



## Math Challenges at MGTC

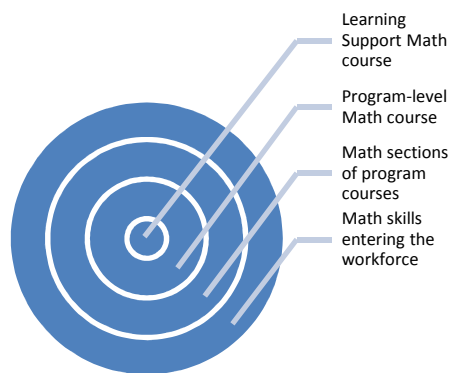
This document is an edited segment of the Quality Enhancement Plan submitted by Middle Georgia Technical College. In this section, each of the four learning outcomes of the QEP are discussed in the context of math challenges found at MGTC. These challenges serve as the benchmark data for each learning outcome.

The full unedited version of the QEP can be found on the QEP website, [qep.middlegatech.edu](http://qep.middlegatech.edu).

## Desired Student Learning Outcomes

When considering the focus of the QEP, the Planning Team sought to positively affect student learning in the three fundamental elements of learning: the student, the teacher, and the classroom. To bring the effort more clearly into focus, four specific student learning outcomes, their assessment, benchmark data, and goals were developed. These outcomes center on points of a student's experience at Middle Georgia Technical College by evaluating learning at the beginning, middle, end, and post-graduation milestones. These four student learning outcomes are:

- Students will demonstrate mastery of the concepts in Learning Support math courses.
- Students completing Learning Support math courses will demonstrate mastery of the concepts in their core math courses.
- Students completing Learning Support math courses will demonstrate mastery of the mathematical concepts in the math portions of their occupational courses.
- Students completing Learning Support math courses will enter the workforce with appropriate math skills.



The student learning outcomes can be assessed effectively to provide the observable results needed to evaluate the success of the QEP's activities. Assessment areas for each can be categorized as direct or ancillary. Direct assessment areas are those that are immediately affected by implementations, such as test scores; ancillary assessment

areas are those that are subsequent results. For example, while test scores are a direct assessment of the student learning, retention or course attainment are ancillary results.

*The First Student Learning Outcome*

The first outcome, *Students will demonstrate mastery of the concepts in Learning Support Math courses*, provides the foundational level of the QEP. It is the intention of the QEP that the improved math skills at this level will flow outward into the other learning outcomes and further in the students' academic career and beyond.

**Benchmark Data**

Table 8 below shows the exit exam mean scores for four prior years, FY 2006 – FY 2009. The exit exam scores are required of each student in these three courses; course completion is dependent upon their being passed. In MAT 0097 and MAT 0098, the exit exams are based on a 100-point scale; the COMPASS exam is used in MAT 0099 and is based on a 70-point scale. For Associate degree students at Middle Georgia Technical College, a COMPASS Algebra score of 37 is required to enter MAT 1111, College Algebra.

**Table 8 Exit Exam Mean Scores**

	<b>FY2006</b>	<b>FY2007</b>	<b>FY2008</b>	<b>FY2009</b>
MAT 0097 Exit Exam Scores	81.5	80.8	74.6	82.4
MAT 0098 Exit Exam Scores	82.0	82.4	84.0	84.5
MAT 0099 Exit Exam Scores (COMPASS)	55.2	49.6	39.4	51.4

The exit exam scores are inflated; a review of these scores should be considered meaningful when combined with the eligibility requirements for taking the final exam.

The General Education department has a requirement that only students with a current

passing grade can sit for the exam. The percentage of end-of-quarter students eligible to take the final exams, is shown in Table 9:

**Table 9 Final Exam Eligibility**

	FY2006	FY2007	FY2008	FY2009
MAT 0097 % of Students Eligible for Final	na	48.3%	41.7%	73.0%
MAT 0098 % of Students Eligible for Final	na	63.2%	69.5%	62.0%
MAT 0099 % of Students Eligible for Final	na	48.3%	86.1%	100.0%

As a point of reference, for FY2007, 275 students of the 489 enrolled in the three math courses at the end of the quarter were eligible to take the final; in FY2008, 208 of 318 were eligible.

### Goals

The goals for the first student learning outcome, established by the QEP Development Team, were based on the benchmark data above and input from math faculty members. These goals will be reviewed on a quarterly, then annual, basis and adjusted as appropriate.

The Exit exam mean score goal for MAT 0097 is an annual mean of 80.00. The Exit exam mean score goal for MAT 0098 is an annual mean of 85.00. For the MAT 0099 COMPASS exam, the goal of the annual mean score is set at 50.00. Finally, each of the Learning Support courses tracks the percent of students eligible to sit for the final exam. For MAT 0097, the goal is for 70.0 percent of the students in the course at the end of the quarter to be eligible for the final. For MAT 0098 and MAT 0099, the goal is 80.0 percent eligibility. A complete list of student outcome goals and recent data is found in Appendix XI.

### *The Second Student Learning Outcome*

The second student learning outcome is *Students completing Learning Support math courses will demonstrate mastery of the concepts in their core math courses.* Once students have successfully completed their learning support courses, the next step in their mathematical academic path is the core math courses. The intention of the QEP is that the improvements made in the previous learning support courses will 'flow' to the core math courses and improvements will be noticed at this level.

### **Benchmark Data**

Table 12 below shows the mean final exam scores for all students in all core math courses for the six quarters ending Fall 2008. Table 13 is a listing of each competency feedback assessment that will be used from each of the four core math courses. Each of these feedback assessments are distributed to students during the appropriate point in the quarter and graded.

**Table 12 Core Math Course Final Exam Mean Scores**

	<b>Summer 2007</b>	<b>Fall 2007</b>	<b>Winter 2008</b>	<b>Spring 2008</b>	<b>Summer 2008</b>	<b>Fall 2008</b>
<b>MAT 1012</b>	80.0	71.4	77.5	70.7	76.9	69.9
<b>MAT 1013</b>	52.7	78.8	76.5	71.1	68.9	64.2
<b>MAT 1011</b>	89.3	75.8	72.9	84.3	80.1	77.8
<b>MAT 1111</b>	78.8	83.3	85.7	85.6	83.1	82.3

**Table 13 Core Math Feedback Assignments**

MAT 1012	Order of operations Adding and subtracting Multiplying and dividing
MAT 1013	Exponents, radicals, and simplifying expressions Factoring exponents Simplifying radicals
MAT 1011	Rounding whole numbers and decimals Markdowns Weighted means
MAT 1111	Rules of exponents Radicals and quadratics Graphing

## Goals

Based on the benchmark data above and anecdotal information from math faculty members, the goals for the second student learning outcome were established by the QEP Development Team. These goals will be reviewed on a quarterly, then annual, basis and adjusted as appropriate. These goals are established for all students, regardless of input status: learning support or program-ready.

The Final exam score goal for MAT 1012 is an annual mean of 75.0; MAT 1013 is 70.0; MAT 1011 is 79.0; MAT 1111 is 84.0. A complete list of student outcome goals and recent data is found in Appendix XI.

### *The Third Student Learning Outcome*

The third outcome, *Students completing Learning Support math courses will demonstrate mastery of the mathematical concepts in the math portions of their occupational courses*, requires specific direct assessment in occupational courses.

Again, it is the intention of the QEP that enhanced learning at the learning support level will translate into improvements in the math sections of occupational courses.

**Table 15 Occupational Course Competency Assessments**

<b>Learning Support Course</b>	<b>Core math Course</b>	<b>Occupational Course</b>	<b>Competency Assessed</b>	<b>Test/Number of questions</b>
MAT 0097	MAT 1011	ACC 102, Accounting II	Multiplying fractions and decimals	Chapter 13 Notes test, 12 questions
MAT 0098 and/or MAT 0099	MAT 1013 and/or MAT 1111	IFC 101, Direct Current Circuits I (Electronics)	Algebra	Chapter 4, Ohm's Law, 43 questions
MAT 0097	MAT 1012	MAS 103, Pharmacology (Medical Assisting)	Metric conversion	Chapter 4, 42 questions
MAT 0097	MAT 1012	AHS 102, Drug Calculations	Multiplying and dividing fractions, decimal conversion, ratios, metric conversion, temperature conversion, others	Chapter 1, test 1, 36 questions
MAT 0098	MAT 1013	DDF 100, Measurements	Multiplying and dividing fractions, ratios	Chapter 1, worksheet 1, 25 questions

Table 16 below shows the most recent data for each of the five assessments above.

The scores represent the percentage of overall mastery of the test section by the students in the course.

**Table 16 Embedded Assessments**

Notes test section in ACC 102	100.0	98.0
Ohm's Law test section in IFC 101	75.0	88.0
Drug Calculations test section in AHS 102	94.0	86.5
Metric Conversions test section in MAS 103	67.0	n/a
Scales test section in DDF 100	n/a	82.3

<b>Winter 2009</b>	<b>Spring 2009</b>
--------------------	--------------------

**Goals**

Based on the benchmark data above and anecdotal information from occupational program faculty and math faculty members, the goals for the third student learning

outcome were established by the QEP Development Team. These goals will be reviewed on a quarterly, then annual, basis and adjusted as appropriate.

For each of the assessments listed in Table 16 above, the goal will be success on these test portions at an 85 percent rate for all students regardless of input status (program-ready or learning support). Both groups will be tracked separately. A complete list of student outcome goals and recent data is found in Appendix XI.

*The Fourth Student Learning Outcome*

The fourth outcome, *Students completing Learning Support math courses will enter the workforce with appropriate math skills*, links directly to the mission of the College.

Middle Georgia Tech is a workforce preparatory institution and this outcome recognizes the value of math skills for all graduates in their transition to the workplace. It is intended that the improved math skills established at the learning support level have remained with the students through their program progression and now at the beginning point of their career.

**Benchmark Data**

Table 18 below shows the mean scores of the Work Ready Applied Mathematics for the previous five quarters. Table 19 shows the most recent results of the Employer Satisfaction survey question, “Mathematic Skills”.

**Table 18 Work Ready Applied Mathematics Mean Scores**

	<b>Summer 2008</b>	<b>Fall 2008</b>	<b>Winter 2009</b>	<b>Spring 2009</b>	<b>Summer 2009</b>
Diploma Graduates	5.25	4.85	4.61	4.47	5.00
Degree Graduates	na	5.29	5.08	4.96	na

**Table 19 Employer Satisfaction Survey “Mathematic Skills” Results**

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
Employer Satisfaction Rate	96%	93%	100%	95%	100%

## Goals

Based on the benchmark data above, scholarly research, and anecdotal information from employers, the goals for the fourth student learning outcome were established by the QEP Development Team. These goals will be reviewed on a quarterly, then annual, basis and adjusted as appropriate.

The goal of this student learning outcome is that all degree students will score a mean of 5.75 on the WorkReady math test, all diploma students will score a mean of 5.0, and all graduates will achieve a satisfaction rate of 100 percent on the “Mathematical Skills” section of the Employer Satisfaction Survey.

These four specific student learning outcomes benefit the College by producing a clearly defined desired impact of the effectiveness of the QEP. As the QEP is assessed according to these measures, the results of the data collected will be reviewed so that adjustments can be made for the students’ benefit. A complete list of student outcome goals and recent data is found in Appendix XI.

### *Research and Data Analysis of Ancillary Improvement Areas*

The student learning outcomes provide valuable direct assessment of the impact the QEP will have on student learning. There are a number of areas that might also improve with the implementation of the QEP but are not directly linked to the student outcomes. These areas are valuable to the College and include retention and attainment. Although not a direct assessment used by the QEP, assessment of these ancillary outcomes will be observed.

**Retention.** A possible result of improved student learning in learning support math courses might be increased student retention. Although not immediately associated with

student learning, retention is nonetheless a valuable topic for the College. A review of the recent data shows a declining state of retention of those students enrolled in learning support math courses, specifically MAT 0097, MAT 0098, and to a lesser extent, MAT 0099. Table 20 below shows the disparity between those students who took learning support courses and those who were not required to:

**Table 20 Learning Support Retention**

<b>Six-Quarter Period</b>		<b>Retention Rate</b>
200602 to 200704	Students without MAT 0097	66%
	Students who took MAT 0097	41%
	Students without MAT 0098	65%
	Students who took MAT 0098	58%
	Students without MAT 0099	64%
	Students who took MAT 0099	100%
200702 to 200804	Students without MAT 0097	59%
	Students who took MAT 0097	49%
	Students without MAT 0098	59%
	Students who took MAT 0098	50%
	Students without MAT 0099	58%
	Students who took MAT 0099	58%

MAT 0099 has a better relationship with student retention than the other courses.

Students in MAT 0099 tend to remain in school until graduation. MAT 0099 is a learning support course for the degree-level MAT 1111, College Algebra, and is taken by students in a degree program. MAT 0097 and MAT 0098 are both diploma-level learning support math courses.

MAT 0099 data reflects those students who are in the smaller population degree program (n=9 and n=12, respectively), and who are characteristically students who have completed a diploma credential and are adding the core requirements found in the degree. That is, degree students have completed the number of occupational courses found in their diploma and are therefore more engaged in their academic pathway.

These occupational courses are valued by students because of their contextual nature;

that is, the occupational theory and practice taught in these courses are reflective of the practices found in their intended careers.

A definition of contextual learning from Karweit (1993) states “learning that is designed so that students can carry out activities and solve problems in a way that reflects the nature of such tasks in the real world.” Cantor (1999) refers to contextual learning as “a key to motivations and student success.” These findings support the value of learning in the context of the post-graduate occupation. Contextual learning is also supported by the basic tenets of adult learning theory that adults are goal oriented, relevancy oriented (problem centered), practical problem-solvers. This relevance is certainly more explicit in those students having completed a diploma prior to entering the degree program.

To delve further into the retention data of learning support students, a random sample of students who did not successfully complete MAT 0097 between Spring 2007 and Spring 2008 was created. Twenty students were chosen from either the daytime classroom course, the nighttime classroom course, or the PLATO lab course. Seventeen of these students received a grade of “F” in MAT 0097 and three received a grade of “D.”

Of the 20 students who did not complete the MAT 0097, 6 were still enrolled during Summer 2008, a retention rate of 30 percent. None of these students had graduated by Summer 2008. Of the fourteen students not retained, five continued for two consecutive quarters following the quarter taking MAT 0097; six of those not retained were enrolled only in the quarter MAT 0097 was taken and not after.

A supporting point for adult learning in the context of their post-graduate occupation is the influence of occupational program courses on the retention of MAT 0097 students. Of the six students still enrolled in 200901, five had had a program-level course at some

point since taking MAT 0097. By contrast, eleven of the fourteen students not retained had not taken a program-level course since taking MAT 0097.

As mentioned previously, in Summer 2008, Middle Georgia Technical College participated in the National Community College Benchmark Project as one of one 188 community colleges. Results from this project show comparable data and percentile ranks of MGTC against the other colleges. An interesting note to make is that while the College is in the 81<sup>st</sup> percentile in math retention, in the subject of completer success rate, the ranking falls into the 1<sup>st</sup> percentile. This may indicate that although math students may remain through the course, their persistence through graduation is poor.

**Attainment.** Another ancillary result for the College might be an improvement in student attainment. The attainment rate can be determined for those students successfully completing the MAT 0097, MAT 0098, and MAT 0099 courses. A review of Winter Quarter 2008 data shows that for scores from all courses in diploma or degree courses taught at Middle Georgia Technical College, the attainment rate (those achieving A, B, or C) was 73.9 percent. The attainment rate for students in the aforementioned three MAT courses was 37.9 percent. As mentioned previously, the GPA of students achieving letter grade scores in Learning Support math courses was 1.465 deviations below the college GPA. Another assessment of this learning outcome could be the results of the end-of-course exit exams in each of the three courses.

From FY2005 through FY2007, the attainment rates for all College courses were 80, 83, and 82 percent respectively; the intended outcome for the College was 80 percent.

More recently, the Fall 2007 through Fall 2008 attainment rates for the MAT 0097, MAT 0098, and MAT 0099 courses are shown in Table 21 below:

**Table 21 Learning Support Attainment (Quarterly)**

	<b>MAT 0097</b>	<b>MAT 0098</b>	<b>MAT 0099</b>
Fall 07	17%	48%	50%
Winter 08	23%	42%	38%
Spring 08	36%	41%	65%
Summer 08	23%	52%	53%
Fall 08	55%	50%	61%
Winter 09	45%	35%	65%
Spring 09	37%	52%	63%

Improvements in the attainment rates of students in these courses may lead to many positive outcomes, including student retention. Table 22 below shows the data for the Fall 2007, Winter 2008 and Spring 2008 quarters and the comparison of the success rates of program-ready students compared to students who came through the learning support courses.

**Table 22 Program-Ready versus Learning Support Attainment**

		<b>MAT 1011</b>	<b>MAT 1012</b>	<b>MAT 1013</b>	<b>MAT 1111</b>
<b>Fall 2007</b>	<b>Program Ready</b>	70%	63%	53%	74%
	<b>Learning Support</b>	56%	63%	50%	67%
<b>Winter 2008</b>	<b>Program Ready</b>	52%	61%	53%	70%
	<b>Learning Support</b>	43%	78%	45%	na
<b>Spring 2008</b>	<b>Program Ready</b>	78%	51%	40%	74%
	<b>Learning Support</b>	50%	50%	43%	67%
<b>Summer 2008</b>	<b>Program Ready</b>	56%	63%	65%	82%
	<b>Learning Support</b>	100%	62%	52%	67%
<b>Fall 2008</b>	<b>Program Ready</b>	40%	56%	47%	69%
	<b>Learning Support</b>	80%	67%	40%	76%

<b>Winter 2009</b>	<b>Program Ready</b>	63%	53%	55%	77%
	<b>Learning Support</b>	100%	78%	25%	100%

**Attrition.** Student attrition is a great concern to the Middle Georgia Technical College community and is included as a hopeful improvement result of the QEP. Table 23 below shows the rate of student attrition, especially in the MAT 0097 course, for Fall Quarter over the four year period 2004-2007.

**Table 23 Learning Support Math Attrition**

<b>Course</b>	<b>Quarter</b>	<b>Grad</b>	<b>Not Graduated</b>	<b>Still Enrolled</b>	<b>Attrition Rate</b>
MAT 0097	Fall 2004	15	73	2	<b>81%</b>
	Fall 2005	3	34	5	<b>81%</b>
	Fall 2006	12	44	2	<b>76%</b>
	Fall 2007	1	41	11	<b>77%</b>
	Fall 2008	2	20	18	<b>50%</b>
MAT 0098	Fall 2004	25	72	4	<b>71%</b>
	Fall 2005	26	52	10	<b>59%</b>
	Fall 2006	29	90	11	<b>69%</b>
	Fall 2007	18	71	36	<b>57%</b>
	Fall 2008	24	78	23	<b>63%</b>
MAT 0099	Fall 2004	8	1	0	<b>11%</b>
	Fall 2005	6	3	1	<b>30%</b>
	Fall 2006	10	5	1	<b>31%</b>
	Fall 2007	9	14	5	<b>50%</b>
	Fall 2008	16	9	3	<b>32%</b>

*Ancillary goals*

While not a direct intention of the QEP but nonetheless valuable to Middle Georgia Technical College, ancillary goals were also established. Attainment rates of learning support students was set at 80 percent for both learning support and core math courses, and the attrition rate of learning support math courses was set at 30 percent.

During each annual review of the QEP, the established goals will be reviewed and adjusted according to the most recent available results.