in higher education (students-of-color, low-income students, or students whose parents had not attended college) placed in the lowest developmental levels. Also, some disparities in math placement levels were associated with gender and age differences.

Any attempts to address low student success outcomes for those placing into the lowest levels of developmental math should take into account the high proportions of students of color, low-income, and females that this would impact.

- ✓ 81% of Black/African American students had low math placements (Math ABE or 60) compared to 45% of White students. 63% of Black/African American students placed into a developmental reading level (Reading 100 or 200) compared to 21% of White students. The proficiency gap between Black/African American and White students was even wider when both math and reading placements were considered.

- ✓ 73% of low-income students (Pell grant recipients) had low math placements compared to 48% for other students. 52% of low-income students placed into a developmental reading level compared to 27% of other students.

- ✓ Over 70% of females from all age categories had low math placements compared to 49% of males who were recent high school graduates.

- ✓ Math placements also varied among age categories for male students: 65% of working adult males, age 25 and over, had low math placements compared to 49% for males who were recent high school graduates.

Any attempts to address low student success outcomes for those placing into the lowest levels of developmental math should take into account the high proportions of students of color, low-income, and females that this would impact. In addition, MCTC may wish to consider whether the age-related differences seen in math placements are a signal of older students forgetting course material that could be remediated by refresher courses offered prior to placement testing.

Alternatives to Developmental Education Coursework

MCTC mitigated the need for some students to take developmental courses by offering academic awards in several programs that did not require college-readiness skills.

- ✓ 788 of the 3,495 (23%) students did not need to take any developmental education courses, because they had sufficient reading, writing, and math skills to register for courses and pursue an academic program upon entering MCTC. Only 78 of the students were "college-ready" upon entering MCTC, meaning that the other 710 students had developmental placements in one or more subjects, but met the prerequisits for the courses and programs that they pursued, thereby avoiding the need to take any developmental courses.

Still, 2,707 of the 3,495 (77%) first-time MCTC students believed that they needed developmental education, and attempted to improve their placement levels after entering MCTC.

- ✓ Few students were able to improve their placement levels by retaking the Accuplacer test; less than 4% of the 2,707 students who attempted to improve their placement levels were successful through retesting, without taking any developmental courses. Most of the students who could not retest into a higher placement level enrolled in one or more developmental courses. Some students may have decided to drop-out, without enrolling in developmental courses, after being unable to achieve higher scores on the Accuplacer test or not being able to advance beyond an ABE skill level.

Finally, the importance of offering programs that do not require college-level skills in math and/or reading is illustrated by analyzing the programs that were producing MCTC graduates.

- ✓ Only 25% of MCTC graduates attained college readiness status in both math and reading, and 37% of those students graduated from programs that did not require college-ready skills in either of these subject areas.

- ✓ 557 of the 3,495 first-time students earned an academic award from MCTC within four years of enrolling at the college: Only 14% of these students graduated from programs that required college readiness in both reading and math, another 23% graduated from other programs that required at least Math 70 placement as a prerequisite, and 63% graduated from programs that had no math prerequisite. The program producing the most graduates (Nursing Assistant/Home Health Aide certificate) had minimal prerequisites (placement at Reading 100 with no writing or math placements required), and accounted for 32% of the 557 graduates.

Developmental Education Coursework Patterns

Developmental courses, thus, were the primary means by which students could advance to higher placement levels, and meet the prerequisites to register for additional courses and programs.

- ✓ 2,261 of the 3,495 (65%) first-time MCTC students took one or more developmental courses. Of the student taking developmental courses, 39% took only math courses, 36%

took only reading or writing courses, and 25% took both math and reading/writing courses.

Higher education experts[8] generally agree that students should take their developmental courses soon after enrolling in college and be restricted from repeating the same course multiple times. As shown in Table S-4, most MCTC students followed these recommended patterns.

- ✓ The pass rate for developmental courses was fairly uniform across the different levels of developmental math and reading, averaging 63% across all subject areas.

- ✓ About 90% of students enrolling in developmental reading or writing courses did so in their first term at MCTC. More students who took developmental math delayed enrolling in it until a later term, but still 76% of them took it in their first term at MCTC. Students who delayed registering for developmental courses in most subjects passed the courses at about the same, or slightly higher, rates than students who enrolled in the courses in their first term.

- ✓ Further analysis showed that students who delayed taking their first developmental math course experienced about the same success rate (defined as graduation, retention, or transfer after good academic progress) as students who took developmental math in their first term. The success rate for 510 students who took developmental math in their first term and were enrolled at MCTC for at least two terms was 57%, compared to 56% for 395 students who delayed taking developmental math and also were enrolled for at least two terms.

Further analysis showed that students who delayed taking their first developmental math course experienced about the same success rate (defined as graduation, retention, or transfer after good academic progress) as students who took developmental math their first term.

- ✓ Few students repeated the same developmental course, and only 1-2% of the students who took developmental courses repeated the same course multiple times. Repeat registrants passed their developmental courses at substantially lower rates.

The other noteworthy trend shown in Table S-4 is that students were much less inclined to register for developmental math courses than developmental reading or writing courses.

- ✓ 77% of the students who placed in a developmental reading or writing level registered for the respective developmental course; only 56% of the students who placed in Math 60, 70 or 80 registered for the respective developmental course (Math ABE students were excluded from the analysis because there was no corresponding developmental course available for them).

- ✓ Fewer students may have attempted to remediate their math skills because they did not need to improve their placement level to meet the math prerequisite for their intended program. Students could meet the prerequisites for up to 42 of the 50 subjects in which

MCTC offered academic programs without attaining college-level math skills. Students could meet the prerequisites for programs in only 30 subject areas without attaining college-level reading skills.

Table S-4: Key Statistics about Developmental Education Coursework

Key Statistics	Developmental Education Placement Level at Entry					
	Read100	Read200	Eng900	Math60	Math70	Math80
Number of Students Who Tested into Placement Level at Entry	550	818	1,226	1,046	672	402
Initial Term for Dev Ed Course Registration						
First Term	448	525	825	481	276	137
Delayed to Second Term	29	37	82	90	30	34
Delayed to Third Term or Later	3	18	33	63	45	29
Number of Students Registering for Course	480	580	940	634	351	200
% of Students Who Registered for Course	87%	71%	77%	61%	52%	50%
% of Students Registering for Course						
Who Took It in Their First Term	93%	91%	88%	76%	79%	69%
Failed on First Attempt & Repeated	16%	13%	13%	13%	11%	9%
Repeated Course More Than Once	2%	2%	1%	1%	2%	2%
Pass Rates for the Dev Ed Course						
First Term Registrations	65%	56%	62%	60%	62%	63%
Delayed Registrations	63%	64%	66%	66%	68%	76%
Repeat Registrations	30%	44%	30%	41%	54%	61%

Note: Table includes only the first course taken in each developmental sequence by students who were placed into these developmental levels based on their Accuplacer test scores.

The study also showed that there were some significant differences in the rates at which students passed certain courses depending on their placement in another subject area.

Students who placed in Math 60 passed developmental reading courses at a rate about 20 percentage points higher than students who had placed in Math ABE.

- ✓ The rate at which students passed the Math 60 courses was related to their reading placements. Only 51% of students who placed at Reading 100 passed Math 60, compared to 56% who had placed at Reading 200, and 65% who placed at College-Level Reading.

- ✓ Students who placed in Math 60 passed developmental reading courses at a rate about 20 percentage points higher than students who had placed in Math ABE. For students taking the Reading 100 courses, 73% of the students with Math 60 placements passed, compared to only 51% of the students with Math ABE placements. For Reading 200, the passing rates were 61% and 42% for students with Math 60 and Math ABE placements, respectively.

- ✓ The rate at which students passed the College English course (an entry-level college course required by many programs) was related to whether they had attained college-level reading status. MCTC, however, did not use reading placements as a prerequisite for enrolling in the College English course; students only needed to attain college-level writing status to register for College English. Of 324 students who took a College English course while still at a developmental reading placement, only 40% of them passed the course, earning a grade point average of 1.71. By comparison, of the 1,640 students who tested into college-level reading and enrolled in a College English course, 66% of them passed the course, earning a grade point average of 2.70. [Note: Because MCTC now uses the Reading Comprehension subtest for both reading and writing placements, students may no longer be placed at College-Level Writing and developmental Reading based on their test results. It remains possible, though, for students to be placed in both developmental Reading and Writing, pass only the writing course, and then enroll in College English.]

The number of developmental courses needed to complete a sequence affected the chances that a student would earn college-level status in a subject area. Quite simply, many students with the lowest placement levels would not be enrolled for enough terms to complete a sequence.

The number of developmental courses needed to complete a sequence affected the chances that a student would earn college-level status in a subject area. Quite simply, many students with the lowest placement levels would not be enrolled for enough terms to complete a sequence. For example, students who were placed at Math 60 upon entering MCTC would have needed to pass three developmental math courses to earn college-level math status, but only 52% of them enrolled for more than two terms. Even if students from lower placement levels remained enrolled, they faced the challenge of passing more developmental courses than students who tested into higher placement levels. Failure to pass the course at any level of the sequence stymied their efforts to advance to college-level.

- ✓ Of 984 students who tested into a developmental reading level and continually attempted to improve their reading placement level[9], 62% reached college-level reading status. Of the 362 students from this analysis who tested initially into the Reading 100 placement level, 46% of them reached college-level reading status: 24% of the students passed both developmental reading courses, 19% of them had one course waived[10], and 3% retested into college-level reading. Of the 622 students who tested initially into the Reading 200 placement level, 70% of them reached college-level reading status: 58% passed Reading 200 and 12% retested into college-level reading.

- ✓ Of 878 students who tested into a developmental Math 60, 70, or 80, and continually attempted to improve their math placement level (again see Endnote 9), 40% reached college-level math status. The ability to reach college-level math status varied considerably depending on students' initial developmental math level. Only 19% of the Math 60 students passed three developmental math courses to reach college-level math status, compared to 37% of the Math 70 students who passed two developmental math

For entry-level college reading, writing, and math courses, students who progressed to college-level through developmental courses performed comparably to students who had placed there based on their assessment tests.

courses, and 67% of the Math 80 students who passed only one math developmental course.

The previous analysis indicates the dominant effect that the initial placement level had on students' chances of reaching college-level status. For developmental reading students, differences in test scores on the Accuplacer Reading Comprehension subtest were not related to how many developmental reading courses students were able to pass. Uniformly across test score quintiles within a placement level, about 25% of the Reading 100 students passed two courses and about 58% of the Reading 200 students passed one course in order to advance to college-level reading. Uniform rates for advancing to college-level math also were apparent for students who had placed at Math 60 and Math 80, but not students who placed at Math 70.

- ✓ Of 107 students who had test scores in the bottom two quintiles of the Math 70 placements, 23% of them were able to pass both Math 70 and Math 80 courses and reach college-level math status. Of 95 students who had test scores in the upper two quintiles of Math 70 placements, 52% of them were able to pass both Math 70 and Math 80 courses and reach college-level math status. Although there were a limited number of students for this analysis, the difference was statistically significant ($p < .001$). Accordingly, this discontinuity in the Math 70 placement level deserves further scrutiny.

A common method of testing the quality of developmental coursework is to compare the performance of students in entry-level college courses between students who had completed a developmental sequence ("progressed into the course") and students who tested into college-level for that subject area ("placed into the course"). Table S-5 shows the results for that analysis of the students included in this study.

- ✓ The results were somewhat mixed for entry-level college reading, writing, and math courses. Students who progressed to college-level Reading through developmental courses performed comparably to students who had placed there based on their assessment tests. The results for College English and Algebra suggest an advantage for students who placed into those courses, but the magnitude of the differences was not great.

A final consideration related to developmental coursework was its efficiency. To measure efficiency, the study analyzed the extent that MCTC graduates needed and took developmental coursework. Table S-6 shows the result of this analysis.

- ✓ Overall, 44% of the MCTC graduates took more developmental coursework than needed to be admitted to their program of study, suggesting that students made a fairly inefficient use of developmental courses. Most of the inefficiency, though, was confined to students who graduated either with a NAHA certificate or a program that did not have math as a prerequisite.

Table S-5: Performance in College Entry Courses: Comparison of Students who "Placed into College-Level from Assessment Tests to Students Who "Progressed" to College-Level through Developmental Coursework

Course	Students Who "Placed" into College Level			Students Who "Progressed" into College Level		
	Course Registrants	% Who Passed	GPA	Course Registrants	% Who Passed	GPA
College Textbook Reading	186	65%	2.44	102	68%	2.48
College English 1	1,888	65%	2.61**	605	61%	2.32**
College Algebra	39	79%*	2.06	351	64%*	1.83

Note: The differences between students who "placed" and those who "progressed" into these entry-level college courses were not statistically significant, except for:

**The difference in writing course GPAs was statistically significant (p<.001).

*The difference in the rate of passing college math was statistically significant (p=.03). Although the GPAs for College Algebra appear quite different for the two groups, it was not a statistically significant difference due to the small number of students who had placed into the course.

Table S-6: MCTC Graduates Efficiency in Taking Developmental Courses

Program Prerequisites		Number of Graduates	Students Who Needed No Developmental Courses and Took None	Took Developmental Courses			Efficiency Rate
Reading Placement	Math Placement			Took Only Courses Needed	Took More Courses than Needed	Took Courses But Needed None	
Read 100	None	179	45	1	1	132	26%
Read 200	None	105	56	1	36	12	54%
College	None	69	34	5	5	25	57%
Read 200	Math 70	74	40	5	20	9	61%
College	Math 70	27	20	5	2	0	93%
College	Math 80	27	20	5	0	2	93%
College	College	76	7	69	0	0	100%
All MCTC Graduates		**557**	**222**	**92**	**63**	**180**	**56%**

Developmental Education: Enabler or Barrier to Successful Educational Outcomes?

Higher education scholars have debated the effectiveness of developmental education for many decades. Weissman, Bulakowski, & Jumisko[11] (1997) cited numerous studies that found beneficial effects for students who enrolled in developmental coursework compared to under-prepared students who had not taken developmental courses. Clark[12] (1960) argued that community colleges filtered out students who, although interested in a college degree, lacked either the will or the ability to earn one. More recently, Bailey[13] (2009) questioned the cost effectiveness of requiring students to take developmental courses.

The ultimate test of effectiveness is whether students achieved successful educational outcomes[14]. Student success, though, depends on factors associated with both the students and the institution. Student factors include the academic skills of incoming students, their educational goals, life challenges they may be facing outside the classroom, and their commitment and motivation to succeed. Institutional factors include the availability of academic programs for students at various skill levels, effective opportunities for students to improve their skill levels, and services to help students find educational pathways conducive to their skills and interests.

Overall, 35% of the first-time MCTC students included in this study had successful education outcomes after four years (16% graduated from MCTC, 8% remained enrolled at MCTC, and 11% had transferred to other colleges after making good academic progress at MCTC). Considering that only 2% of the students were assessed as "college-ready" upon enrolling at MCTC, a 35% success rate can be viewed as a considerable accomplishment. Indeed, as shown in Tables S-7 and S-8, success rates depended on students' entering math and reading placements.

Table S-7: Student Success Rates by Entering Math Placements

Educational Outcomes	Entering Math Placements						
	Math ABE	Math 60	Math 70	Math 80	College Math	Not Tested	All Levels
Unsuccesful Outcome							
Dropped Out, after academic difficulty	422	387	208	92	11	32	1,152
Transferred, after academic difficulty	200	205	94	55	13	27	594
Dropped Out, after good academic progress	114	174	137	68	11	26	530
Subtotal- Unsuccessful Students	736	766	439	215	35	85	2,276
Successful Outcome							
Graduated:							
NAHA	41	66	28	21	6	17	179
Other Program without Math Requirement	67	58	23	12	1	13	174
Program with Math Requirement	3	41	69	66	13	12	204
All Graduates	111	165	120	99	20	42	557
Transferred, after good academic progress	65	118	73	78	24	15	373
Retained	71	117	62	30	3	6	289
Subtotal - Successful Students	**247**	**400**	**255**	**207**	**47**	**63**	**1,219**
First-Time Students in Study	**983**	**1,166**	**694**	**422**	**82**	**148**	**3,495**
Graduation Rate	11%	14%	17%	23%	24%	28%	16%
Success Rate	25%	34%	37%	49%	57%	43%	35%

Table S-8: Student Success Rates by Entering Reading[15] Placements

Educational Outcomes	Entering Reading Placements			
	Reading 100	Reading 200	College Reading	All Levels
Unsuccesful Outcome				
Dropped Out, after academic difficulty	257	312	583	1,152
Transferred, after academic difficulty	135	162	297	594
Dropped Out, after good academic progress	68	108	354	530
Subtotal- Unsuccessful Students	460	582	1,234	2,276
Successful Outcome				
Graduated:				
NAHA	43	44	92	179
Other Program without Math Requirement	30	56	88	174
Program with Math Requirement	10	29	165	204
All Graduates	83	129	345	557
Transferred, after good academic progress	47	64	262	373
Retained	39	60	190	289
Subtotal - Successful Students	169	253	797	1,219
First-Time Students in Study	**629**	**835**	**2,031**	**3,495**
Graduation Rate	13%	15%	17%	16%
Success Rate	27%	30%	39%	35%

Entering math and reading placement levels, though, provided only a partial explanation for the variation in success rates. Success also depended on students' experiences with MCTC's developmental education programming:

- ✓ 788 of the 3,495 students pursued their educational goals without using MCTC's developmental education programming. Upon entering MCTC, these students apparently met the prerequisites for the courses that interested them. They enrolled for an average of 3.3 terms and achieved a 39% success rate.

- ✓ Of the 2,707 students who attempted to improve their skill levels, 1,131 progressed to a level that appeared sufficient[16] for them to pursue their educational goals. These students were enrolled for an average of 4.5 terms and achieved a 52% success rate.

- ✓ Another 490 of the 2,707 students who attempted to improve their skills showed some improvement, but were unable to improve their skill level to the full extent attempted. Many of these students may have readjusted their educational goals. On average, they attended MCTC for 3.8 terms and achieved a 37% success rate.

- ✓ The remaining 1,086 students had attempted to improve their skills, but were unable to do so. Most of them (78%) departed from MCTC immediately after an unsuccessful attempt to improve their skill levels and less than 10% of them remained enrolled for more than one additional term. On average, these students attended MCTC for only 1.9 terms, and had a 14% success rate.

These results suggest that attempting to improve academic skills through developmental education is a high-stakes endeavor for students. The difference in the success rates between students who reached a skill level that they found satisfactory (52% success) and students who were unable to improve their skills (14% success) was dramatic. Developmental education enabled a large proportion of MCTC students to boost their performance, but loomed as a barrier to about an equal number of students. As Table S-9 shows, students who improved their skill level with developmental education consistently achieved higher success rates, regardless of their entering placement levels, than students who were unable to improve their skills.

Table S-9: Success Rates Based on Entering Placement Levels[17] and Improvement in Skill Levels

Entering Math & Reading Placement Levels	Number of First-Time Students Who Entered at These Levels	Success Rates Based on Improvement in Skill Levels from Developmental Education				
		Improvement Attempted But None Made	Some Improvement	No Attempted Improvement	Full Improvement	All Students at Entering Placement Levels
$R_{100}M_{ABE}$	371	6%	29%	n/s	36%	20%
$R_{100}M_{60+}$	258	14%	44%	n/s	45%	36%
$R_{200}M_{ABE}$	390	10%	49%	39%	37%	25%
$R_{200}M_{60+}$	481	4%	32%	45%	50%	32%
$R_{CL}M_{ABE}$	222	26%	n/s	30%	n/s	33%
$R_{CL}M_{60+}$	627	15%	33%	35%	56%	38%
$R_{200}M_{70}$	195	19%	35%	38%	47%	36%
$R_{CL}M_{70}$	534	14%	42%	34%	62%	38%
$R_{CL}M_{80}$	339	31%	n/s	50%	64%	50%
$R_{CL}M_{CL}$	78	n/s	n/s	59%	n/s	59%
All Students	3,495	14%	37%	39%	52%	35%

The results also reiterate the importance for students to experience early success in college. Students who partially attained their attempted improvement in skill levels by using MCTC's developmental education programming were able to nearly match the success rate of students who had not used developmental education, 37%[18] to 39%, respectively, and far exceed the success rates of students who had made no progress toward improving their skills (14% success rate).

The study also suggests that there were limits to how far developmental education reasonably could improve students' skill levels.

- ✓ Less than half the students in the study improved their skill levels after enrolling in MCTC. Admittedly a significant number of students (788) made no attempt to improve their skills, but of the 2,707 students who attempted to improve their proficiency level, 40% failed to make any progress. As stated earlier, 78% of these students left MCTC immediately and less than 10% stayed for more than one additional term. Only 257 of the

2,707 (9%) students advanced more than two proficiency[19] levels, meaning that 90% of the students who improved their skill levels advanced only one or two levels.

Of the 2,707 students who attempted to improve their proficiency level, 40% failed to make any progress. As stated earlier, 78% of these students left MCTC immediately and less than 10% stayed for more than one additional term.

- ✓ About half the students in the study only attended MCTC for one or two terms; many students would not have attended long enough to complete a sequence of developmental courses and become eligible for admittance to their desired academic program.

- ✓ Student who entered with Math ABE placements faced a particularly difficult challenge in improving more than two levels (less than 5% did so). Students who entered MCTC at a Math 60 placement level and with developmental reading needs fared somewhat better, but still only 20% of them advanced more than two proficiency levels.

Finally, the possible inefficiency associated with students enrolling in unneeded developmental education coursework was a concern. Although efficiency could only be measured for 557 students who had graduated from MCTC, it suggested that too many students (44%) had registered for more developmental courses than they needed for their program of study.

A variety of reasons could have contributed to students taking more developmental coursework than needed for the program in which they graduated. Some students could have changed their mind about the program they wished to study. Other students may have intended to pursue additional college credentials and wanted to complete more developmental coursework to prepare for their next program of study. Still other students may have been undecided about their intended program, and were taking developmental courses until they decided what programs they wanted or could pursue. Finally, it is possible that some students simply were confused and enrolled in developmental courses that they did not need. The MCTC curriculum design is very complex. Many students likely need help navigating the curriculum, particularly if they were undecided about their program of study or were changing programs.

Policy Implications

Developmental education will play a critical role if MCTC is to attain its goals of student success and educational equity. Students from underrepresented groups (racial/ethnic minorities, low-income, or first-generation students) generally had the lowest combination of reading and math skills and were most dependent on developmental education. It was clear that student success, particularly for students from underrepresented groups, was unlikely without developmental education.

Foremost, this study emphasizes the importance of ensuring that students understand their developmental education needs and their chances of remediating any skills needed to access their chosen academic program. Possible strategies include:

- Simplifying the design of placement levels and developmental education or give students access to tools that will help them evaluate their unique needs and interests. The current design is extremely complex and may be difficult for many students to understand. At MCTC, there were 19 different combinations of reading, writing, and math placement levels as prerequisites for registering for entry-level courses in the 82 subject areas the college offered during the time period of the study. Students who are uncertain about the desired program of study or change their minds about their desired program may have particular difficulty in determining the best educational pathway for themselves. Furthermore, some students may be taking developmental education courses that are not needed for their program. The study found that 44% of the MCTC graduates actually had taken more developmental education courses than were required for their program, indicating that many students may not understand how much developmental education they need.

- Advising students of their realistic chances for gaining access to their desired program of study and achieving a successful educational outcome. If students realize that they face long odds in advancing to a rigorous program of study, they may adjust their goals and aim for a program that is more likely to result in success. In any event, students should have a clear understanding of the time, money, and effort needed to reach their desired program and then achieve a successful outcome.

The study showed the value of having curriculum that allowed students to access programs at multiple skill levels, not just college-ready skills. Only 78 of the students in the study entered MCTC with college-ready skills in all subjects (i.e., reading, writing, and math) , and another 365 students attained the college-ready skill level within four years. Yet, over 1,200 of the 3,495 students had a successful educational outcome. Many of the students found success in career/technical education programs that were suited to their skill levels. Accordingly, MCTC must strive to optimize the range of academic programs available to each student. Possible strategies include:

- Creating additional opportunities for students at lower skill levels by designing new programs or revisit the merits of existing program prerequisites.

- Reducing the number of placement levels or accelerating the rate by which students are able to advance placement levels. Students who needed the most improvement in their proficiencies often were not enrolled long enough to advance to their desired level. Only half the students attended MCTC for more than two terms.

The study also showed the positive effects for students who used developmental education to improve their skill levels. For many students, developmental education coursework helped "level the playing field" with students who entered MCTC at higher skill levels. Unfortunately, developmental coursework also filtered out as many students who were unable to improve their skill levels. Therefore, MCTC must continue to explore ways to improve the effectiveness of its developmental coursework. The study suggests some potential opportunities for designing new approaches to developmental coursework, including:

- Considering the interdependencies between math and reading placement levels, and the rates at which students passed the respective developmental courses. Too many students with low reading placements were not passing developmental math courses and too many students with low math placements were not passing developmental reading courses. Strategies to integrate the development of math and reading skills together should be considered.

- Addressing the special needs of students from certain subgroups. In addition to the challenges faced by students from groups traditionally under-represented in higher education, female students and working adults had particular difficulty with math placements. Women and working adults accounted for a disproportion number of students with low math placements, and may need special assistance to help them improve their math skills.

MCTC must continue to explore why so many students failed in their efforts to improve their skill levels. Over 1,000 students who attempted to improve their skill level, failed to do so, and the results were devastating – as stated earlier, 78% of these students left MCTC immediately and less than 10% stayed for more than one additional term; overall, the students had a 14% success rate. This study identified some strategies that should help more students achieve successful education outcomes. Yet, much remains unknown. There may be ways to improve upon the methods used to place students into appropriate developmental or college-level courses that will foster greater student success.[20] In addition, different approaches to understanding why some students encounter academic difficulty, such as focus groups, interviews, or case studies, may reveal additional insights and lead to new ideas for addressing issues that underlie the problem. Solutions can then be sought by working with the K-12 system on skills development and experimenting with new approaches for college students

Endnotes

[1] MnSCU Policy 3.3 and Procedure 3.3.1 designates the Accuplacer subtest scores that students must earn to demonstrate that they have college-level skills in each subject area. Students who earn college-level placements in reading, writing, and math are deemed to be "college ready".

[2] Skill levels for most students are determined from their Accuplacer subtest scores. Students may be exempted from taking the Accuplacer test if they are able to demonstrate college-level skills by alternate means, such as satisfactory completion of a college course in the subject area or a sufficiently high score on the ACT college admissions test; few first-time community college students, though, are able to be exempted from the Accuplacer test.

[3] Each college has the discretion to establish a unique curricular framework for developmental education sequences and prerequisites for academic programs. For example, MCTC has created three levels of developmental math, whereas other colleges only offer two levels of developmental math. MCTC also has created 19 unique combinations of reading, writing, and math placement levels as program prerequisites. Similar programs at other colleges may have different prerequisites.

[4] First-time students have not attended any college or university since graduating from high school. Transfer students, who attended other colleges or universities after high school, are not included in this study.

[5] To simplify the presentation in table S-2, several math placements were combined into M60+ for three categories. In addition to 1,166 students who placed at Math 60, these categories include148 students who had not yet taken the math sub-tests upon entering MCTC and 52 students at the Reading 100 level who had placed at Math 70 or higher. These results shown in the table essentially would have been the same as if only Math 60 placements had been used for the presentation. Overall, only 86 of 1,166 (7%) students who placed at Math 60 were able to reach college readiness status.

[6] Center for Community College Student Engagement (February 2012). *A Matter of Degrees: Promising Practices for Community College Student Success (A First Look)*. Austin, TX: The University of Texas at Austin, Community College Leadership Program.

[7] Minnesota State Colleges and Universities & University of Minnesota (January 2011). *Getting Prepared: A 2010 Report on Recent High School Graduates Who Took Developmental/Remedial Courses.*

[8] Adelman (2006). *The toolbox revisited: Paths to degree completion from high school through college*. U.S. Department of Education.

[9] This analysis excludes students who never enrolled in any developmental courses in the sequence or did not enroll in further developmental courses after successfully completing one or more developmental courses, but not completing the full sequence of courses.

[10] Most of these students were able to skip Reading 200 based on the recommendation from their Reading 100 instructor.

[11] Weissman, Bulakowski, Jumisko (Winter 1997). Using research to evaluate developmental education programs and policies. *New Directions for Community Colleges, 100*, pp. 73- 80.

[12] Clark (1960). The "cooling-out" function in higher education. *American Journal of Sociology, 65*, p. 569-576.

[13] Bailey (Spring 2009). Challenge and opportunity: Rethinking the role and function of developmental education in community college. *New Directions for Community Colleges, 145*, pp. 11- 30.

[14] There is no generally accepted definition of what constitutes a successful education outcome. For this study, students were considered to have achieved a successful educational outcome if they graduated from MCTC within four years, remained enrolled at MCTC after four years, or had departed from MCTC after making good academic progress (earning at least two-thirds of attempted credits) and transferred to another college. This definition provides a useful metric for the analysis used in this study, but it should not be used for comparing the MCTC to other community colleges.

[15] The numbers for Reading 100 in this table include 28 students who did not have a reading placement in their first term at MCTC and 31 students who entered MCTC with at a Reading ABE level. The success and graduation rates for the Reading 100 category were not affected by including these extra students in the analysis.

[16] Students who successfully improved their skill level on their last attempt (developmental course taken or retaking the assessment test) and remained enrolled at MCTC were assumed to have reached a skill level that was satisfactory to them.

[17] Table S-9 suggests that there was a strong statistical relationship between entering placement levels and student success rates. This relationship was tested with a binary logistic regression mode, using math and reading placements as possible predictors of student success. The results showed that math placement levels were a statistically significant predictor of student success, even after accounting for differences in reading placements. Reading placements, though, were not a statistically significant predictor, after accounting for math placements. It showed that math placements accounted for more variability in student success rates than reading placements.

[18] The students who only partially improved their skill levels likely settled for academic awards with less rigorous prerequisites. Almost half the students who made partial improvement in their skills and later graduated from MCTC, graduated with a NAHA certificate, compared to only 14% of the graduates who had not attempted to improve their skill levels.

[19] Proficiency levels are defined in the full study. It identified six proficiency levels that corresponded to a various combinations of reading, writing, and math placements set as prerequisites for a group of subjects. The levels were hierarchical, meaning that as students advanced in proficiency levels the cumulative number of subjects for which they met the prerequisites increased, thereby affording them more options for programs of study.

[20] For example, a recent study found that high school grades were a better predictor of community college success than placement test scores. See Bellfield & Crosta (February 2012), Predicting success in college: The importance of placement tests and high school transcrips (Working Paper No. 42). New York: Community College Research Center, Teachers College, Columbia University.