NAVARRO COLLEGE

Quality Enhancement Plan

On-Site Review: October 12-15, 2015
Submitted on: September 1, 2015

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Together Everyone Achieves Math Mastery

Quality Enhancement Plan

Navarro College

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Together Everyone Achieves Math Mastery
Quality Enhancement Plan

QEP Planning Committee

(Members and Campus Locations)

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Vicky Ferguson (Co-Chair), Assistant Dean, Humanities and Fine Arts (Corsicana)

Dr. Jill Baker (Co-Chair), Dean, Academic Support Programs (Corsicana)

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EXECUTIVE SUMMARY

The purpose of the Navarro College Quality Enhancement Plan (QEP) -***Together Everyone Achieves Math Mastery- TEA(M)²*** - is derived from a broad-based, campus-wide effort to improve student learning and achievement in mathematics.

> The focus of the Navarro College QEP is to increase student completion in developmental and credit-bearing mathematics courses necessary to meet degree requirements.

The QEP has two measurable goals that were developed to guide the QEP initiative and provide the platform for effective assessment of outcomes.

GOAL 1: Increase the percentage of students who successfully complete their program-specific developmental mathematics courses.
GOAL 2: Increase the percentage of students who, upon completion of the developmental mathematics course sequence, successfully complete the credit-bearing gateway program-specific mathematics course by the end of the following traditional (fall or spring) semester.

In order to achieve these goals, the QEP Planning Committee, in conjunction with the mathematics faculty, conducted an extensive review of research that led to the design of coordinated strategies proven to support more effective teaching and learning in mathematics. Students who do not engage in the classroom and do not have adequate support outside of the classroom struggle with success in mathematics. Furthermore, the majority of students who do not *immediately* enroll in a credit-bearing mathematics course upon successful completion of required developmental mathematics courses, typically do not persist to successful completion of credit-bearing mathematics courses. Through strategies including: 1) targeted advisor sequence training, 2) new engagement and empowerment techniques embedded within course instruction, 3) integration of technology into teaching and learning, 4) implementation of tutoring support, and 5) professional development for faculty and others directly involved in the effort, students will be immersed in an initiative that seeks to increase student learning and success at Navarro College.

Navarro College has devoted sufficient resources to implement, sustain, and evaluate this initiative. The QEP will be assessed and monitored for continuous improvement to enable students to overcome the difficulties associated with developmental and credit-bearing gateway mathematics courses that hinder students from completing their chosen degree plans. Navarro College recognizes the unique opportunity that the QEP has afforded students throughout the district. These targeted efforts are designed to provide students with the support systems needed to complete their educational goals.

CHAPTER 1. COLLEGE OVERVIEW

Navarro College is an open enrollment, single-district, multi-campus, two-year college with its district offices located in Corsicana, Texas. The College was established in the spring of 1946, at the site of the Air Activities of Texas, a World War II primary flight school located six miles south of Corsicana. In September of that same year, the first student body, primarily comprised of World War II veterans taking advantage of their GI Bill benefits, enrolled in classes. Since those early beginnings, the College has prospered. The campus in Corsicana has since moved and increased in size to 103 acres and twenty-three buildings.

Navarro College now consists of a five county service area, having expanded to better serve the student population. In the 1970s, the College broadened its mission to that of a comprehensive college, dropped "junior" from its title, and added campus locations in Ellis County (Waxahachie) and Limestone County (Mexia). In 2006, the Midlothian campus was added in Ellis County, and in 2013, the Fairfield Center was added in Freestone County.

Navarro College currently offers the Associate in Arts (AA), Associate in Science (AS), Associate in Arts in Teaching (AAT), and Associate in Applied Science (AAS) degrees as well as numerous certificates. In the 2012-2013 academic year, Navarro College awarded 1,604 degrees and certificates. While the majority of students, 56.7%, are enrolled less than half time, students are largely either seeking an associate degree, transfer credits, or are enrolled to achieve workplace skills for immediate employment.

The fall 2013 credit enrollment was 10,257 students; 74.5% of which were from the institution's five-county service area. The College also draws students from other states and countries. During the fall 2013 semester, the ethnic make-up of the student body was 22.7% African-American, 18.8% Hispanic, 0.7% Asian, 55.3% Caucasian, and 2.5% of other origin. The gender make-up was 40.5% male and 59.5% female. The typical student at Navarro College is a part-time female, under the age of twenty-two.

The mission of Navarro College is to provide educational opportunities that empower students to achieve their personal, academic, and career goals that promote life-long learning for all communities. The faculty and staff at Navarro College are dedicated to accomplishing that mission in order to see students succeed in their endeavors. To convey this dedication to students, the mission statement will be demonstrated through the QEP – ***Together Everyone Achieves Math Mastery – TEA(M)²*** as the College seeks to assist students in their mathematics success and ultimately their college success.

CHAPTER 2. SELECTING AND DEVELOPING A QEP TOPIC

In September 2012, Navarro College began steps to identify a Quality Enhancement Plan directed at improving student learning. The Topic Selection Committee, consisting of seventeen members and chaired by a member of the faculty, represented a wide variety of faculty and staff who were asked to identify a problem area or area of need within the district and present proposals that aligned with the college mission and strategic goals (see Appendix A for mission and strategic goals). Through collaborative dialogue the committee identified five topics of greatest need, divided into teams, and researched the topics to develop into five proposals and present to the full committee for review:

- **Campus Safety: Learn to Live with It –** A focus on enhancing campus safety for students, faculty, staff, administration, and visitors through campus initiatives.
- **TEAM: Information Literacy –** A focus on improving critical thinking and information literacy by implementing a TEAM approach: Teach, Evaluate, Assess, and Master information synthesis.
- **Reading Comprehension Enhancement Program –** A focus on improving reading comprehension skills in order to achieve higher rates of completion in the students' chosen fields.
- **Providing a Place for Success (PPS): Providing Student Support Centers for greater success at Navarro College –** A focus on developing a Student Support Center on each campus for students to come for help staffed with professional tutors.
- **Student Engagement: A Movement for Student Success at Navarro College –** A focus on promoting student success by teaching students to become engaged, active, participants in their learning process.

These proposals were then distributed to all faculty, staff, administrators, and students in a survey via email for a vote to determine the best fit for Navarro College. Seven hundred and nine stakeholders responded, including 472 students. With a total of 362 votes, the district selected *Providing a Place for Success (PPS): Providing Student Support Centers for Greater Success at Navarro College.* Although the desire to increase tutoring facilities was demonstrated, the high cost of constructing and implementing a complete tutoring center on all four campuses was not sustainable at that time for the institution; therefore, the proposal ranking second, with 101 votes, *Student Engagement: A Movement for Student Success at Navarro College,* was recommended.

The new QEP focus, titled *Ngage*, was then introduced to students through a focus group in May 2013, where students provided suggestions for how faculty and students could better engage in the classroom. Students were in agreement that this would be a positive change for Navarro College, but it was quickly determined that the topic was too broad. While improving student learning was at the heart of the topic, the capacity to consistently implement such a broad topic across all four campuses was questioned, as was the ability to measure student learning improvement.

The QEP Topic Selection Committee was restructured in September 2013 to build upon the findings of the previous committee and select a data-driven, feasible topic that would focus on the improvement of student learning. This committee was co-chaired by the Assistant Dean of Humanities and Kinesiology and the Chair of the Business Information Technology Department. This fifteen member committee included two members of the prior committee and a broad array of faculty members from all campuses. See Table 2.1 for the list of participants.

Table 2.1
Members of the QEP Topic Selection Committee

Name	Discipline or Department, and Location
Vicky Ferguson	Assistant Dean, Humanities & Kinesiology, Corsicana
Amy Nicholson	Business Information Technology Professor, Corsicana
Elaine Hand	Speech Professor, Corsicana
Dr. Brenda Reed	Mathematics Professor, Corsicana
Christi Esquivel	Economics Professor, Corsicana
Dr. Floretta Jones	Biology Professor, Waxahachie
Dr. Todd Kirk	Psychology Professor, Corsicana
Dr. Virginia Grossman	Biology Professor, Midlothian
Beverly Pearson	English Professor, Corsicana
Dr. Anna Kantor	English Professor, South Campus at Mexia
Terry Peterman	Director, PASS: Preparing Academically Successful Students, Corsicana
Dr. Bruce Brazell	Planetarium Director/Adjunct Professor, Corsicana
Margaret Moreno	Director of Student Recruiting, Corsicana
Sina Ruiz	Dean, Institutional Effectiveness, Corsicana
Jack Summerfield	Student Ambassador, Corsicana
Courtney Brice	Student Ambassador, Corsicana

This group held an orientation meeting on September 11, 2013 to familiarize new members of the committee with the work of the previous committee and to explain the process needed to ensure a data-driven, student-centered QEP. This committee was charged with selecting the topic of the QEP, ensuring broad-based involvement in the process, conducting data-driven research, and educating the district regarding the purpose of the QEP.

A review of the college's mission statement was a key focus in developing the topic. As stated in the mission, Navarro College seeks to "empower students to achieve their personal, academic, and professional goals…" – which is deemed to reflect student success. To assist in ensuring focused discussion, the committee brainstormed definitions of student success - which included course completion and persistence leading to a certificate or diploma. The group then decided the next step was to expand data collection with a survey asking students to identify the "one thing that could be done to improve student learning at Navarro College." In November 2013, a survey was distributed to students, faculty, staff, members of the Board of Trustees, and community members. The College received over 5,000 submissions that included a broad array of open-ended responses. These responses were sorted and analyzed by the committee, using a systematic approach, to determine emerging themes and frequency. While many non-learning responses were given, seven student learning related themes emerged from the analysis, represented by the following:

- increased tutoring services
- expanded availability of study areas/study hall
- improved technology and technology support
- enhanced class availability/scheduling
- increased comprehensive advising
- increased engagement with faculty
- extended library services

Of those top seven themes, three themes occurred with the highest frequency: the need for increased faculty/student engagement, increased tutoring, and improved technology/technology support (see Appendix C).

These three themes were brought to faculty and student focus groups for further discussion and development. Three separate focus groups, centering on each of the above topics,

were held on three campuses (Corsicana, Mexia, and Waxahachie). Sixty-five students participated and were asked to identify positive and negative experiences with tutoring services, technology and technology support services, and faculty engagement practices. In addition, they were asked to identify improvements they would like to see in technology, expectations they had of faculty members, and services they expected to receive from their tutoring experiences See Appendix D. The following themes occurred across all focus groups on all campuses:

- broader variety of tutoring and student awareness of tutoring availability
- increased technology support on all campuses
- open lines of communication inside and outside of the classroom which includes one-on-one instruction

The evaluation of qualitative data then led the committee to an analysis of quantitative data. The QEP Topic Selection Committee reviewed both institutional data and peer institutional data. The committee began by reviewing the ten most dropped and/or failed courses at Navarro College. These courses were sorted according to those affecting 500 or more students. See Table 2.2 for a summary of the courses with the highest drop and failure rates.

Table 2.2 *Failure and Drop Rates For Fall 2011-Spring 2013*

Highest Failure Rate								
	FALL 2011		SPRING 2012		FALL 2012		SPRING 2013	
	% of Stds	# of Stds	% of Stds	# of Stds	% of Stds	# of Stds	% of Stds	# of Stds
MTH 1074 - Intro. Algebra	28.68%	809	31.92%	896	33.23%	677	34.42%	703
MTH 1071 - Essentials of Mathematics	24.67%	973	34.09%	613	22.54%	865	25.39%	571
SPCH 1311- Introduction to Speech Communication	21.82%	660	20.94%	635	27.18%	574	21.18%	524
Highest Drop Rate								
BIOL 2401 - Anatomy & Phys.	22.13%	705	27.75%	418	28.44%	633	24.79%	363
MATH 1314 - College Algebra	20.18%	1135	23.63%	800	17.87%	1164	22.6%	814

Definitions:
Failure is defined as a letter grade of F
Drop is defined as student withdrawal from the course after first census.

These courses were reviewed to understand the greatest college-wide impact. Two developmental math courses, MTH 1074* Introduction to Algebra and MTH 1071* Essentials of Mathematics, emerged over a two-year period with the highest failure rates, and one credit-bearing math course, MATH 1314 College Algebra emerged as a part of the highest drop rate. (**Course numbering was changed in 2013-2014, and MTH 1074 now equates to MTH 0305 and MTH 1071- equates to MTH 0302.)* Table 2.3 details the rationale for not selecting SPCH 1311 or BIOL 2401

Table 2.3
Course Non-Selection Justification

Course	Justification for not Selecting
SPCH 1311-Introduction to Speech Communication	Students are not required to demonstrate college readiness to enter this course, resulting in an underprepared student lacking the necessary skills for course success.
BIOL 2401 – Anatomy & Physiology	Gatekeeper course for health-related programs, i.e. RN, LVN, OTA. In an overall review of the college, this course does not affect a significant amount of students.

As the mathematics faculty continued to review the most failed and dropped courses, MTH 1312 Intermediate Algebra* was also discovered in the top ten highest failure rates. *(*MTH 1312 has been renumbered to MTH 0306*.) MTH 1312 (now MTH 0306) is the direct feeder course for students needing MATH 1314 College Algebra to complete their degree plan requirements. Faculty then made the recommendation to look at the success rates of students taking MTH 1074 (now MTH 0305) leading to MATH 1342 Elementary Statistical Methods and the sequence of students taking MTH 1312 (now MTH 0306) leading to MATH 1314. See Table 2.4 for retention and success rates.

Table 2.4 *Retention and Success Rates for MTH 0305, 0306, MATH 1314 and MATH 1342*								
	2012-2013		**2013-2014**		**2014-2015**		**3 year Average**	
	Retention	*Success*	*Retention*	*Success*	*Retention*	*Success*	*Retention*	*Success*
MTH 0305	88.21%	47.25%	82.07%	49.05%	84.67%	51.23%	84.98%	49.18%
MTH 0306	90.13%	61.78%	87.78%	57.67%	87.27%	54.09%	88.39%	57.85%
MATH 1314	78.8%	57.03%	79.3%	57.75%	84.22%	65.42%	80.77%	60.07%
MATH 1342	84.7%	74.5%	81.4%	69.9%	90.9%	76.5%	85.7%	73.6%

Definitions:

Successful course completion rate: the ratio of the number of students who earned an A, B, or C in the course to the number of students who received a grade in the course

Retention rate: the ratio of the number of students enrolled in the course at the end of the semester to the number of students enrolled at first census

In reviewing the data, it was quickly noted that while students were being retained in MTH 0305, MTH 0306, and MATH 1314, course success with a grade of C or higher was a concern. The low course success rates for MTH 0305, MTH 0306, and MATH 1314, presented in Table 2.4, were consistent with the high failure and drop rates for these same courses, presented in Table 2.2, validating the need for consideration.

As part of the committee's research to further solidify the College's area of need, faculty were surveyed and asked how they perceived student ability in the following areas:

- to think and analyze at a critical level
- to communicate orally in clear and coherent language
- to analyze various forms of spoken information
- to understand mathematics in the classroom
- to write in a clear, correct, coherent manner
- to read, analyze, and comprehend written material

The faculty responded that students needed improvement in all areas, but 66% of faculty members responding to the survey indicated that students needed improvement in understanding mathematics, and 22% indicated that they failed to perform in understanding mathematics in the classroom (see Appendix E). Consistent with these findings, 52% of respondents in a student survey ranked mathematics as the greatest weakness of students in learning and academic achievement. In the same survey, students ranked mathematics

lowest in terms of student academic strengths (see Appendix F). These responses triangulated with highest failure and drop rate findings for mathematics and successful course completion and retention rate findings, supporting mathematics as the primary college-wide need in terms of improving student learning and success. This led to continued investigation.

To understand how developmental courses impact students at Navarro College, the persistence rates for those students needing developmental courses and those who did not were reviewed. As shown in Table 2.5, of the students needing developmental courses, less than half were likely to return for year two; whereas, nearly seven in ten students who entered as college ready returned for year two.

Table 2.5
Comparison of Student Persistence Fall-to-Fall by Cohort (FTIC)
Students Enrolling in Fall of Year 1 and Returning in Fall of Year 2
Texas Higher Education Coordinating Board

	2011 Cohort	***2012 Cohort***	***2013 Cohort***	***Average***
Students who met college readiness standards for mathematics upon entrance	68.1%	64.7%	65.6%	66.1%
Students who did not meet college readiness standards upon entrance	49.6%	51.2%	47.1%	49.3%

Based upon the literature review and comprehensive analysis of all quantitative and qualitative data collected, it became apparent to the Topic Selection Committee that the QEP topic should address improved student learning in mathematics. To encourage district-wide involvement, a marketing and education plan was designed which included the announcement of a college-wide title contest to announce the kick-off of the Navarro College QEP. Ninety-four title recommendations were submitted to the newly created QEP Planning Committee who voted and narrowed the submissions down to the top four titles which were then distributed to the College for a vote. Over 650 participants voted on the following four titles:

- Counting on Navarro!
- Together Everyone Achieves Math Mastery- *TEA(M)²*
- A Mind 4 Math
- It all adds up at Navarro

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With 190 votes, the College chose ***Together Everyone Achieves Math Mastery TEA(M)².***

Development of the Topic: QEP Goals, Objectives, and Performance Measurements

With the topic identified, the QEP Planning Committee began the tasks of planning and developing a focus statement, goals, and implementation strategies. In July 2014, representatives from the team attended the SACSCOC Summer Institute to learn more about designing a QEP. The Planning Committee met between August 2014 and May 2015 to develop the focus statement and goals. During this time, mathematics faculty representatives reported that the mathematics department had a current, systematic approach to Student Learning Outcomes (SLOs) that had been implemented throughout the department. Likewise, the Developmental Mathematics faculty had implemented a systematic reporting approach for SLOs and additional General Learning Outcomes (GLOs) for their department (described in Chapter 3). Review of the SLOs and associated student success data aided in design of the focus statement, goals, and implementation strategies. Using supporting qualitative and quantitative data, the Committee developed two specific goals, with objectives and performance measurements. Table 2.6 presents a summary of the goals, objectives, and performance measurements.

Table 2.6

QEP Focus Statement, Goals, Objectives, and Performance Measurements

Focus Statement: *To increase student completion in developmental and credit-bearing gateway mathematics courses necessary to meet degree requirements.*

Goal 1: Increase the percentage of students who successfully complete their program-specific developmental mathematics courses.

- ***Objective 1.1:*** Increase student learning in MTH 0305 and MTH 0306 Student Learning Outcomes)
    - ***Measurement 1.1:*** Increased knowledge, skills, and attributes as demonstrated in assessment of course Student Learning Outcomes
- ***Objective 1.2:*** Increase achievement outcomes for students enrolled in MTH 0305 and MTH 0306.
    - ***Measurement 1.2:*** Improved successful course completion rates for MTH 0305 and MTH 0306
        - Improved retention rate
        - Improved successful course completion rate

Goal 2: Increase the percentage of students, who upon completion of the developmental mathematics course sequence, successfully complete the credit-bearing gateway program-specific mathematics course by the end of the following traditional (fall or spring) semester.

- ***Objective 2.1:*** Increase student learning in MATH 1314
    - ***Measurement 2.1:*** Increased knowledge, skills, and attributes as demonstrated in assessment of course Student Learning Outcomes.
- ***Objective 2.2:*** Increase achievement outcomes for students enrolled in MATH 1314.
    - ***Measurement 2.2:*** Improved successful course completion rate for MATH 1314.
        - Improved retention rate
        - Improved successful course completion rate
- ***Objective 2.3:*** Increase the percentage of students enrolling in and successfully completing their program specific developmental and credit-bearing gateway course sequence within the following traditional (fall or spring) semester.
    - ***Measurement 2.3:*** Increase the number of students enrolling in and successfully completing program specific credit-bearing gateway mathematics course.

NOTE: the following definitions are provided for terms used in this research design:

- *Successful course rate*: the ratio of the number of students who earned an A, B, or C in the course to the number of students who received a grade in the course
- *Retention rate*: the ratio of the number of students enrolled in the course at the end of the semester to the number of students enrolled at first census
- *Gateway course*: defined by the Texas Higher Education Coordinating Board as the first college level (credit-bearing) mathematics or English course; these courses are part of the state's momentum points leading to college completion

Goal 1 addresses MTH 0305 Introductory Algebra and MTH 0306 Intermediate Algebra for learning, achievement, and sequence completion. Goal 2 addresses MATH 1314 College Algebra for learning, achievement, and program-specific sequence completion. MATH 1324 Mathematics for Business and Social Sciences and MATH 1342 Elementary Statistical Methods are also credit-bearing gateway courses and were evaluated for inclusion in the study for sequence completion. However, the Office of Institutional Research determined that the sample sizes for tracking course progression were too small to be valid for setting benchmarks and the courses were eliminated from the study. These courses will continue to

benefit from advising strategies to enroll students in their developmental mathematics course sequence early in their college careers and keep them enrolled until their credit-bearing gateway course is completed. The courses will continue to be monitored for enrollment, retention, and success, but not as part of the research design.

An overview of course sequences, enrollment trends, and success and retention trends provides a snapshot of the relationship between the courses, the impact of each course in terms of enrollment, and the level of course success. An assessment of Student Learning Outcomes, by course, provides an overview of the level of student mastery of course knowledge, skills, and attributes. Table 2.7 presents the developmental to credit-bearing gateway mathematics course sequencing.

Table 2.7 ***Developmental and Credit-Bearing Gateway Mathematics Course Sequencing***
MTH 0305 >>> MTH 0306 >>> MATH 1314 College Algebra
MTH 0305 >>> MTH 0306 >>> MATH 1324 Mathematics for Business and Social Sciences *
MTH 0305 >>> MATH 1342 Elementary Statistical Methods *
* Note: Although these sequences are not included in the QEP, they are presented here to provide a comprehensive overview of all of the College's developmental/credit bearing gateway mathematics course sequences and will be tracked for review by the QEP Assessment Committee.

Enrollment trends are consistent with the College's overall enrollment decline over recent years. Both Introductory Algebra and Intermediate Algebra experienced a decline of approximately 25% over the past three years, while College Algebra remained relatively stable with a 5% decline. The decline in developmental mathematics course enrollment could be due to several causes, including overall college enrollment decline nationwide due to economic recovery from the Great Recession of 2007. However, it could also be a response to College strategies to better prepare students for college readiness, such as Math Boot Camp, which is an intensive summer intervention to refresh mathematics skills and prepare students for the course placement exam. These strategies are being studied longitudinally for effectiveness, aside from the QEP. See Table 2.8 for enrollment trends.

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Table 2.8 *Enrollment Trends for QEP Courses*				
Course	**2012-2013**	**2013-2014**	**2014-2015**	**3 Year Average**
MTH 0305	1,380	1,237	996	1204
MTH 0306	1,112	845	697	885
MATH 1314	1,981	1,985	1,882	1,949

Evaluation of course success and retention trends indicates that the developmental courses (Goal 1) retain their students, but success is a challenge. In the case of Introductory Algebra (MTH 0305), the three year success trend has been upward, while Intermediate Algebra (MTH 0306) has experienced a steady decline over the same period. College Algebra (Goal 2) experienced an overall upward trend in success and retention, most significantly in 2014-2015. See Table 2.9 for retention and success trends.

Table 2.9 *Retention and Success Trends for QEP Courses*					
Course		**2012-2013**	**2013-2014**	**2014-2015**	**3 Year Average**
MTH 0305	Retention	88.21%	82.07%	84.67%	84.98%
	Success	47.25%	49.05%	51.23%	49.18%
MTH 0306	Retention	90.13%	87.78%	87.27%	88.39%
	Success	61.78%	57.67%	54.09%	57.85%
MATH 1314	Retention	78.80%	79.30%	84.22%	80.77%
	Success	57.03%	57.76%	65.42%	60.07%

In addition to learning, retention, and course success, Goal Two also measures improvement of successful “developmental to credit-bearing gateway course sequence” completion rates. The Topic Development Committee reviewed data regarding developmental enrollment and success rates when evaluating timeliness of completion of the course sequences and success patterns. The Office of Institutional Research provided data and research methodology for measurement. The data aggregates all program-specific developmental/credit-bearing gateway course sequences:

- MTH 0306 to MATH 1314
- MTH 0306 to MATH 1324
- MTH 0305 to MATH 1342

In addition, a separate metric is provided for the disaggregated MTH 0306 to MATH 1314 sequence. Table 2.10 provides an overview of the 2012-2014 First Time in College (FTIC) cohort outcomes for successful sequence completion.

Table 2.10
Developmental Student Enrollment and Successful Course and Sequence Rates 2012-2014 First Time in College (FTIC) Cohorts
Navarro College Office of Institutional Research

	2012	2013	2014	Average
Of all students in the FTIC cohort, the percentage who enrolled in developmental mathematics in the first semester	38.79%	33.13%	38.84%	36.92%
Of those students who enrolled, the percentage who successfully completed their highest level program-specific developmental mathematics course in the first semester	61.47%	56.16%	54.72%	57.45%
Of those students who successfully completed their developmental mathematics course, the percentage who then enrolled in their credit-bearing gateway mathematics course in the following semester	26.12%	29.27%	28.78%	28.06%
Of those students who enrolled in their highest level developmental mathematics course in fall semester, the percentage who failed and then re-enrolled in the same developmental mathematics course in the following semester	40.48%	32.29%	29.96%	34.24%
Of those students who passed their developmental course in the first semester and remained enrolled in the sequence from developmental to credit-bearing gateway mathematics in the following term, the percentage that successfully passed the gateway course and completed the sequence within their first two semesters	68.57%	63.69%	65.00%	65.82%
Of those students who remained enrolled in their *MTH 0306 to MATH 1314* developmental to credit-bearing gateway sequence, the percentage that successfully completed the two-course sequence	43.14%	55.26%	59.52%	52.64%

In reviewing the completion data, it is clear that those students who pass the highest level developmental mathematics course in the first semester and enroll in a credit-bearing gateway course the next semester, succeed at a high level, with an average of 66%

successfully passing the gateway course and completing the sequence. The most vulnerable transition point appears to be at the end of the first semester, with only 28% of those students who passed their highest level developmental mathematics course enrolling in their credit-bearing gateway course for the second semester.

In response to these trends, the QEP Planning Committee agreed that the strategies designed to implement this initiative must not only be maintainable and meaningful for the mathematics department but sustainable and measurable by the institution. After an extensive literature review, it became clear that the needs of Navarro College's students were consistent with national trends, and that the College was prepared to address these needs. Five strategies emerged from quantitative and qualitative data analysis that were aligned with the literature:

- advisor sequence training
- engagement and empowerment in the classroom
- technology support
- tutoring support
- professional development for mathematics faculty and others directly involved

CHAPTER 3: STUDENT LEARNING OUTCOMES

Navarro College identifies Student Learning Outcomes (SLOs) for each of its courses and assesses them regularly, following a continuous quality improvement process. Results are recorded and submitted annually and reported through the three-year comprehensive Program Review, which is presented to the College's Academic Council for discussion and review and archived in the Office of Institutional Effectiveness for college-wide access. Developmental mathematics courses, including MTH 0305 Introductory Algebra and MTH 0306 Intermediate Algebra, and mathematics courses, including MATH 1314 College Algebra, have long participated in Student Learning Outcomes assessment and serve as the cornerstone of learning assessment for the QEP initiative, *Together Everyone Achieves Math Mastery*, *TEA(M)*^{2}.

In recent years, the Texas Higher Education Coordinating Board (THECB) has overseen systematic review and revision of its core courses as part of its pathways approach to accelerating college completion. In the 2013-2014 academic year, the THECB convened representative mathematics faculty from two-year and four-year institutions statewide to revise the curriculum and SLOs for MATH 1314 College Algebra for implementation in 2014-2015. Navarro College mathematics faculty implemented the revised curriculum and SLOs, with associated objectives, in the 2014-2015 academic year. To accommodate this change, the previous SLOs were mapped to the revised outcomes to provide longitudinal consistency. See Appendix G for the map.

In the 2013-2014 academic year, the developmental mathematics faculty updated curriculum, course numbering, and SLOs for MTH 0305 and 0306. This occurred after faculty evaluated course content and content sequencing and current SLO assessments, and then reviewed proven best practices for more effective outcomes assessment. This process led to a new hierarchical structure, using General Learning Outcomes (GLOs) at the highest level, with Student Learning Objectives mapping up to targeted Student Learning Outcomes, which, in turn, map up to the GLOs. Table 3.1 presents the structure for both developmental mathematics General Learning Outcomes and mathematics Student Learning Outcomes.

Table 3.1 **Alignment of Outcomes Assessment Hierarchy** **for Developmental Mathematics and Mathematics Courses**	
Developmental Mathematics	**Mathematics**

General Learning Outcome (level 1)
• *Student Learning Outcome (level 2)*
  ○ Objective (level 3)
  ○ Objective (level 3)
	Student Learning Outcome (level 1)
	• *Objective (level 2)*
	• *Objective (level 2)*

The GLOs and SLOs are presented later in this chapter, and the full set of GLOs, SLOs, and Student Learning Objectives for MTH 0305 and 0306 are provided in Appendices H and I. The faculty also took this opportunity to assure that the SLOs and course numbering were consistent with changes in the THECB *Academic Course Guide Manual (ACGM).* With the SLO revision completed, the faculty mapped the previous 2012 SLOs and Objectives to the new GLOs and SLOs to preserve longitudinal consistency where applicable. See Appendices J and K for the maps.

MTH 0305, MTH 0306, and MATH 1314 each have three years of longitudinal SLO data to support the research methodology for setting benchmarks for learning improvement, which are presented later in this chapter. And, as summarized in the previous paragraphs, all three of the courses have curricula and SLOs that are recently revised and consistent with best practices and the *Academic Course Guide Manual*.

In both developmental mathematics and mathematics departments, SLO assessment occurs at scheduled intervals throughout the semester and is captured and assessed via homework assignments, quizzes, tests, final exams, and projects. This approach provides students the opportunity to be assessed in authentic settings and contexts to demonstrate their learning. In terms of assessing student work and meeting performance targets, students must receive a grade of 70% or higher on the content assessment to meet the standard for learning achievement, and 70% or more of the students being assessed must meet the 70% threshold in order for the course to meet its minimum performance target.

Assessment of General Learning Outcomes and Student Learning Outcomes for Introductory Algebra (MTH 0305) revealed an overall upward trend over three consecutive years, although the outcome for linear inequalities showed a decline. The range of

outcomes met is 49.6% to 70.1%, indicating that there is opportunity for growth across all course SLOs. It is noted that all GLOs/SLOs were assessed in all three years. See Table 3.2 for MTH 0305 GLO and SLO assessment results. (Note: Objectives are mapped up to SLOs for the purpose reporting out and do not appear here.)

Table 3.2
GLOs and SLOs for MTH 0305 with Assessment Results

General Learning Outcomes (highest level) Student Learning Outcomes	Fall 2012	Fall 2013	Fall 2014	Average
GLO 1. *Students will be able to solve linear equations in one unknown, inequalities, absolute value equations and inequalities*	64.3%	56.1%	60.5%	60.3%
SLO 1.1. Students will solve line equations in one unknown	69.4%	62.3%	78.6%	70.1%
SLO 1.2. Students will solve linear inequalities and absolute value equations and inequalities	59.2%	49.9%	42.5%	50.5%
GLO 2. *Students will be able to graph linear equations with two unknowns and solve systems of linear equations*	48.5%	47.8%	63.2%	52.8%
SLO 2.1. Students will graph linear equations in two unknowns	50.8%	50.1%	65.0%	55.3%
SLO 2.2. Students will find the equation of the line	50.8%	50.1%	63.1%	54.7%
SLO 2.3. Students will solve systems of equations	44.0%	43.3%	61.6%	49.6%
GLO 3. *Students will be able to simplify and perform operations on algebraic expression and polynomials*	63.4%	53.5%	80.3%	64.3%
SLO 3.1. Students will be able to simplify algebraic expressions and polynomials	63.3%	47.6%	81.9%	64.3%
SLO 3.2. Students will be able to perform operations on polynomials	63.4%	59.3%	78.7%	67.1%

Assessment of General Learning Outcomes and Student Learning Outcomes for Intermediate Algebra (MTH 0306) revealed an overall upward trend, with a range of 64.5%

to 72.2% students meeting learning expectations. Again, as with MTH 0305, indicating opportunity for growth. It is noted that, with the exception of two SLOs that were new in 2013, all GLOs/SLOs were assessed in all three years. See Table 3.3 for results.

Table 3.3
GLOs and SLOs for MTH 0306 with Assessment Results

General Learning Outcomes (highest level) Student Learning Outcomes	Fall 2012	Fall 2013	Fall 2014	Average
GLO 1. *Students will be able to factor polynomials and solve quadratic equations, rational equations, and radical equations*	63.7%	67.0%	75.7%	68.8%
SLO 1.1. Students will be able to factor polynomials	65.0%	69.5%	82.1%	72.2%
SLO 1.2. Students will be able to solve quadratic equations	66.0%	68.7%	75.2%	70.0%
SLO 1.3. Students will be able to solve rational equations and radical equations	60.0%	62.9%	70.7%	64.5%
GLO 2. *Students will be able to perform operations on rational expressions, radical expressions, and complex numbers*	62.0%	59.0%	76.6%	65.9%
SLO 2.1. Students will be able to perform operations on rational expressions	62.0%	61.1%	75.2%	66.1%
SLO 2.2. Students will be able to perform operations on radical expressions	Not Measured	58.9%	77.7%	68.3%
SLO 2.3. Students will be able to perform operations on complex numbers	Not Measured	57.0%	76.8%	66.9%

Student Learning Outcomes assessment for College Algebra (MATH 1314) revealed an upward trend overall and a slight decline in one area. The range for those students meeting learning expectations extended from 69.2% to 83.1%, with most falling into the mid-70s. There is room for growth, including correctly solving a logarithmic equation, which had the lowest percentage of achievement. See Table 3.4 for MATH 1314 assessment results.

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Table 3.4 ***SLOs for MATH 1314 with Assessment Results***				
Student Learning Outcomes	**Fall 2012**	**Fall 2013**	**Fall 2014**	**Average**
SLO 1. *Demonstrate and apply knowledge of properties of functions, including domain and range, operations, compositions, and inverses*	76.0%	69.1%	79.8%	75.0%
Obj. 1.1. Students demonstrate the successful completion of this outcome by correctly performing the steps to finding the domain and range.	73.4%	76.7%	80.5%	76.9%
Obj. 1.2. Students demonstrate the successful completion of this outcome by correctly finding the combination of functions.	79.8%	63.5%	81.1%	74.8%
Obj. 1.3. Students demonstrate the successful completion of this outcome by correctly finding an inverse function.	74.8%	67.0%	77.7%	73.2%
SLO 2. *Recognize and apply polynomial, rational, radical, exponential, and logarithmic functions and solve related equations.*	72.3%	75.4%	80.0%	76.2%
Obj. 2.1. Students demonstrate the successful completion of this outcome by correctly solving a polynomial equation.	72.4%	79.6%	88.0%	80.0%
Obj. 2.2. Students demonstrate the successful completion of this outcome by correctly solving the rational equation.	74.2%	75.8%	79.9%	76.6%
Obj. 2.3. Students demonstrate the successful completion of this outcome by correctly solving a radical equation.	New	New	82.9%	82.9%
Obj. 2.4. Students demonstrate the successful completion of this outcome by correctly solving an exponential equation.	77.5%	79.4%	77.2%	78.0%
Obj. 2.5. Students demonstrate the successful completion of this outcome by correctly solving a logarithmic equation.	65.0%	66.7%	75.9%	69.2%
SLO 3. *Apply graphing techniques*	-	-	83.1%	83.1%
Obj. 3.1. Students demonstrate the successful completion of this outcome by	New	New	83.1%	83.1%

correctly graphing a function using shifting techniques.				
SLO 4. *Evaluate all roots of higher degree polynomial and rational functions.*	72.2%	75.9%	73.5%	73.9%
Obj. 4.1. Students demonstrate the successful completion of this outcome by correctly finding the zeros of a polynomial function.	70.1%	76.0%	74.6%	73.6%
Obj. 4.2. Students demonstrate the successful completion of this outcome by correctly finding vertical and horizontal asymptotes.	74.2%	75.8%	72.3%	74.1%
SLO 5. *Recognize, solve, and apply systems of linear equations using matrices.*	82.1%	79.9%	76.8%	79.6%
Obj. 5.1. Students demonstrate the successful completion of this outcome by correctly solving a system of equations using concepts of matrices.	82.1%	79.9%	76.8%	79.6%
Note: Although developmental mathematics courses use a GLO/SLO/Objective hierarchy and nomenclature, credit-bearing mathematics courses use an SLO/Objective hierarchy and nomenclature. However, student learning expectations are identified and measured for all courses.				

In reviewing SLO assessment results and retention and success rates, some common trends emerge. MTH 0305 has a high retention rate of 85%, but a low success rate of 50%; consistent with this success rate, GLO/SLO assessment rates fall primarily within the 50-59% mastery level. MTH 0306 has an even higher retention rate of 89% and a low success rate of 58%; consistent with this finding, GLO/SLO assessment rates fall primarily within the 60-69% mastery level, although, it is noted that the outcomes assessment mastery rates surpass the success rate. MATH 1314 has a retention rate of 81%, and a low success rate of 60%; but its SLO assessment rate falls primarily within the 70-79% mastery level, which is significantly above the success rate. Factors contributing to this contradictory data are, at this point, unclear; however, the data are consistent over three years of data collection, which includes assessments for the revised and comprehensive statewide 2014-2015 SLOs in the final year of longitudinal data. Meaningful analysis of these data will occur in conjunction with assessment of QEP outcomes data. Benchmarks for SLO improvement and success and retention improvement will be discussed in the Assessment Plan chapter, as part of the integrated strategies and interventions supporting the overall initiative.

CHAPTER 4: LITERATURE REVIEW AND BEST PRACTICES

Upon final selection of the Quality Enhancement Plan (QEP) topic, *Together Everyone Achieves Math Mastery*, a contingent of the larger QEP Planning Committee began a review of scholarly works and effective practices relevant to successful completion of the developmental mathematics course sequence and program-specific gateway credit-bearing courses. Based upon committee dialogue and refinement of the initiative, the group expanded their review. Ultimately, the literature review led to the selection of five strategies to support achievement of the QEP goals of retention and success in developmental and gateway mathematics courses, and continued progression within the developmental mathematics course sequence to the program-specific gateway course:

- ***Early Enrollment in and Progression of Students through Their Developmental Mathematics/Program-Specific Gateway Mathematics Course Sequence***: assessment and placement of students into the appropriate course sequence per their declared program major, with consistent advising provided by faculty and staff to ensure students are both enrolling in the appropriate course early in their college career and completing the sequence in a timely manner.
- ***Engagement and Empowerment of Students***: active learning and engagement strategies embedded within the curriculum, coupled with success strategies in support of learning mathematics, specifically targeting the needs of developmental mathematics students.
- ***Integration of Technology***: use of technology both in and outside of the classroom to enhance student access, learning, and engagement and to maximize student interaction with technology applications embedded in the textbooks adopted for developmental and gateway courses (such as Hawkes Learning System and Pearson's MyMathLab).
- ***Tutoring/Learning Assistance Lab***: high quality learning support services that address the needs of students enrolled in developmental and gateway mathematics courses delivered in a manner that is accessible to all students and aligned with mathematics instruction as it is delivered in the classroom.
- ***Professional Development***: professional development targeting effective teaching and learning strategies for developmental and gateway mathematics courses, including strategies in support of engagement, empowerment, and technology applications.

Early Enrollment in and Progression of Students through Their Developmental Mathematics/Program-Specific Gateway Mathematics Course Sequence

Bailey, Jeong, and Cho (2010) identified the importance of early enrollment in developmental education courses and its impact on overall college success. The role of developmental mathematics is to prepare students for their appropriate program-specific gateway course, which in turn prepares the student for college success and completion. Bailey et al. (2010) found that two out of three students who complete their full developmental mathematics sequence subsequently enroll in a gateway course, and of those who enroll, three out of four pass the course. Bonham and Boylan (2011) found that those students who complete their developmental mathematics sequence and enroll in a credit-bearing (gateway) mathematics course do as well as those students who do not require developmental mathematics.

Further research supporting early enrollment in developmental mathematics courses, conducted by Lesik (2007), demonstrated a causal relationship between completion of the developmental mathematics sequence and overall persistence in college. Other studies found that students who delay enrollment in developmental mathematics during their first semester of college risk lower overall GPA and lower persistence rates (Bremer, Center, Opsal, Mehanie, Jang, & Geise, 2013; Fike & Fike, 2012).

Students avoid enrolling in developmental courses for a variety of reasons, including affective factors such as self-confidence and math anxiety, but the longer they procrastinate, the worse their chances are for success (Boylan, 2011; Howard & Whitaker, 2011; Pajares & Kranzler, 1995). Bonham and Boylan (2011) report that one in five students placing into developmental mathematics never enrolled in such a course over a three year period. A common strategy used by those students avoiding developmental courses is to enroll in courses not requiring demonstration of college readiness (Bailey et al., 2010); however, there is a limit to this strategy and continued avoidance of developmental courses ultimately leads to failure to progress and earn a college degree (Abraham, Slate, Saxon, & Barnes, 2014; Bahr, 2012; Boylan & Saxon, 2005).

An effective strategy emerging in recent years is the pathways model, which incorporates highly structured enrollment practices and momentum points as key indicators of success. In *A Matter of Degrees,* the Center for Community College Student Engagement (2014) identifies specific momentum points considered to be high impact practices that significantly

improve a student's chances for completion. These momentum points include completion of at least one developmental education course with a grade of C or higher, completion of at least one gateway course with a grade of C or higher, and Fall to Spring and Fall to Fall student persistence.

O'Banion (2013) created a momentum points model of high impact practices that is based upon structured intake, testing and placement, and development of a structured degree plan with a clearly defined sequence of coursework that is effectively communicated with and understood by the student. It requires students to complete their developmental courses early in their college careers, and immediately enroll in the appropriate gateway course.

In a similar manner, Bailey, Jaggars, and Jenkins (2015) developed a guided pathways model that is prescriptively based upon momentum points and effective practices. It replaces the cafeteria model that allowed students to enroll in courses according to choice rather than purpose or goal. Bailey et al.'s pathways model calls for enrollment in and completion of the developmental and gateway mathematics sequence early in the student's college career. It also calls for strategies to get students on track and keep them on track to complete their degrees. Such tracking strategies include initial intake services of assessment and placement, communication of the importance of early enrollment in developmental and gateway courses, and academic advising and technology-based advising resources. Consistent with O'Banion (2013) and Bailey et al., in their study of a public two-year college in the south, Fowler and Boylan (2010) found that implementation of an all-inclusive mandatory pathways program yielded significantly higher retention and GPA among developmental students.

Advising is critical to successful completion of the developmental mathematics course sequence and program-specific gateway course early in the student's academic career (Bailey et al., 2015; Fowler & Boylan, 2010; O'Banion, 2013). Structured systems need to be in place to ensure early student advisement, degree planning, and follow-up throughout the student's college career. In colleges using a model which incorporates faculty and staff advisors, it is essential to require targeted training in support of consistent communication of accurate information and delivery of services (Bailey et al., 2015). An example of this type of training is Miami Dade College's required six hour advisor training program that includes role playing of predictable scenarios to assure that advisors are prepared to implement a pathways approach to degree planning and enforce the College's structured enrollment strategies (Bailey et al., 2015).

Engagement and Empowerment of Students

Students in developmental education courses typically have different learning styles from those traditionally addressed by faculty in higher education institutions (Barkley, 2010; Bonham & Boylan, 2011; Boylan, 2002; Boylan and Saxon, 2005; Center for Community College Engagement, 2014; Epper & Baker, 2009; Strengthening Pre-Collegiate Education, 2008; Nolting, 2014; O'Banion, 2013; Pelligrino & Hilton, 2012). Developmental students need a learning-centered approach that is holistic and includes multiple teaching and learning strategies and modalities (Barkley, 2010; Bonham & Boylan, 2011; Boylan & Saxon, 2005; Epper & Baker, 2009; Fowler & Boylan, 2010; Howard & Whitaker, 2011; Pelligrino & Hilton, 2012). Engagement and empowerment strategies emerge among numerous studies as the means by which educators can reach, teach, and advance developmental education students.

In *A Matter of Degrees,* the Center for Community College Student Engagement (2014) emphasizes the importance and impact of engagement and empowerment practices in terms of outcomes. This research found that student engagement practices of active and collaborative learning, student-faculty interaction, and support for learners "correlated to a statistically significant degree with IPEDS graduation rates," (p. 27).

Engagement. Engagement has been defined as a twofold approach to teaching and learning, addressing both motivation to learn and active learning, which work together synergistically to empower students to take control of their learning (Barkley, 2010). The benefits of active learning and collaborative learning have been extensively documented, particularly in relation to developmental education students. (Bonham & Boylan, 2011; Boylan, 2002; Chickering & Gamson, 1987; Kuh et al., 2005; Pelligrino & Hilton, 2012; Tinto, 1993). Learning styles for developmental students tend to be more visual and hands-on than auditory and passive (AMATYC, 2006; Bonham & Boylan, 2011; Boylan & Saxon 2005), which must be considered when designing classroom instruction. AMATYC (2006) created a table of learning style characteristics and strategies for practice to assist mathematics faculty when designing instructional activities (see Appendix L).

Bonham and Boylan (2011) recommend that when designing learning experiences, faculty are cognizant of multiple approaches, including those based in technology, and that "students actually learn math by doing math" (p. 4). Developmental mathematics students need to touch it, think about it, manipulate it, talk about it, and make meaning of it. By doing

so, they take active ownership in creating their own learning (Barkley, 2010; Boylan, 2002; Boylan & Saxon, 2005; Pelligrino & Hilton, 2012).

Effective practices in support of active learning and collaborative learning indicate that the design of such activities or assignments should be structured to provide students with a firm understanding of learning and behavior expectations, rules and processes, outcomes or products expected, and performance rubrics, which are used to both reinforce learning throughout the process (feedback) and serve as an evaluation tool following the completion of the activity or assignment (Barkely, 2010; Boylan, 2002; Center for Community College Engagement, 2014; Chickering & Gamson, 1987; Fowler & Boylan, 2010; Pelligrino & Hilton, 2012; Strengthening Pre-Collegiate Education in Community Colleges, 2008). Research indicates students are more motivated if the activity is challenging and interesting to them and they believe they can achieve it. In addition, such activities should be interactive, draw on prior knowledge and experience, and provide multiple opportunities for the student to engage in the learning process (Pelligrino & Hilton, 2012; Strengthening Pre-Collegiate Education in Community Colleges, 2008).

Collaborative learning is based upon peer teaching and learning, as well as teamwork, and provides opportunities for the instructor to facilitate growth by assigning student groups with a purposeful learning activity. An effective example of such a strategy entails placing a student with strong academic or self-efficacy skills in a group to serve as a model for others who are still developing these skills (Barkley, 2010; Bonham & Boylan, 2005; Boylan, 2002; Pelligrino & Hilton, 2012; Strengthening Pre-Collegiate Education in Community Colleges, 2008). These types of strategies are effective in building community and empowering the peer learning/peer helping relationship (Barkley, 2010). Collaborative learning has been shown to raise the overall degree of accomplishment of all participants in the group, which then raises each member's sense of self-confidence (Bonham & Boylan, 2011). This strategy has proven to be significantly effective with underrepresented groups (Bonham & Boylan, 2011).

Empowerment. Empowerment strategies include: student success and study skills such as time management, reading strategies, note taking, homework completion, and test taking (Bonham & Boylan, 2012; Boylan, 2002; Fowler & Boylan, 2010; Howard & Whitaker, 2011; Nolting, 2014; Pelligrino & Hilton, 2012). Additionally, affective considerations such as addressing math anxiety and test anxiety issues, acknowledging the relationship between student attitude toward math and achievement in math, and dealing with low student self-

efficacy in learning mathematics all contribute to student empowerment, and ultimately to engagement and success (Bandura, 1997; Bean & Eaton, 2000; Benken, Ramirez, Li, & Wetendorf, 2015; Bonham & Boylan, 2011; Hall & Ponton, 2005; Nolting, 2014; Pajares & Urdan, 1996; Pajares & Kranzler, 1995; Tinto, 1993).

Students come to college with varying levels of preparation. Those students enrolling in developmental mathematics courses are often the least prepared overall (Bahr, 2012). Some students need to be taught how to learn, and this is addressed through study and organization skills. But many also arrive with low self-confidence and self-efficacy in learning mathematics. These students will need to reframe how they view themselves and perceptions related to the study of mathematics (Bandura, 1997; Bean & Eaton, 2000; Bonham & Boylan, 2012; Boylan, 2002; Boylan, 2007; Boylan & Saxon, 2005; Hall & Ponton, 2005; Nolting, 2014; Pajares& Kranzler, 1995; Pajares & Urdan, 1996; Pelligrino & Hilton, 2012; Strengthening Pre-Collegiate Education in Community Colleges, 2008).

Hall and Ponton (2005) found that mathematics self-efficacy is predicated upon a history of successful experiences in mathematics. With each course and each successful experience, the student becomes more confident in his or her ability to learn and master mathematics. This is why calculus students are more secure in their ability to learn their subject matter than are developmental mathematics students. The research shows that the best strategy to increase self-efficacy in developmental mathematics students is to get them enrolled in the appropriate courses and then scaffold learning opportunities for them to be successful. With each successful course completion, they build their sense of mathematics self-efficacy. Howard and Whitaker (2010) had similar findings in their qualitative study of the practices that successful developmental mathematics students found most useful to them.

Another area within the affective domain relates to math phobia, math anxiety, and test anxiety (AMATYC, 2006; Bonham & Boylan, 2012; Boylan, 2002; Boylan, 2007; Boylan & Saxon, 2005; Hall & Ponton, 2005; Nolting, 2014; Pajares & Kranzler, 1995; Pajares & Urdan, 1996; Pelligrino & Hilton, 2012; Strengthening Pre-Collegiate Education in Community Colleges, 2008). Pajares and Kranzler (1995) and Pajares and Urdan (1996) found that math anxiety directly correlates with math achievement, aptitude, and grades in mathematics classes. Pajares and Kranzler (1995) found that ability had a strong effect on self-efficacy and that self-efficacy has a strong effect on anxiety. These conditions should be addressed proactively with students through discussion and understanding of what the conditions are and how to cope with them.

Effective strategies, such as those provided by Nolting (2014), can help students take control of their fears and the physical response to them. These strategies include relaxation exercises, deep breathing, visualization, and positive self-talk. Classroom strategies such as the use of icebreakers and other activities to reduce stress and anxiety have proven effective as well (Bledsoe & Baskin, 2014). Howard and Whitaker (2011) found that students who have a motivation to be successful in mathematics and who used multiple effective strategies, many of which are associated with effective study skills, are able to positively change their mathematics course outcomes from previously unsuccessful course attempts.

Integration of Technology

Technology has proven to be an established and effective component of the teaching and learning process. Epper and Baker (2009) noted that in 1995 the American Mathematical Association of Two Year Colleges (AMATYC) included the use of technology as an essential part of an up-to-date curriculum in its guiding principles for the standards for college-level mathematics preparation. In its 2006 revision of the standards, *Beyond Crossroads: Implementing Mathematics Standards in the First Two Years,* AMATYC expanded upon this guiding principle:

> Technology: *Technology should be integral to the teaching and learning of mathematics.*
>
> Technology continues to change the face of mathematics and affects the relative importance of various concepts and topics of the discipline. Advancements in technology have changed not only *how* faculty teach, but also *what* is taught and *when* it is taught. Using some of the many types of technologies can deepen students' learning of mathematics and prepare them for the workplace (p. 10).

AMATYC (2006) states in its *Implementation Standard for Student Learning and the Learning Environment* that students need to use and have access to technology and that classrooms should be designed and equipped to facilitate technology. However, Epper and Baker (2009) observed that delivering upon the promise of technology has been a challenge for community colleges due to high costs, implementation challenges, and training. Both information technology infrastructure and academic technology innovations have lagged in the community college sector, despite ongoing efforts to keep pace with change.

Integration of technology into the art and science of teaching involves the intentional selection of appropriate hardware and software for the purpose of creating an optimal learning experience. In some instances this learning experience is interactive, in others it is not. It can be delivered face-to-face or virtually, and in some applications using both modalities. It serves both the producer and the consumer of learning materials and opportunities by facilitating environments in which media-rich teaching and learning can occur. And at its best, it meets the challenge of what Lyons, McIntosh, and Kysilka (2003) identify as the high tech/high touch paradox, by enhancing the connection of the student with the teacher, and ultimately to learning. Its impact reaches from serving as the patient tutor within computer-assisted instruction applications to the vehicle for engaging students in interactive teaching and learning in the classroom and online (AMATYC, 2006; Bonham & Boylan, 2011; Boylan, 2002; Chickering and Gamson, 1987; Epper & Baker, 2009; Kuh et al., 2005; Lyons et al., 2003; Ye and Herron, 2010).

The literature indicates that instructional technology should be used to supplement rather than replace *traditional* methods in education (Bonham & Boylan, 2011; Boylan, 2002; Boylan & Saxon, 2005; Epper & Baker, 2009; Kuh et al., 2005; Lyons et al., 2003). Boylan & Saxon (2005) found that when used as a supplemental strategy, developmental student learning and achievement increased, as did student attitudes toward computer-based learning. However, when computer-based learning became the primary method for delivery of instruction, student learning decreased.

A current application of educational technology, with a long and effective history, is computer-assisted instruction, a learning environment where students work, often independently, on practice to gain greater mastery within the subject area. It provides the student with more time on task, which has proven effective in moving course concepts from short-term memory to long-term memory, and gives autonomy to the student in terms of pace and repetition (Boylan, 2002; Boylan & Saxon, 2005; Chickering & Gamson, 1987; Kuh et al., 2005). The evolution of computer-assisted instruction within online learning systems and platforms has increased both student capability and outcomes. Ye and Herron (2010) found that computer-based instructional applications within such courseware as MyMathLab and Hawkes Learning System empower students to access pedagogically-driven assignments, participate in activities, manipulate and solve problems, verbalize their processes, and get immediate feedback, all the while working online and independently.

These strategies increase student outcomes. However, use of these strategies comes with a caveat. Boylan (2002) warns not to assume that students know how to use computer technology for learning applications. They must be taught how to access the material online and navigate the software effectively. Faculty need the capability to instruct students in the use of these systems both initially and in an ongoing manner throughout the course as they discuss out of class assignments. This requires technology presentation systems with reliable internet capability in mathematics classrooms (AMATYC, 2006).

Faculty are encouraged to create opportunities for students to use technology in support of their learning and in support of projects they create as class assignments; this includes strategies such as the full and robust use of online course management systems such as Blackboard, courseware applications, in-class and online presentation technologies such as computer and projection systems, tablets, SMART technologies, media-creation and other software, and resources on the internet (Boylan, 2011; Galligan, Loch, McDonald, & Taylor, 2010; Gningue, Menil, & Fuchs, 2014; Kuh et al., 2005; Lyons et al., 2003). However, Epper and Baker (2009) emphasize that only by aligning technology with learning objectives and finding the appropriate synergy between the two can increased learning be actualized. They encourage faculty to do so, as technology is the best strategy to dig deeper into the curriculum, given inadequate time to do so in class.

Effective practices documented in the literature provide insight for applications in the classroom. Martin (2009) conducted a course redesign using TI-83 graphing calculators in introductory algebra to increase student expertise in the use of graphing calculators and to apply the calculators as a higher order problem solving tool. Significant professional development was embedded in the redesign to support the many different faculty, both full-time and adjunct, and their teaching styles. Presentation technology was provided in the classrooms to project the calculator interface and model its use for students. This created a guided learning and application opportunity for students to achieve success with the calculators. Pass rates were significantly higher for the implementation years of the intervention. The author provided a “lessons learned” commentary for those interested in incorporating a calculator component into their introductory algebra curriculum.

Galligan et al. (2010) examined the use of tablet PCs and related technologies such as smart pens in the teaching and learning of mathematics. They studied applications in three environments, including the classroom, small group tutoring, and one-on-one consultation/tutoring in both face-to-face and online or virtual environments. Tablet and

related technologies were chosen for the study because they are versatile and bring different benefits to each of the three applications and environments.

Tablets and related technologies provide the opportunity for both the instructor and the student to interactively communicate in writing via “digital ink” on a “digital whiteboard,” which can be projected in a classroom, shared in a small group using a collaboration table with monitor, or used synchronously online. The recorded products can be edited and rendered for upload to a website for student review. Of interest, this study was conducted at a university in Australia that serves a large number of students who are located at the university, but also to a large number who live in remote locations. Distance learning is a common delivery mode in this environment. Results of the qualitative study were positive overall for both students and faculty. One faculty member noted that the tablet had made her more “visual” in her lectures.

Galligan et al. (2010) provided a summary of advantages and disadvantages for each of the applications in their study. The ability to be spontaneous and interactive was cited as an advantage, as was the ability to capture the moment digitally and post it as a video snippet online. Ninety-eight percent of students reported that digital ink writing during the lecture helped them learn more effectively. A disadvantage of the tablet technology was the handwriting of some faculty, which was reported as illegible by some students.

Gningue et al. (2014) studied the use of virtual manipulatives in the teaching of pre-algebra and algebra concepts and its impact on students’ attitudes, confidence, and achievement in learning. Findings from the research determined that mastery of pre-algebra was the best indicator of college success for their students. The use of manipulatives by students is an active learning strategy employed in mathematics to address the difficulties students have with learning arithmetic and pre-algebra. Virtual manipulatives are based upon traditional manipulatives such as base 10 blocks, geoboards, and fraction bars. Manipulatives allow learning by discovery. Findings of the study documented that students enjoyed the online manipulatives and engaged in a higher level of constructivist learning, even experimenting on their own. They worked independently in class and some repeated the lessons online at home. The experimental group performed higher than the control group and expressed more excitement with this way of learning. They also liked the feature of instant feedback from the software, releasing them from dependence on the teacher. Delivery of a course which uses virtual manipulatives requires intense professional development on its use to ensure effective practice by all faculty.

Tutoring/Learning Assistance Centers

Tutoring and learning assistance centers have a long and effective history with supporting developmental education (Boylan, 2002; Boylan & Saxon, 2005; Casazza & Silverman, 1996; Fowler & Boylan, 2010). Casazza and Silverman (1996) provided a historical context for tutoring and learning assistance centers in American postsecondary education, and observed that with the open door policies and commitment to expanding educational opportunities to all students, including non-traditional and underrepresented students and those with learning disabilities, the question becomes not *if* the college should provide these services, but *how* they would provide them.

Learning support services have proven themselves essential to student success. Bremer et al. (2013) found that participation in tutoring during the first term of college enrollment had implications for success throughout the student's college career, with higher GPA and persistence continued through year three. They found that tutoring significantly raised GPA in other courses within the same discipline. Perin (2004) found a significant correlation between the frequency of visits to the tutoring center and GPA, with those students receiving services at least six times within one semester having grade point averages one point higher than those students who used the center less frequently. Similar outcomes in support of student achievement have been reported by Boylan (2002) and Habley, Bloom, & Robbins (2012). The Center for Community College Student Engagement (2014) found a significant, positive correlation between tutoring and graduation rate, aligning with the national completion agenda (O'Banion, 2013).

Multiple types of delivery systems for learning assistance exist (Boylan, 2002; Boylan & Saxon, 2005; Casazza & Silverman, 1987; Habley et al., 2012; Perin, 2004). The four most common are:

- centralized general tutoring centers that address multiple disciplines
- centralized tutoring centers that support targeted disciplines such as developmental education
- centralized learning assistance centers that support multiple disciplines
- decentralized learning assistance centers that tend to serve a specific discipline, such as mathematics, and are located in the building where those classes are taught and the faculty are housed.

In their nationwide survey of postsecondary institutions, *What Works in Student Retention,* Habley et al. (2012) found that 90% of the participating colleges listed tutoring as a learning

assistance program at their site. When asked to rank all programs and services offered at the college according to retention effectiveness, tutoring and learning assistance centers were ranked number one. It is apparent that practitioners at all levels recognize the importance of a strong tutoring presence on postsecondary campuses, particularly those institutions with large numbers of developmental students.

The literature is consistent in its documentation of a strong relationship between academic departments and tutoring or learning assistance centers (AMATYC, 2006; Bonham & Boylan, 2011; Boylan, 2002; Boylan & Saxon, 2005; Casazza & Silverman, 1996; Epper & Baker, 2009; Fowler & Boylan, 2010; Grubb, 2010; O'Banion, 2013; Perin, 2004). For tutoring to be effective, it must align with *what* is being taught in class and *how* it is being taught in class, and it must support the student learning outcomes of the course. It is disruptive and confusing for those students seeking learning assistance with a subject, such as math, to receive mixed messages; students need one consistent way to approach and solve the problems, which is the way the faculty are teaching it in class. This requires significant collaboration between tutoring services and the faculty in the departments. Researchers have found that the most effective model has the academic director or lead tutor of the specific tutoring service, such as mathematics, actually integrating with the department faculty through attendance at their meetings and training sessions. The academic director or lead tutor needs to have an established background and understanding of the subject area, preferably credentialed in it, and be an expert in how best to provide tutoring support for it (AMATYC, 2006; Bonham & Boylan, 2012; Boylan, 2002; Boylan & Saxon, 2005; Epper & Baker, 2009; Grubb, 2010; Perin, 2004).

Tutoring staff should be comprised of both professional level tutors and peer tutors. In this way, there is the overarching expertise and knowledge of the professional tutor, who is an expert in the subject area, and the peer opportunity for students to support each other under professional direction (AMATYC, 2006; Bonham & Boylan, 2012; Boylan, 2002; Boylan & Saxon, 2005; Casazza & Silverman, 1996; Epper & Baker, 2009; Grubb, 2010; Kuh et al., 2005; Grubb, 2010; Perin, 2004). In the case of peer tutors, there is strong research mandating careful selection and hiring practices, with an effective strategy being to ask subject-area faculty to provide recommendations for students who would be effective tutors. Once selected, peer tutors undergo extensive training prior to working with students, using such training programs as College Reading and Learning Association tutor certification or similar credentials (Agee & Hodges, 2012; AMATYC, 2006; Bonham & Boylan, 2012;

Boylan, 2002; Boylan & Saxon, 2005; Casazza & Silverman, 1996; Epper & Baker, 2009; Grubb, 2010; Kuh et al., 2005; Perin, 2004). The peer tutoring curriculum typically covers learning theory, including active learning, critical thinking skill, and metacognition; assessment of students' learning; group dynamics, including collaborative and group work; the purpose and role of tutoring; and valuing diversity (Casazza & Silverman, 1996; Lipsky 2011). Kuh et al. (2005) reiterate the importance of highly structured training and highly qualified tutors in order for this practice to be effective.

Boylan (2002) stresses that tutoring services must be offered at times and locations that align with student needs. This can be accomplished with a needs assessment, but will likely indicate that students need access in the evenings, on weekends, and online, in addition to services during the day. To truly meet the needs of developmental students, colleges are urged to offer services where and when students are able to attend or participate.

Professional Development

The importance of professional development in support of effective growth and improvement is pervasive throughout the literature. Bonham and Boylan (2012) state that teaching developmental mathematics is much different from teaching more advanced college-level mathematics courses. Developmental mathematics faculty need an intensive background in mathematics, but they also need training in developmental education as well. And they must be able to implement change into their practice as effective developmental education strategies in the field emerge. To do so, they need access to sustained professional development, including those opportunities provided through conferences and workshops, but also through affiliation with professional organizations, and through local communities of practice that are inquiry based (AMATYC, 2006; Bonham & Boylan, 2012; Boylan, 2002; Boylan & Saxon, 2005; Epper & Baker, 2009; Grubb, 2010; Kuh et al., 2005; Pathways to Faculty Improvement, 2012; Pelligrino & Hilton, 2012; Strengthening Pre-collegiate Education in Community Colleges, 2008; Texas Higher Education Coordinating Board, 2014). Boylan and Saxon (2005) found that there is a correlation between sustained and effective professional development for developmental education faculty and improved outcomes in developmental course pass rates, grades, and persistence; this correlation extends to professional development of tutoring staff as well. Casazza and Silverman (1996) found a correlation between student success and professional development of all personnel working with underprepared students.

Epper and Baker (2009) document consensus across the research that professional development must be rigorous, intense, and thoughtful; it is critical to any proposed innovation in the field, whether it is content-based, classroom-based, or technology-based. AMATYC (2006) concurs that strong professional development is required for any significant change to the delivery and support of mathematics education. Consistent with this, in their study of high performing, inquiry-driven colleges, Kuh et al. (2005) found that professional development was essential for effective integration of technology and innovative practices into instruction. Whether through communities of practice, inquiry groups, or department meetings, there was strong support for faculty sharing ideas, lessons learned, and new research and strategies with their peers upon return from conferences and workshops (Bonham & Boylan, 2005; Boylan, 2002; Pathways, 2012; Strengthening Pre-Collegiate Education in Community Colleges; 2008).

Bailey et al. (2015) found that professional development, collaboration, and inquiry groups are vital to effective pathways in support of student completion. In order to learn how to more effectively grow and serve students, practitioners require professional development in their own subject areas, but they also need to work collaboratively with others at the college to create the synergistic effect of all programs and services seamlessly moving the student forward together.

Summary

Review of the scholarly literature and best practices established for improving developmental mathematics outcomes, achievement, and persistence, clearly evidences that the combination of 1) early completion of the developmental and gateway course sequence, 2) integration of engagement and empowerment strategies into the curriculum, 3) infusion of technology into learning and practice, 4) provision of research-based tutoring and learning assistance, and 5) sustained professional development to achieve these changes has proven effective in supporting achievement of the goals of the College's QEP. The College has used this research to frame the QEP implementation plan and budget, and aligned it with the College's overarching commitment to pursuing a seamless pathways approach to student completion.

CHAPTER 5: IMPLEMENTATION PLAN

Navarro College will begin piloting implementation strategies for the Quality Enhancement Plan (QEP), *Together Everyone Achieves Math Mastery*, TEA(M)^2, beginning Fall 2015. These strategies are based upon a framework of overarching standards of practice set by the American Mathematical Association for Two-Year Colleges [AMATYC] (2006), and closely align with research and best practices discussed in the literature review. Of the five standards set by AMATYC (2006), the following most directly apply to the College's QEP:

- *"Mathematics faculty and their institutions will create an environment that optimizes the learning of mathematics by all students"* (p. 17), with recommendations for mathematics faculty to address the following:
    - appropriate initial placement into the mathematics curriculum
    - consideration of student learning styles when designing instructional activities
    - consideration of affective factors such as mathematics anxiety that affect learning
    - provision of appropriate facilities and academic support programs to "promote student success in mathematics and complement learning experiences" (p. 26).
- *"Faculty will use a variety of teaching strategies that reflect the results of research to enhance student learning"* (p. 51), with recommendations for mathematics faculty to address the following:
    - inclusion of active learning and collaborative learning strategies when designing instructional activities
    - effective integration of technology into teaching and learning

The implementation of the QEP entails a period of piloting and experimentation as the College begins this transformational change process. Strategies and actions are based upon scholarly research, best practices, and overarching standards set by national scholars and practitioners in the field of introductory college mathematics education (AMATYC), but, nevertheless, strategies and actions which represent new territory for practitioners at Navarro College. To support this endeavor, financial resources have been committed for the next five years and a carefully defined plan based upon a philosophy of pilot testing, assessment and evaluation, modification when indicated, and ultimately, institutional implementation when proven effective.

Implementation strategies and actions are presented below, along with identification of positions responsible for overseeing their implementation.

The QEP Assessment TEAM has responsibility for overseeing all data collection, assessment, and evaluation support. The Assessment Plan details how these actions and outcomes will be assessed and evaluated. The Implementation Timeline presents the staggered order in which these actions will be piloted and implemented over the course of the QEP. The Assessment TEAM is comprised of the QEP Co-Directors, Director of Institutional Research, Dean of Institutional Effectiveness, Mathematics Faculty, Math Lab Instructors, Dean of Academic Support Programs, Dean of Professional Development, Dean of Student Guidance, and Chief Information Officer.

Implementation is designed around five strategies designed to work together synergistically to provide students the support and engagement they need to succeed in developmental and credit-bearing gateway mathematics courses. These strategies include:

- advising and communication in support of early enrollment in the mathematics course sequence
- engagement and empowerment to enhance student learning and self-efficacy
- integration of technology in support of teaching and learning
- provision of mathematics tutoring/learning assistance centers to support students in their mathematics learning in a manner that is directly aligned with classroom instruction
- provision of professional development to assure that all stakeholders in direct support of the initiative are given the opportunity to learn, develop, and share skills and strategies to advance student learning

Advising and Communication in Support of Early Enrollment in Course Sequence

Upon admission to the College, students who have not provided evidence of college readiness such as SAT, ACT, or Texas Success Initiative (TSI) qualifying scores, are required to take the TSI placement test. Based upon their score, students are placed into the appropriate mathematics course, and for many that is a developmental course. While it is highly recommended to enroll in the course immediately, it is not a requirement, and many students delay and sometimes avoid the course altogether. Implications of this are restricted access to certain courses and ultimately inability to meet graduation requirements. This

scenario creates a barrier to successful college completion and the benefits of achieving such a credential.

The College's two-pronged approach to increase early enrollment in the developmental/ gateway mathematics course sequence includes a more intrusive advising model with respect to mathematics course enrollment and a marketing campaign to advance these enrollment objectives.

Advising. When meeting with First Time in College (FTIC) students, advisors will review student placement scores for mathematics with the student and strongly advise him or her to enroll in the appropriate program-specific developmental/gateway mathematics course in the first semester. When meeting with current students, advisors will review the student record to determine if the student has completed his or her program-specific developmental/gateway mathematics sequence. Students who have not completed their sequence will be strongly advised and encouraged to enroll immediately and complete it.

There are challenges with this strategy that are inherent in the College's advising model. Navarro College uses a faculty-centered advising system, where students are assigned to a specific faculty member or other College employee for advising and registration support during their tenure at the college. While this decentralized approach to advising provides a more personal relationship between the advisor and student, it requires timely dissemination of changes in practice and knowledge of requirements for specific degrees.

To address this challenge, the College is creating and deploying a comprehensive training program for all personnel serving as advisors, to begin in September 2015. Advising personnel will receive interactive training and written guidelines for student enrollment in the mathematics sequence in the first semester for First Time in College (FTIC) students, and getting current students who have not completed their math sequence back on track. It is imperative for those serving as advisors to follow these guidelines in getting the students properly enrolled. To assure this practice becomes institutionalized, in addition to initial training there will be subsequent follow up training and dissemination of updated guidelines each semester to keep advisors current on established practices and changes.

To keep students on track, during each new semester's registration period, mathematics faculty, including both fulltime and adjuncts, will strongly encourage their current students to enroll in the next course in their program-specific sequence, and offer assistance to the student as needed.

Responsible Parties for Implementation: Dean of Student Guidance, Executive Dean of Academics, Mathematics Faculty, and QEP Co-Directors

Communication. A planned communications and marketing campaign targets students. Communication begins with the initial notification to the student of mathematics course placement level. Students will receive a notification of the results and the appropriate course in which to enroll, along with messaging on the importance of enrolling now. In addition to this, a website and social media campaign is planned, encouraging students to complete their mathematics course sequence early in their college career and how this benefits overall completion with obtaining a degree or transfer. In addition, plans include a targeted marketing effort with posters and other print media that will keep students and college stakeholders apprised of the importance of early enrollment, persistence, and the learning support that is available to students.

Responsible Parties for Implementation: Director of Marketing, Dean of Student Guidance, and QEP Co-Directors.

Engagement and Empowerment

The importance of engagement and empowerment strategies in developmental and gateway course design is strongly supported by the literature review and AMATYC standards. The importance of engagement to students was documented and evidenced in survey and focus group findings early in the QEP process. Consequently, the College's first formal professional development activity in support of the QEP addressed engagement strategies. In January 2015, the QEP Committee hosted a presentation by Dr. Rosemary Karr, who is a Professor of Mathematics at Collin College and a nationally acclaimed developmental studies practitioner and scholar. The training, which was recorded for later review by those who could not attend, covered numerous engagement strategies for the developmental mathematics classroom. Some of the faculty immediately experimented with suggested strategies in the first week of classes and throughout the semester and found them to be effective. Consistent with this approach, the College will research, pilot, evaluate, and implement actions in support of student learning, to include:

- designing instruction in a manner that incorporates both active learning and collaborative learning activities that are consistent with learning styles associated with developmental education students

- creating an online orientation module for students that includes discussion of empowerment practices addressing affective considerations such as math anxiety and test anxiety, provides an overview of study skills that are useful in mathematics, and introduces the student to learning support services that are available through the tutoring/learning assistance center and online through Tutor.com
- incorporating study skills into the curriculum in a manner that supports the developmental progression of the student through his or her mathematics sequence

Professional development is an essential component of the plan throughout the life of the QEP, but most dramatically during the first two years of the initiative as faculty formulate and pilot specific actions to enhance learning. To facilitate this, communities of practice are planned for implementation across the district as faculty at each campus come together as individual cohorts to engage in targeted professional development and define and pilot strategies in support of engagement and empowerment. To extend the synergy of individual cohort learning, opportunities for sharing strategies and findings with other campuses across the College are planned. Ultimately, a list of proven strategies compiled by the cohorts is planned for publication, to be shared across all campuses to support others when designing instructional activities.

Professional development plans include both local opportunities and offsite attendance at conferences and workshops. Funding for both venues has been incorporated into the budget. As part of this strategy, Navarro College has been selected to host the Regional Workshop for Hawkes Learning Systems in November 2015 with featured guest speaker, developmental educator and author, Dr. Paul Nolting. Faculty members from the College are working collaboratively with Hawkes in the design of the format, topics, and logistics for the workshop. Subsequent onsite professional development opportunities are in the planning phase and will be scheduled for fall and spring of this first year of the initiative. In addition, various faculty members plan to attend the AMATYC annual conference the fall of 2015 and the National Association of Developmental Education annual conference in spring of 2016, in addition to other professional development opportunities. Faculty have begun attending conferences and workshops addressing strategies in support of engagement and affective factors.

As the various campus cohorts research, refine, and pilot their engagement and empowerment strategies, evaluation is formalized as faculty assess effectiveness, make improvements which will be subsequently implemented and assessed again, and move

forward to broader implementation and a cycle of continuous improvement. Years one and two will be exploratory and consist of pilots and refinement, while years three through five will be institutionalization of practices.

Responsible Parties for Implementation: Mathematics Faculty, Math Lab Instructors (Tutoring/Learning Assistance Centers), Dean of Sciences, Kinesiology, and P.A.S.S. Program, Dean of Academic Support Programs, Dean of Student Guidance, Counseling, Dean of Professional Development, Dean of Online Instruction, Media Integration Services, and QEP Co-Directors.

Technology in Support of Teaching and Learning

Standardized technology-based classroom presentation systems. Navarro College has placed classroom and learning technologies as a priority for all of its campuses, as it has lagged behind industry standards on some campuses. Students, faculty, and staff indicated in surveys and focus group findings that technology must be improved in terms of hardware and software capacity and infrastructure, including wireless access. Since there is not a standard classroom technology-based presentation configuration for the College, the QEP Committee asked the Media Integration Services Department to create one for use in the mathematics classrooms not having such equipment. The configuration of a computer, document camera, projector, and speaker system, with lectern or other installation housing, will be ensured for every mathematics classroom on every campus in the College. Mathematics faculty worked closely with Media Integration Services in designing the system and its functionality. These classrooms are being installed for use during the pilot phase of the initiative in fall of 2015 at the Corsicana campus. Document cameras for each mathematics classroom and selected pilot engagement technologies will be ordered for the other campuses during the Fall 2015 semester.

Software applications in support of student learning. Standardization of the hardware and software systems in the classrooms will enable faculty to use technology in support of teaching and learning, which is consistent with the literature and is one of AMATYC's implementation recommendations. With this capability, all faculty will be able to review with students the material from the learning management systems embedded in their textbooks (examples include Hawkes Learning System and Pearson's MyMathLab), which students cited as a need in the surveys and focus group findings. Also cited by students was the need for assistance with the TI-84 graphing calculator, which is essential for success in algebra courses, and faculty will now be able to use the new calculator emulator software in

the classrooms throughout the semester. These same capabilities will be incorporated into the tutoring/learning assistance centers on all three campuses, and will be piloted at the Corsicana campus in Fall 2015.

With classroom technology-based presentation systems in place, the faculty will have the opportunity to investigate and pilot strategies such as the tablet and smart pen technologies described in the literature review, which have the capability to be recorded, edited, and rendered for upload to Blackboard for access by students. Some faculty at various campuses have requested to investigate and pilot such a system in year one.

Another application discussed in the literature, virtual manipulatives, which allow students to participate in “hands-on” concrete learning activities online, will be researched and piloted by other faculty. Years one and two will be a time of managed exploration by the campus mathematics faculty cohorts, as they identify and pilot technology strategies that engage students and lead to greater learning and success. The budget includes funds for professional development and purchasing hardware and software for piloting purposes. These strategies will be used in the mathematics tutoring/learning assistance centers as well.

Alignment of hardware and software applications between the classrooms and the tutoring/learning assistance centers. The mathematics tutoring/learning assistance centers are being equipped with desktop computers, laptops, and tablets for student use, in addition to technology-equipped collaboration tables for small group tutoring. “Digital ink” features of the virtual whiteboard capability of the tablets enables interactive learning experiences in the lab. The math lab instructor and tutors can share their tablet displays on the large screen LCD monitor at the collaboration table, and then give access for students to share their work. This active learning strategy will be piloted at the Corsicana campus in Fall 2015 and Spring 2016, and evaluated for expansion to the other campuses in Fall 2016. Professional development and hands-on training are a key component of implementing the strategies included in this section.

Responsible Parties for Implementation: Chief Information Officer, IT Staff, Mathematics Faculty, Math Lab Instructors, Dean of Professional Development, Dean of Online Instruction, Media Integration Services Coordinator, Dean of Academic Support Programs, and QEP Co-Directors.

Mathematics Tutoring/Learning Assistance Centers

In their most recent iteration of the *What Works in Student Persistence Survey of Colleges Nationwide*, Habley et al. (2012) found that practitioners rated tutoring/learning assistance centers as the most effective support service for student success. Consistent with this, QEP student survey and focus group findings indicate that Navarro College students want tutoring and learning assistance support services, staffed by knowledgeable professional tutors, and they want access when needed, which includes evenings and weekends, as well as daytime hours. This type of centralized professional-level mathematics tutoring service does not currently exist at the College.

As part of the QEP initiative, the College will create a mathematics tutoring/ learning assistance center at three of its four campuses, with the Ellis County campuses sharing a facility. Staffed by professional level tutors and peer tutors, the centers will offer mathematics tutoring that is consistent with the same teaching philosophy and mathematics strategies used by the faculty in the classroom. Consistent with best practices in the literature review, the Math Lab Instructor(s) at each center will meet regularly with the mathematics faculty at the campus, attend department meetings and professional development, and ensure that the instruction students receive in the center meets their learning needs. To assure this alignment, mathematics faculty will be involved from the start, serving on hiring committees for the Math Lab Instructor positions, beginning with the first position in August, 2015.

The Math Lab Instructor has authority for all instructional activities in the center, beginning with the hiring and training of tutors and providing quality assurance that students are receiving the instructional support they need. The center plans to follow best practices in training its tutors and seek College Reading and Learning Association certification for them. Funding has been allocated for this training.

Computers, laptops, and tablets have been ordered and will be available in the centers for student use. Students will be able to do homework using their textbook's learning management system and get assistance and reinforcement as needed. Special small group tutoring will be provided to address specific issues with which students are struggling, including mathematics, study and test taking skills, and affective issues such as math anxiety. Small group services will also be provided by request for students enrolled in career technical courses who need assistance with mathematics embedded within their

coursework. Interactive small group instruction will be provided at technology-equipped collaboration tables, using PC tablets, and staffed by professional-level tutors.

The center is being piloted in Corsicana during the first year to evaluate the service and make adjustments as needed. Access will include some evening and weekend hours; however, the extent of these hours will be determined by student usage. The center will be open later during finals, consistent with library hours during this peak period. The Corsicana tutoring and learning assistance center is housed within a larger learning commons that will open in Fall 2015. The mathematics tutoring and learning assistance center will benefit from the economy of scale of having the Dean of Academic Support Programs located on site, and the services of a tutoring coordinator, who will support all services in the learning commons, including the mathematics center.

The other campuses will roll out their mathematics tutoring/learning assistance centers in year two. They will be located in space adjacent to faculty offices and the mathematics classrooms, which is consistent with a specialized learning assistance center. Their organization will be different in that the fulltime faculty will be more directly involved based upon location. There will be professional-level tutors, one of which will serve as the part-time Math Lab Instructor, and peer tutors.

Online students and those enrolled in dual credit courses with the high schools will be able to use the centers if they choose to come on campus, but they can also continue to use the Tutor.com services that the College continues to offer. The College plans to investigate and pilot an online platform enabling College faculty and staff to provide virtual learning support services. Investigation will occur in year one and be piloted in year two if it proves cost effective and feasible.

Responsible parties for implementation: Dean of Academic Support Programs, Math Lab Instructors, Mathematics Faculty, Learning Commons Coordinator, Media Integration Services Coordinator, Dean of Online Instruction, Dean of Student Guidance, Counseling, and QEP Co-Directors.

Professional Development in Support of the QEP

The QEP will require significant professional development and training in order to be effective, which is consistent with the literature review and AMATYC standards. A significant training program is planned for Fall 2015 for the new classroom presentation systems in Corsicana, including hands-on training, access to an online video, and a one-page at-a-

glance visual guide to using the system. Training will be provided for all employees engaged in student advising in Fall 2015 for Spring 2016 enrollment to assure that everyone is: 1) consistently and strongly encouraging FTIC students to enroll in their developmental/gateway mathematics sequence, and 2) checking to see the status of current students in completing their sequence, and strongly encouraging those students who are not complete to enroll and complete their mathematics requirement. This includes training sessions and written guidelines.

Training of tutors will be more significant in terms of breadth of content and the hours needed to master the job skills. However, the Math Lab Instructor who serves as the instructional director for the tutoring/learning assistance center will be in charge of this, and will work in conjunction with tutoring practices and standards consistent with the College Reading and Learning Association.

Professional development in support of engagement and empowerment will require significant involvement of faculty and staff and require attendance at conferences and workshops, and dialogue with peers, which result in development of pilot strategies within the developmental and gateway mathematics sequence. This will require more in-depth participation and application of learning and will need to be supported. The costs of attending the conferences have been budgeted, as have the costs of technologies that may be piloted. A supplies budget has been written into the overall budget for incidental expenses. Data collection will be assisted, and in some cases conducted by, the Director of Institutional Research, with concomitant analysis also performed by the Director of Institutional Research. However, there is still the possibility that additional part time help may be needed to support the faculty in these efforts. The QEP Co-Directors will monitor these needs and if necessary seek additional funds for part-time temporary assistance during peak periods.

Although the initiative will support what evolves in terms of a community of practice built by faculty in support of new teaching and learning strategies, it is intended that a vibrant culture of inquiry grows from these efforts. Different venues for making such a group viable include an online discussion space within Blackboard, brown bag lunches, and other collaborative gatherings for sharing what is working and what is not.

Professional development for others working in the initiative will be covered, by request, through the College's Professional Development Fund. Upon review, if the need is not met,

the team will request line item professional development funds for those needing it in future year budgets.

Responsible parties for implementation: Mathematics Faculty, Dean of Sciences, Kinesiology, and P.A.S.S. Program, Media Integration Services Coordinator, Dean of Professional Development, Dean of Online Instruction, Dean of Student Guidance, Dean of Academic Support Programs, and the QEP Co-Directors.

CHAPTER 6. IMPLEMENTATION AND ASSESSMENT TIMELINE

Developing, planning, and implementing an intervention as large and complex as a Quality Enhancement Plan (QEP) requires significant coordination and planning. A carefully designed timeline is essential to ensure integration of each of the parts, as the initiative, *Together Everyone Achieves Math Mastery, TEA(M)*^{2} moves forward according to plan. For organizational purposes, Navarro College integrated the implementation plan and assessment plan into a single timeline for the QEP.

The QEP Co-Directors oversee the administration of the timelines for both implementation and assessment. They work closely with the Implementation TEAM and Assessment TEAM, which are groups that oversee these two functions over the life of the initiative. These teams are comprised of stakeholders from across the College.

The initiative entails coordinating multiple strategies for implementation, including:

- *advisor sequence training and communication* in support of early enrollment in developmental/credit-bearing mathematics course sequence
- *engagement and empowerment* strategies specific to the learning needs of developmental and credit-bearing gateway mathematics students
- *teaching and learning technologies* in the classroom and beyond,
- *mathematics tutoring/learning support centers* to work in coordination with mathematics faculty to deliver instructional and learning support
- *professional development* to support stakeholders as they move forward with these strategies

The initiative entails two levels of assessment, including:

- assessment of the initiative's formal goals and objectives, including Student Learning Outcomes assessment, retention and successful course completion, and successful completion of the student's program specific developmental mathematics/credit-bearing gateway mathematics course sequence, for targeted courses including MTH 0305, MTH 0306, and MATH 1314
- implementation strategies including advisor sequence training and communication, engagement and empowerment practices, integration of teaching and learning technologies, tutoring and learning support services, and professional development

Overview of the OEP Timeline

Academic Year	QEP Year	Symbol
Spring-Summer 2015	Planning	P
Fall-Summer 2015-2016	Year 1	1
Fall-Summer 2016-2017	Year 2	2
Fall-Summer 2017-2018	Year 3	3
Fall-Summer 2018-2019	Year 4	4
Fall-Summer 2019-2020	Year 5	5

Abbreviations for Strategies and Functions

Strategy/Function	Abbreviation
Early Enrollment and Completion of Math Sequence	EECMS
Engagement and Empowerment Practices	E & E
Integrate Teaching and Learning Technologies	Tech
Math Tutoring/Learning Assistance Centers	Tutoring
Professional Development	Pro Dev
Assessment	A
Oversight	O

Abbreviations for Campus Sites

Campus	Abbreviation
Corsicana	CC
Mexia	MEX
Midlothian	MID
Waxahachie	WAX

Implementation Timeline				
Date	***Strategy***	***Activity***	***CAMPUS***	***QEP YEAR***
YEAR:PLANNING				
Spring 2015	PROF DEV/ E&E	Mathematics faculty attend on site Professional Development seminar focusing on engagement and empowerment strategies for teaching and learning mathematics	ALL	P
Spring 2015	TUTORING	Plan & design TEAM Centers to include furnishings, equipment, layout and renovations	CC	P
Spring 2015	TUTORING	Order equipment and furnishings in TEAM Center	CC	P
Spring 2015	TECH	Plan & design standardized presentation systems for mathematics classrooms	CC	P
Spring 2015	TECH	Order equipment and furnishings for standardized mathematics classroom presentation systems	CC	P
Summer 2015	TUTORING	Receive and install equipment and furnishings in TEAM Center	CC	P
Summer 2015	TECH	Receive and install standardized classroom presentation systems	CC	P
Summer 2015	TUTORING	Recruit and hire new personnel for TEAM Center	CC	P
Summer 2015	TUTORING	Order, receive, and install tracking system for TEAM Center	CC	P
Summer 2015	ALL	Design initial assessment instruments for all strategy evaluations	ALL	P
Summer 2015	E&E	Pilot group researches and identifies potential strategies to improve course engagement and empowerment	CC	P

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YEAR 1				
Fall 2015	E&E	Pilot of MATH 1314 course curriculum alignment and engagement practices through synchronization of selected course sections	CC	1
Fall 2015	TECH	Order, receive and install necessary equipment to complete standardized classroom presentation systems	MEX, WAX, MID	1
Fall 2015	TUTORING	Create tutor training resources	CC	1
Fall 2015	TUTORING	Hire and train professional and peer tutors for TEAM Center	CC	1
Fall 2015	TUTORING	Opening of TEAM Center	CC	1
Fall 2015	TUTORING	Offer one-on-one and small group tutoring	CC	1
Fall 2015	TUTORING	Develop tutoring strategies using technology as outlined in the Implementation Plan	CC	1
Fall 2015	PROF DEV/ E&E	Conduct faculty development activities throughout the semester, including hosting of Hawkes Regional Workshop	ALL	1
Fall 2015	TECH	Develop materials and conduct training sessions for mathematics faculty in using standardized classroom presentation systems	CC	1
Fall 2015	EECMS	Develop material and conduct training sessions for all academic, faculty, and staff advisors for mathematics course sequence training	ALL	1
Fall 2015	PROF DEV	Full-time mathematics faculty attend conferences in support of QEP	ALL	1
Fall 2015	EECMS	Implement marketing campaign for mathematics sequence completion	ALL	1
Fall 2015	EECMS	Implement mathematics course sequence training sessions for all advisors for use during Spring 2016 registration	ALL	1

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Fall 2015	A	Conduct an assessment of MATH 1314 pilot, revise and refine as indicated	CC	1
Fall 2015	A	Conduct strategy assessments for tutoring, advisor sequence training, professional development, and classroom presentation training as outlined in the assessment plan.	ALL	1
Fall 2015	A	Conduct formative assessments of goals one and two as outlined in the assessment plan	ALL	1
Fall 2015	A/O	Complete formative assessment report for fall 2015 as outlined in the assessment plan	ALL	1
Spring 2016	TUTORING	Pilot tutoring strategies using technology as outlined in the implementation plan	CC	1
Spring 2016	E & E	Faculty create communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	1
Spring 2016	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	1
Spring 2016	TUTORING	Design, furnish and equip additional TEAM Centers, place orders	WAX/ MEX	1
Spring 2016	EECMS	Update advisor sequence training for continuation of advising strategy	ALL	1
Spring 2016	E & E	Continue Pilot of MATH 1314 selected courses	CC	1
Spring 2016	TECH	Develop strategies for new technologies in support of engagement related interventions MTH 0305, MTH 0306, MATH 1314	ALL	1
Spring 2016	A	Conduct an assessment of MATH 1314 pilot, revise and refine as indicated	CC	1

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Spring 2016	A	Conduct strategy assessments for tutoring, engagement & empowerment, advisor sequence training, professional development and classroom presentation training as outlined in the assessment plan.	ALL	1
Spring 2016	A	Conduct summative assessments of goals one and two as outlined in the assessment plan	ALL	1
Spring 2016	A/O	Complete summative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	1
Summer 2016	TUTORING	Collaborate with counselors to develop workshops addressing math anxiety	CC	1
Summer 2016	TUTORING	Develop workshops for study skills	CC	1
Summer 2016	TUTORING	Install equipment and furnishings in additional TEAM Centers	WAX/ MEX	1
Summer 2016	TUTORING	Hire professional and peer tutors for additional TEAM Centers	WAX/MEX	1
Summer 2016	TUTORING	Train professional and peer tutors for additional TEAM Centers	WAX/ MEX	1
Summer 2016	O	Report to Assessment TEAM, Implementation TEAM, President's Cabinet, and QEP website	ALL	1
YEAR 2				
Fall 2016	EECMS	Update advisor sequence training including new degree plans or degree changes	ALL	2
Fall 2016	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	2

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Fall 2016	TUTORING	Pilot math anxiety and study skills workshops	CC	2
Fall 2016	TUTORING	Implement tutoring strategies using technology as outlined in the implementation plan	CC	2
Fall 2016	TUTORING	Open additional TEAM Centers	WAX /MEX	2
Fall 2016	E&E/ EECMS	Pilot of engagement and empowerment strategies emerging from communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	2
Fall 2016	TECH	Develop online faculty led tutoring and assess feasibility of practice	ALL	2
Fall 2016	E&E	Develop online orientation module for mathematics students as outlined in the implementation plan	ALL	2
Fall 2016	E&E	Continue pilot of MATH 1314 selected courses, revise and refine as indicated	ALL	2
Fall 2016	A	Assess and evaluate math anxiety and study skills workshops, revise and refine as indicated	ALL	2
Fall 2016	A	Conduct strategy assessments for tutoring, advisor sequence training, engagement & empowerment, professional development, tutoring and classroom presentation training as outlined in the assessment plan.	ALL	2
Fall 2016	A	Conduct formative assessments of goals one and two as outlined in the assessment plan	ALL	2
Fall 2016	A/O	Complete formative assessment report for fall 2016 as outlined in the assessment plan	ALL	2
Spring 2017	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	2

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Spring 2017	TUTORING	Pilot math anxiety and study skills workshops	ALL	2
Spring 2017	E&E	Pilot online orientation module for mathematics students as outlined in the implementation plan	ALL	2
Spring 2017	TECH	Continue to develop strategies for new technologies in support of engagement related interventions MTH 0305, MTH 0306, MATH 1314	ALL	2
Spring 2017	E&E/ TECH	Continue pilot of engagement and empowerment strategies emerging from communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	2
Spring 2017	E&E	Continue pilot of MATH 1314 selected courses	ALL	2
Spring 2017	A	Assess pilot math anxiety and study skills workshops, revise and refine as indicated	ALL	2
Spring 2017	A	Assess pilot of MATH 1314 selected courses, revise and refine as indicated	ALL	2
Spring 2017	A	Assess online orientation module, revise and refine as indicated	ALL	2
Spring 2017	A	Conduct strategy assessments for tutoring, engagement & empowerment, advisor sequence training, professional development and classroom presentation training as outlined in the assessment plan.	ALL	2
Spring 2017	A	Conduct summative assessments of goals one and two as outlined in the assessment plan	ALL	2
Spring 2017	A/O	Complete summative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	2

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Spring 2017	O	Report to Assessment TEAM, Implementation TEAM, President's Cabinet, and QEP website	ALL	2
YEAR 3				
Fall 2017	TUTORING	Pilot math anxiety and study skills workshops	ALL	3
Fall 2017	EECMS	Update advisor sequence training including new degree plans or degree changes and continue marketing to students	ALL	3
Fall 2017	E&E	Implement MATH 1314 pilot	CC	3
Fall 2017	E&E	Implement online orientation module for mathematics students as outlined in the implementation plan	ALL	3
Fall 2017	TECH	Pilot strategies for new technologies in support of engagement related interventions MTH 0305, MTH 0306, MATH 1314	ALL	3
Fall 2017	E&E/ TECH	Continue pilot of engagement and empowerment strategies emerging from communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	3
Fall 2017	A	Assess pilot math anxiety and study skills workshops, revise and refine as indicated	ALL	3
Fall 2017	A	Assess pilot of MATH 1314 selected courses, revise and refine as indicated	CC	3
Fall 2017	A	Assess online orientation module, revise and refine as indicated	ALL	3
Fall 2017	A	Assess strategies for new technologies in support of engagement, tutoring, engagement & empowerment, advisor sequence training,	ALL	3

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		professional development and classroom presentation training as outlined in the assessment plan.		
Fall 2017	A	Conduct formative assessments of goals one and two as outlined in the assessment plan	ALL	3
Fall 2017	A/O	Complete formative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	3
Spring 2018	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	3
Spring 2018	E&E/ TECH	Continue pilot of engagement and empowerment strategies emerging from communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	3
Spring 2018	E&E	Update online orientation module for mathematics students as outlined in the implementation plan	ALL	3
Spring 2018	A	Conduct strategy assessments for tutoring, engagement & empowerment, advisor sequence training, professional development and classroom presentation training as outlined in the assessment plan.	ALL	3
Spring 2018	A	Conduct summative assessments of goals one and two as outlined in the assessment plan	ALL	3
Spring 2018	A/O	Complete summative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	3
Spring 2018	A	Assess online orientation module, revise and refine as indicated	ALL	3
Spring 2019	O	Report to Assessment TEAM, Implementation TEAM, President's Cabinet, and QEP website	ALL	3

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YEAR 4				
Fall 2018	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	4
Fall 2018	EECMS	Update advisor sequence training including new degree plans or degree changes and continue marketing to students	ALL	4
Fall 2018	E&E/ TECH	Continue pilot of engagement and empowerment strategies emerging from communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	4
Fall 2018	E&E	Update online orientation module for mathematics students as outlined in the implementation plan	ALL	4
Fall 2018	A	Assess online orientation module, revise and refine as indicated	ALL	4
Fall 2018	A	Assess strategies for new technologies in support of engagement, tutoring, engagement & empowerment, advisor sequence training, professional development and classroom presentation training as outlined in the assessment plan.	ALL	4
Fall 2018	A	Conduct formative assessments of goals one and two as outlined in the assessment plan	ALL	4
Fall 2018	A/O	Complete formative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	4
Spring 2019	E&E/ TECH	Implement proven engagement and empowerment strategies emerging from pilots conducted by communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	4

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Spring 2019	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	4
Spring 2019	A	Assess strategies for new technologies in support of engagement, tutoring, engagement & empowerment, advisor sequence training, professional development and classroom presentation training as outlined in the assessment plan.	ALL	4
Spring 2019	A	Conduct summative assessments of goals one and two as outlined in the assessment plan	ALL	4
Spring 2019	A/O	Complete summative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	4
Spring 2019	O	Report to Assessment TEAM, Implementation TEAM, President's Cabinet, and QEP website	ALL	4
YEAR 5				
Fall 2019	E&E/ TECH	Develop online orientation module for mathematics students as outlined in the implementation plan	ALL	5
Fall 2019	PROF DEV	Continuation of onsite and offsite professional development for mathematics faculty as outlined in the implementation plan	ALL	5
Fall 2019	EECMS	Update advisor sequence training including new degree plans or degree changes and continue marketing to students	ALL	5
Fall 2019	E&E/ TECH	Implement proven engagement and empowerment strategies emerging from pilots conducted by communities of practice at each campus as they participate in professional development and explore and share strategies related to engagement and empowerment, including those that are technology based	ALL	5
Fall 2019	A	Assess strategies for new technologies in support of engagement, tutoring, engagement & empowerment, advisor sequence training, professional development and classroom presentation training as outlined in the assessment plan.	ALL	5

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Fall 2019	A	Conduct formative assessments of goals one and two as outlined in the assessment plan	ALL	5
Fall 2019	A/O	Complete formative assessment report with next steps using continuous improvement model as outlined in the assessment plan	ALL	5
Spring 2020	A	Complete final assessment of five year initiative and write report	ALL	5
Summer 2020	O	Report to Assessment TEAM, Implementation TEAM, President's Cabinet, and QEP website	ALL	5

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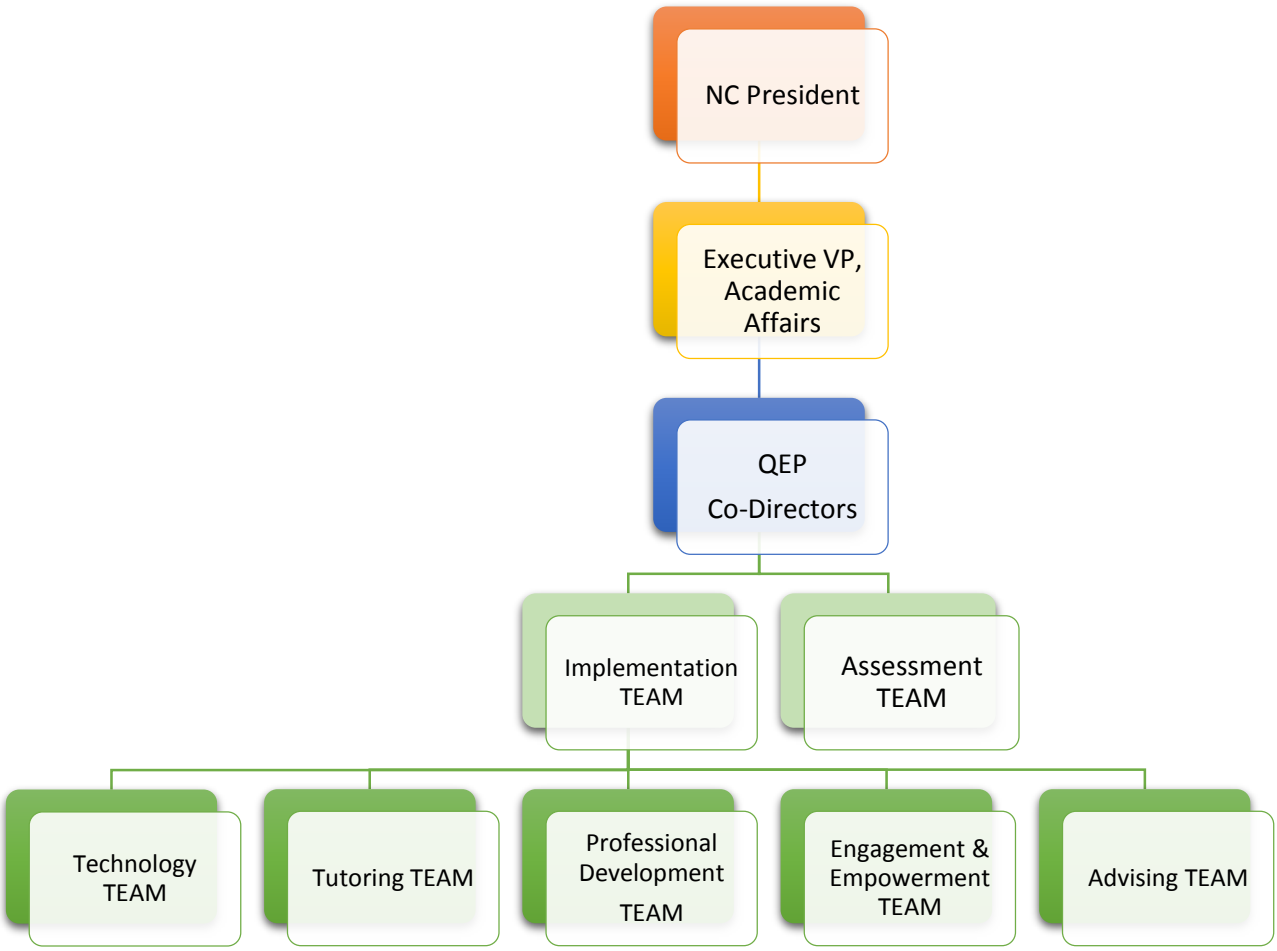
CHAPTER 7: ORGANIZATIONAL STRUCTURE

A team of exceptional individuals has been developed to oversee the implementation of the Navarro College QEP- **Together Everyone Achieves Math Mastery – *TEA(M)²*.** The Executive Vice President of Academic Affairs is responsible for the oversight of the QEP and reports all findings directly to the District President of Navarro College.
The following organizational chart details the reporting structure of the NC ***TEA(M)²*** QEP.



Roles and Responsibilities

QEP Implementation TEAM

The QEP Implementation TEAM includes: the Executive Vice President of Academic Affairs, QEP Co-Directors, Executive Dean Academic Studies, Dean Academic Support Programs, Director of Institutional Research, Director of Professional Development, Math Lab Instructor, Chief Information Officer, Coordinator of Learning Commons and Tutorial Services, and a Math Faculty Representative. The role of the QEP Implementation TEAM is

to oversee the implementation and coordination of all sub-committees (also identified as TEAMs) in regards to the QEP initiative and to provide direction and feedback, and ensure broad-based involvement throughout the QEP.

Mathematics Faculty

To ensure seamless coordination between the classroom and tutoring facilities the mathematics faculty will have distinguished roles on all strategy TEAMs. As the content specialists, the QEP Implementation TEAM will look to the mathematics faculty to provide curriculum alignment and necessary leadership throughout the implementation process.

QEP Co-Directors

The QEP Co-Directors report directly to the Executive Vice President (EVP) of Academic Affairs and will:

- Manage and provide leadership to the QEP Implementation TEAM
- Conduct monthly updates with the EVP of Academic Affairs and provide periodic updates to the President's Cabinet as necessary
- Oversee the Implementation and Assessment Timeline to ensure it remains on track
- Manage and provide leadership to the Assessment Committee for the collection, analysis, and evaluation of data in support of the initiative's goals and strategies
- Collaborate with the Marketing Department to continue to publicize the QEP district-wide
- Monitor and manage the QEP budget
- Monitor and participate in all strategy TEAMs
- Provide updates to college stakeholders regarding QEP
- Collaborate with the Information Technology and Media Integration Departments to ensure appropriate administration of classroom and tutorial technology and online services
- Prepare annual reports for college stakeholders
- Prepare five year final report

Strategy TEAMs

The strategy TEAMs will manage the daily operations of each strategy throughout the implementation of the QEP. The TEAMs will provide the required expertise needed to appropriately expand each individual strategy and to inform the QEP Implementation TEAM of needs, concerns and growth opportunities.

- **Advising TEAM:**
    - Dean of Student Guidance, Executive Dean of Academics, Mathematics Faculty, Director of Marketing, and QEP Co-Directors
- **Engagement & Empowerment TEAM:**
    - Mathematics Faculty, Math Lab Instructors (Tutoring/Learning Assistance Centers), Dean of Sciences, Kinesiology, and P.A.S.S. Program, Dean of Academic Support Programs, Dean of Student Guidance, Counselor, Dean of Professional Development, Dean of Online Instruction, Media Integration Services, and QEP Co-Directors
- **Technology in Support of Teaching TEAM:**
    - Chief Information Officer, IT Staff, Mathematics Faculty, Math Lab Instructors, Dean of Professional Development, Dean of Online Instruction, Media Integration Services Coordinator, Dean of Academic Support Programs, and QEP Co-Directors.
- **Mathematics Tutoring/Learning Assistance Centers TEAM:**
    - Dean of Academic Support Programs, Math Lab Instructors, Mathematics Faculty, Learning Commons Coordinator, Media Integration Services Coordinator, Dean of Online Instruction, Dean of Student Guidance, Counselors, and QEP Co-Directors.
- **Professional Developmental in Support of the QEP TEAM:**
    - Mathematics Faculty, Dean of Sciences, Kinesiology, and P.A.S.S. Program, Media Integration Services Coordinator, Dean of Professional Development, Dean of Online Instruction, Dean of Student Guidance, Dean of Academic Support Programs, and the QEP Co-Directors.

Assessment TEAM

The QEP Assessment TEAM will be responsible for overseeing all data collection, assessment, and evaluation support. The Assessment TEAM will be comprised of the following: the QEP Co-Directors, Director of Institutional Research, Dean of Institutional Effectiveness, Mathematics Faculty, Math Lab Instructors, Dean of Academic Support Programs, Dean of Professional Development, Dean of Student Guidance, and Chief Information Officer.

CHAPTER 8: BUDGET

Navarro College has demonstrated its commitment to the QEP as evidenced by the robust allocation of resources to implement and sustain the Quality Enhancement Plan (QEP) in the areas of: facilities, furnishings, technology support, systems, supplies, human resources, and professional development.

The chart below details the five-year proposed budget as approved by the President's Cabinet and the Board of Trustees. The budget was designed to meet the needs of all campuses over a five year span with the understanding that budget needs may vary and consequently require appropriate adjustments.

QEP BUDGET							
	Plan Yr	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Personnel							
QEP Co-Director	$6,000	$20,000	$20,000	$20,000	$20,000	$20,000	$106,000
Stipends for Math Faculty	$3,000	0	0	0	0	0	$3,000
Corsicana							
Math Lab Faculty TEAM Center	0	$55,000	$56,650	$58,350	$60,100	$61,900	$292,000
Tutors Level 2 (1000 hrs @ $18.00/hr)	0	$18,000	$18,000	$18,000	$18,000	$18,000	$90,000
Tutors Level 1 (600 hrs @ $10.00/hr)	0	$6,000	$6,000	$6,000	$6,000	$6,000	$30,000
Tutor Training (10 tutors @ $75 ea)	0	$750	$750	$750	$750	$750	$3,750
Waxahachie							
Tutors Level 2 (1000 hrs @ $18.00/hr)	0	0	$18,000	$18,000	$18,000	$18,000	$72,000
Tutors Level 1 (600 hrs @ $10.00/hr)	0	0	$6,000	$6,000	$6,000	$6,000	$24,000
Tutor Training (8 tutors @ $75 ea)	0	0	$600	$600	$600	$600	$2,400
Mexia							
Tutors Level 2 (600 hrs @ $18.00/hr)	0	0	$10,800	$10,800	$10,800	$10,800	$43,200

Tutor Training (3 tutors @ $75 ea)	0	0	$225	$225	$225	$225	$900
Facilities							
Corsicana TEAM Center	$32,000	0	0	0	0	0	$32,000
Wax/Midlo TEAM Center	0	$20,000	0	0	0	0	$20,000
Mexia TEAM Center	0	$3,000	0	0	0	0	$3,000
Furnishings							
Corsicana TEAM Center	$13,713	0	0	0	0	0	$13,713
Wax/Midlo TEAM Center	0	$13,780	0	0	0	0	$13,780
Mexia TEAM Center	0	$8,000	0	0	0	0	$8,000
Equipment: Technology							
Corsicana Classrooms: Standardized classroom presentation systems	$59,474	0	0	0	0	0	$59,474
Corsicana TEAM Center	$31,448	$1,500	$1,500	$1,500	$1,500	$1,500	$38,988
Waxahachie Classrooms: classroom update	0	$7,950	0	0	0	0	$7,950
Wax/Midlo TEAM Center	0	$26,672	$1,500	$1,500	$1,500	$1,500	$32,672
Mexia Classrooms: Classroom update	0	$3,770	0	0	0	0	$3,770
Mexia TEAM Center	0	$5,346	$300	$300	$300	$300	$6,546
Midlothian Classrooms	0	$1,200	0	0	0	0	$1,200

District Equipment Update	0	0	0	0	0	$70,000	$70,000
Systems/Software							
Tracking Software	$14,379	0	$14,000	$14,000	$14,000	$14,000	$70,379
Online Tutoring	0	0	$10,000	$10,000	$10,000	$10,000	$40,000
Emulator Software	$790	$1,254	0	0	0	0	$2,044
Supplies							
Corsicana TEAM Center	0	$3,000	$3,000	$3,000	$3,000	$3,000	$15,000
Wax/Midlo TEAM Center	0	$1,000	$2,500	$2,500	$2,500	$2,500	$11,000
Mexia TEAM Center	0	$1,000	$1,000	$1,000	$1,000	$1,000	$5,000
Marketing Supplies	$8,000	$5,000	$4,000	$2,500	$1000	$500	$21,000
Professional Development							
Onsite training 2-day	0	$6,000	0	0	0	0	$6,000
Onsite Training 1-day	0	0	$3,000	$3,000	$3,000	$3,000	$12,000
Corsicana Faculty	0	$12,000	$12,000	$12,000	$6,000	$6,000	$48,000
Waxahachie Faculty	0	$8,000	$8,000	$8,000	$4,000	$4,000	$32,000
Mexia Faculty	0	$2,000	$2,000	$2,000	$1,000	$1,000	$8,000
Midlothian Faculty	0	$4,000	$4,000	$4,000	$2,000	$2,000	$16,000
Technology in Support of the Intervention							
Corsicana	0	$6,000	$9,000	$6,000	0	0	$21,000
Waxahachie	0	$5,000	$7,500	$5,000	0	0	$17,500
Mexia	0	$2,000	$3,000	$2,000	0	0	$7,000
Midlothian	0	$3,000	$4,500	$3,000	0	0	$10,500
Totals	$168,804	$250,222	$227,825	$220,025	$191,275	$262,575	$1,320,726

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CHAPTER 9: ASSESSMENT PLAN

Navarro College has a strong commitment to student learning and success. It values a culture of assessment and evaluation to promote and advance improvement of student learning and achievement. Until recently, research and evaluation occurred largely at the practitioner level, with faculty and staff using appropriate federal, state, and county data resources, institutional and peer data provided by the Texas Higher Education Coordinating Board (THECB), local data provided by the College's Office of Access and Accountability, and program or department data collected by faculty and staff. Building upon these resources and practices, the College increased its institutional capacity to support research and evaluation with the creation and staffing of three new positions: Dean of Institutional Effectiveness in October 2013, Dean of Academic Support Programs in October 2014, and Director of Institutional Research in January 2015. This resulted in research and evaluation becoming more robust and formalized as the College advanced its data-informed practices at all levels of the institution.

Beginning in 2013, the College began working with a consultant to advise QEP development and assessment design. The QEP focus, goals, objectives, and measurements, initially drafted in 2014, were finalized in January 2015. Significant research, based upon data collection and analysis and an extensive literature review, and dialogue at the committee level, in consultation with mathematics faculty, colleagues, peers from other colleges, and the institutional effectiveness and research leadership team, led to a well-designed and measureable college-wide initiative, *Together Everyone Achieves Math Mastery, TEA(M)*^{2}. The initiative's assessment plan is organized by goals and objectives, and then by strategies to be used in achieving both goals.

The QEP Assessment TEAM oversees all assessment for the initiative and reviews progress in goal achievement. The QEP Co-Directors are in charge of ensuring that all assessments proceed according to the timeline, and coordinate with appropriate individuals according to the assessments to be conducted. QEP Assessment TEAM members include: QEP Co-Directors, Director of Institutional Research, Dean of Institutional Effectiveness, Mathematics Faculty, Math Lab Instructors, Dean of Academic Support Programs, Dean of Professional Development, Dean of Student Guidance, and Chief Information Officer. Assessment will occur throughout the academic year, and will be evaluated and acted upon according to the nature of the assessment, and reported to the QEP Assessment TEAM as appropriate. All assessments are to be formally reported and presented annually to the mathematics faculty,

the QEP Assessment TEAM, the Implementation TEAM, President's Cabinet, and the greater College Community.

Goal 1

Goal 1 of the QEP is to increase the percentage of students who successfully complete their program specific developmental mathematics courses. THECB data discussed in previous sections indicate that of those Navarro College students who actually enrolled in their developmental course sequence, just one in three successfully completed their course(s) and became college ready within one year; by the end of two years, this number increased to four in ten students. Increasing student completion of developmental mathematics courses is imperative. The objectives, measurements, and assessments for this goal include:

- Objective 1.1: Increase student learning in MTH 0305 and MTH 0306
    - Measurement 1.1: Increased knowledge, skills, and attributes as demonstrated in assessment of course-specific Student Learning Outcomes
- Objective 1.2: Increase achievement outcomes for students enrolled in MTH 0305 and MTH 0306
    - Measurement 1.2: Improved successful course completion rates for MTH 0305 and MTH 0306 as demonstrated in assessment of:
        - Retention rate
        - Successful course completion rate

Assessment: Student Learning Outcomes: MTH 0305 and 0306

Student Learning Outcomes assess the knowledge, skills, and attributes that students take with them at the completion of the course. In setting targets for improvement, the College used the three year average outcome for each SLO. As stated in the chapter on Student Learning Outcomes, in developmental mathematics at Navarro College, the highest level of learning is identified as a General Learning Outcome (GLO), to which specific Student Learning Outcomes map. For target setting, the College is using aggregated GLO level data; however, for intervention purposes, faculty will address all of the outcomes aggregating to the individual GLO, with the aspiration of reaching a minimum of 70% achievement in each specific SLO assessment.

Faculty are responsible for conducting SLO assessments. The QEP Co-Directors are responsible for working with the mathematics faculty to assure timely assessment, analysis, and reporting of these outcomes to the QEP Assessment TEAM.

See Table 9.1 for MTH 0305 improvement targets and Table 9.2 for MTH 0306 improvement targets.

Table 9.1

MTH 0305 General Learning Outcomes

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
GLO 1	60.3%	62.8%	65.3%	67.8%	70.3%	72.8%	2.5%	12.5%
GLO 2	52.8%	56.8%	60.8%	64.8%	68.8%	72.8%	4%	20%
GLO 3	64.3%	66.3%	68.3%	70.3%	72.3%	74.3%	2%	10%

*Baseline determined using historic three year average of percent of students meeting outcome target

Table 9.1 reveals differentiated target setting for the three outcomes; these are based on the trend data, which showed upward movement. GLO 2 had a significant upward movement in the final year of the three year trend, leading to the decision to pursue a five year 20% increase. Table 9.2 presents the learning outcomes data for MTH 0306.

Table 9.2:

MTH 0306 General Learning Outcomes

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
GLO 1	68.8%	70.8%	72.8%	74.8%	76.8%	78.8%	2%	10%
GLO 2	65.9%	67.9%	69.9%	71.9%	73.9%	75.9%	2%	10%

*Baseline determined using historic three year average of percent of students meeting outcome target

Data from these summative assessments will inform faculty of the improvements and challenges at the course level. Faculty also track learning outcomes throughout the term and have the opportunity to make adjustments to instructional strategies at the formative level. All data will be used for further analysis by the faculty at the end of each semester to determine which interventions are most effective and which need further refinement. Findings and action plans will be reported to the QEP Assessment TEAM for current review and longitudinal tracking of the interventions.

Assessment: Retention and Success: MTH 0305 and MTH 0306

Course-level retention and success data are indicators that measure student achievement, which is considered a corollary to learning. Retention is defined as the ratio of the number of students enrolled in the course at the end of the semester to the number of students enrolled at first census. This metric reflects student perseverance within the course by remaining enrolled for the duration of the term. Student success is defined as the ratio of students receiving a grade of A, B, or C to the number of all students receiving an evaluative grade in the course.

Success rates have been low for the three courses targeted in the QEP. For this reason, success is an essential metric for measuring goal achievement.

Retention and success are included in the assessment plan in order to track the percentage of students who successfully complete the course, which is the directive of Goal 1. Parameters of the metric are set at two attempts, meaning that the student has two attempts to earn an A, B, or C in the course, and will be counted as successful if earning such a grade; those not earning such a grade will be dropped from tracking at that point. This is a parameter of the study, based upon database and tracking considerations. However, it is also the intent of the institution in setting these parameters to not only increase student success, but to do so in a timely manner. See Table 9.3 for MTH 0305 Retention and Success targets for the initiative.

Table 9.3

MTH 0305 Retention and Success Targets

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
Retention	85.0%	85.5%%	86.0%	86.5%	87.0%	87.5%	0.5%	2.5%
Success	49.1%	52.1%	55.1%	58.1%	61.1%	64.1%	3%	15%

*Baseline determined using historic three year average of percent of course retention and success

*Source: Navarro College, Office of Institutional Research

Table 9.3 sets a modest growth target for retention, which is already high. The success growth target is more aggressive, as longitudinal data reveals a consistent three-year growth pattern of approximately 2% per year. Data will be collected each semester by the Director of Institutional Research and provided to the QEP Assessment TEAM and the

mathematics faculty for formative assessment. See Table 9.4 for MTH 0306 Retention and Success Targets for the initiative.

Table 9.4:
MTH 0306 Retention and Success Targets

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
Retention	88.4%%	88.4%%	88.4%	88.4%	88.4%	88.4%	0.0%	0.0%
Success	57.9%%	60.9%	63.9%	66.9%	69.9%	72.9%	3%	15%

*Baseline determined using historic three year average of percent of course retention and success

*Source: Navarro College, Office of Institutional Research

Table 9.4 reveals no specified growth target for retention in MTH 0306, as it is already high. Instead, a steady rate is proposed to maintain the high retention rate over the course of the five-year initiative. The success improvement target is more aggressive, consistent with the target for MTH 0305. However, unlike MTH 0305, MTH 0306 has experienced a downward trend for the past three years, and reaching these targets will entail a stabilization and turnaround. As with MTH 0305 retention and success assessment, data will be collected each semester and provided to the Assessment TEAM and the Mathematics faculty for formative assessment.

Goal 2

Goal 2 of the QEP is to increase the percentage of students who, upon completion of the developmental mathematics course sequence, successfully complete the credit-bearing gateway program-specific mathematics course by the end of the following traditional (Fall or Spring) semester. The objectives, measurements, and assessments for this goal include:

- Objective 2.1: Increase student learning in MATH 1314
    - Measurement 2.1: Increased knowledge, skills, and attributes as demonstrated in assessment of course-specific Student Learning Outcomes
- Objective 2.2: Increase achievement outcomes for students enrolled in MATH 1314
    - Measurement 2.2: Improved retention and successful course completion rates for MATH 1314
- Objective 2.3: Increase the percentage of students successfully completing their program specific developmental and credit bearing gateway mathematics course sequence within the following traditional (Fall or Spring) semester

- Measurement 2.3: Percentage of students enrolling in and successfully completing program specific credit-bearing gateway mathematics course
  - Increase the percentage of students enrolling in the appropriate program specific credit-bearing gateway mathematics course within the following traditional (Fall or Spring) semester upon completion of the developmental mathematics course sequence
  - Increase the percentage of those students enrolling within one semester, who successfully complete the program specific credit-bearing course

Assessment: Student Learning Outcomes: MATH 1314

As with the assessment of Student Learning Outcomes for MTH 0305 and MTH 0306, the College used analysis of trends and the three year average outcome for MATH 1314 to establish targets. As discussed in the Student Learning Outcomes chapter, the Mathematics faculty recently revised its Student Learning Outcomes for this course. For the purpose of target setting, the College used the highest level aggregated SLO data; however, for the intervention, faculty will address all of the outcomes aggregating to the individual SLO, with the aspiration of improving all curricular components at this more actionable level. See Table 9.5 for MATH 1314 Student Learning Outcomes improvement targets.

Table 9.5
MATH 1314 Student Learning Outcomes

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
SLO 1	75.5%	77.5%	79.5%	81.5%	83.5%	85.5%	2%	10%
SLO 2	76.2%	77.2%	78.2%	79.2%	80.2%	81.8%	1%	5%
SLO 3	83.1%	83.6%	84.1%	84.6%	85.1%	85.6%	0.5%	2.5%
SLO 4	73.9%	75.9%	77.9%	79.9%	81.9%	83.9%	2%	10%
SLO 5	79.6%	80.6%	81.6%	82.6%	83.6%	84.6%	1%	5%

*Baseline determined using historic three year average of percent of students meeting outcome target

Table 9.5 reveals that SLO proficiency varies, although the range is within ten percentage points. Objectives informing the outcomes also vary, and it is the combination of this trend and baseline data that resulted in the differentiated targets. For example, SLO 2 has a baseline of 76.2% proficiency; however, of the five objectives that map up to it, correctly

solving logarithmic equations has proven challenging in past years. For this reason, a more reasonable target was set.

As with MTH 0305 and MTH 0306 SLO assessment, data from these summative assessments will inform faculty of the improvements and challenges at the course level. Faculty also track learning outcomes throughout the term and have the opportunity to make adjustments to instructional strategies at the formative level. All data will be used for further analysis by the faculty and staff at the end of each semester to determine which interventions are most effective and which need further refinement.

Assessment: Retention and Success: MATH 1314

Consistent with MTH 0305 and MTH 0306, MATH 1314 has a high retention rate and a low success rate. Improvement targets were set using the same definitions and parameters as were used with MTH 0305 and MTH 0306. Table 9.6 presents the retention and success targets set for MATH 1314.

Table 9.6

MATH 1314 Retention and Success Targets

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
Retention	80.8%	81.8%	82.8%	83.8%	84.8%	85.8%	1%	5%
Success	60.0%%	62.0%	64.0%	66.0%	68.0%	70.0%	2%	10%

*Baseline determined using historic three year average of percent of course retention and success

*Source: Navarro College, Office of Institutional Research

Table 9.6 reveals a moderate improvement target for retention, which is already performing well with 81%. Successful course completion has a more challenging target, and given the trend data for the course, improvement of ten percentage points over the next five years will be substantial. As with MTH 0305 and MTH 0306, retention and successful course completion will be assessed formatively each semester and summatively each year for review and decision making.

Assessment: Developmental to Credit-bearing Gateway Course Sequence Completion

Successful completion of the developmental to credit-bearing gateway course sequence, as discussed in the Student Learning Outcomes chapter, is the critical juncture for most students placing into developmental mathematics. THECB data reveals that for Navarro College students not meeting college readiness standards, the percent completing a

college-level mathematics course with a grade of C or higher in one year is just 1.2%, while 44.5% of students who meet college readiness standards complete such a course within the first year. In their study of First Time in College students, Navarro College Office of Institutional Research found that students who enrolled in their highest level developmental course in fall semester and passed it, and subsequently enrolled in their program specific credit-bearing gateway mathematics course in spring semester, had a 66% successful course completion rate. These data support the strategy to increase consecutive enrollment in and completion of the mathematics course sequence.

See Table 9.7. Developmental Student Enrollment /Successful Course and Sequence Rates, for targets set for the following Enrollment Outcomes (E O):

- Enrollment Outcome 1: Of those students who enrolled in their highest level program-specific developmental mathematics course in the first semester, the percentage that successfully completed with a grade of A, B, or C
- Enrollment Outcome 2: Of those students who successfully completed their developmental mathematics course in fall semester, the percentage who then enrolled in their credit-bearing gateway mathematics course the following semester
- Enrollment Outcome 3: Of those students who enrolled in and successfully completed their developmental course in the first semester, the percentage who remained enrolled in the sequence and successfully completed the program specific credit-bearing gateway mathematics course
- Enrollment Outcome 4: Of those students who remained enrolled in their *MTH 0306 to MATH 1314 developmental to credit-bearing gateway course sequence,* the percentage who successfully completed the sequence with a grade of A, B, or C.

Table 9.7.

Developmental Student Enrollment/Successful Course and Sequence Rates

	Baseline*	Year 1 Target	Year 2 Target	Year 3 Target	Year 4 Target	Year 5 Target	Annual Increase	5 Year Increase
E O 1	57.5%	60.5%	63.5%	66.5%	69.5%	72.5%	3%	15%
E O 2	28.0%	36.0%	44.0%	52.0%	60.0%	68.0%	8%	40%
E O 3	65.8%	67.8%	69.8%	71.8%	73.8%	75.8%	2%	10%
E O 4	52.6%	55.1%	57.6%	60.1%	62.6%	65.1%	2.5%	12.5%

*Baseline determined using historic three year average of percent of developmental student course enrollment, completion, and success outcomes, using FTIC protocol
*Source: Navarro College, Office of Institutional Research

Table 9.7 reveals an aggressive strategy for addressing successful developmental to credit-bearing gateway course sequence completion. However, research indicates that this intervention is essential to overall college success and degree completion for those students who do not meet the college readiness standard upon entrance to the college. And while ambitious, the College believes this goal is achievable using the five proven, research-based strategies selected by the QEP Committee to support the intervention.

Assessments in Support of Strategies Supporting Both Goals

In order to assure continuous improvement and effectiveness of the five strategies selected to support the initiative, the College established an assessment plan for these as well. See Appendix M for sample assessments. The strategies and their assessments are presented in Table 9.8.

Table 9.8
Assessments in Support of QEP Strategies Supporting Both Goals

Advising and Communication	• Pre and post implementation survey • Student survey on outcomes/impact of advising session • Track data for changes in enrollment and success patterns
Engagement and Empowerment	• End of course evaluation (targeted questions) • Pre and post implementation survey of faculty, including open ended questions • Focus group follow up to survey • Targeted assessments for pilots that emerge from exploration of strategies
Integration of Technology	• End of course evaluation (targeted questions) • Pre and post implementation survey of faculty, including open ended questions • Targeted assessments for pilots that emerge from exploration of strategies
Tutoring/Learning Assistance Centers	• Student survey • Focus group follow up to survey • Tracking and analysis of student usage • Faculty srvey

Professional Development	• Pre and post implementation survey • Focus groups • Surveys

Summary

The goals, outcomes, and strategies of Navarro College's QEP, *TEA(M)*^{2}, will be regularly evaluated by semester in some cases and annually in others, according to data type and function. Student Learning Outcomes, by nature, are assessed by the program or department faculty. Other components of the initiative will be assessed under the direction of the Director of Institutional Research, who is responsible for assuring the integrity of the data that is collected and analyzed. The QEP Co-Directors are responsible for assuring that all assessment occurs and is reported according to plan. The QEP Assessment TEAM is responsible for reviewing and evaluating assessments. A comprehensive report of assessment findings, recommendations, and next steps will be published each year by the QEP Co-Directors on behalf of the QEP Assessment TEAM, and presented to the QEP Implementation TEAM, the President's Cabinet, and shared with the greater College Community.

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APPENDIX A: NAVARRO COLLEGE MISSION STATEMENT AND STRATEGIC GOALS

Mission Statement

Navarro College provides educational opportunities that empower students to achieve their personal, academic, and career goals and that promote life-long learning for all communities served.

Strategic Goals 2010-2015

(Used for Alignment with Topic Selection, 2013-2014 timeframe)

Goal 1: Increase student enrollment.
Focus: *Meet the student enrollment and student contact hour goals adopted by the Board of Trustees.*

Goal 2: Promote student success
Focus: *Promote student engagement/integration as an institutional value to help enhance student retention and student persistence.*

Goal 3: Expand the resources to meet the needs of a quality learning environment.
Focus: *Identify funding sources that may be used to assist Navarro College in financing the expansion and deferred maintenance needs of the district.*

Goal 4: Improve and sustain the quality of education programs
Focus: *Ensure that the quality of the education program district-wide is maintained and enhanced.*

Goal 5. Provide comprehensive staff and professional development focused on enhancing the relationship between students and the college.
Focus: *Integrate the principles of "service-oriented strategies" throughout the campuses to develop a positive and supportive relationship with students*

Goal 6. Improve and sustain the institution's technology support and infrastructure.
Focus: *Improve and sustain the institution's technology support and infrastructure.*

Goal 7. Create an eLearning campus.
Focus: *Manage the college online instruction program consistent with the institutional goals developed by the Navarro College Board of Trustees.*

*See new **Strategic Directions, Goals, and Strategies 2015-2020** in Appendix B, which will guide the QEP during its implementation. The Mission, which was approved in 2013, was reviewed and reaffirmed in 2015.*

APPENDIX B. NAVARRO COLLEGE STRATEGIC GOALS 2015-2020

Navarro College
Strategic Directions, Goals, and Strategies
2015-2020

Set the path to success

1. **Create, maintain, and improve a pathway where students are guided through an enriched educational experience and the potential individual success of each student is maximized. To accomplish this, we provide:**
   - 1.1. comprehensive outreach and recruiting
   - 1.2. student-friendly admissions processes including application, assessment, and placement
   - 1.3. career counseling and initial degree plan advisement
   - 1.4. streamlined financial aid advisement
   - 1.5. access to targeted services and programs for identified populations
   - 1.6. orientation opportunities for all students

Empower and support the student's journey to success

2. **Provide students individualized support throughout the education process ensuring each student is empowered to learn and is fully informed of choices and opportunities. To accomplish this, we work in a culture of collaboration between academics, student services, and academic support programs that leads to:**
   - 2.1. rigorous and relevant academic programs and courses founded in research-based curriculum leading to student learning and success
   - 2.2. a student-centered learning philosophy that empowers all students to achieve their educational goals
   - 2.3. on-going and systematic advising to assure that students are on track to achieve their educational goals in a timely manner
   - 2.4. broad communication of information supporting student success including calendars and deadlines, programs and services, and points of contact
   - 2.5. embedding of technology into teaching and learning and student services with appropriate "help desk" assistance
   - 2.6. scheduling of courses and delivery of services consistent with student needs, including days and times of the week, flexible session terms, location, and online environment

2.7. a commitment to research-based practices and on-going evaluation resulting in greater student retention, persistence, success, and completion

Develop and sustain our resources to deliver optimal educational opportunities

3. Ensure resources are adequate for their intended purpose and are sustained and continuously upgraded as we advance the mission of the College. To accomplish this, we:

3.1. advance our *human resources* capacity to meet the needs of the College by building a culture that empowers employee engagement and success, and provides opportunities for professional development

3.2. maintain and upgrade our *facilities* to meet the needs of the College's curriculum, student services, student programs and activities, and administrative services

3.3. advance our *technology* infrastructure, capacity, and applications to meet the industry-standard needs of academics, student services, and administrative services

3.4. advance our financial position through growth strategies aligned with sound *fiscal* planning in support of sustainability of the College's programs and services

Ensure institutional effectiveness and transparency

4. Advance and maintain a culture of ongoing accountability and transparency to those we serve and to whom we are responsible. To accomplish this, we:

4.1. work closely with our communities and partners to assure we are delivering the educational programs and services they need in support of successful transfer, workforce development, lifelong learning, and community service

4.2. assure that we are compliant with state and federal regulations and regional and specialized accrediting commissions

4.3. adhere to the continuous quality improvement model of outcomes assessment, evaluation, and improvement planning, including resource allocation via college-wide integrated planning and Program Review

4.4. engage in dialogue in an interactive and stimulating manner to achieve college-wide participation in improvement efforts

4.5. communicate college-wide and with our communities in a manner that effects a culture of respect and transparency

APPENDIX C: "ONE THING" SURVEY FINDINGS

Survey Findings for Open-ended Survey Question*:*

"What is the one thing that could be done to improve student learning at Navarro College?"

Summary of "One Thing" Survey Responses November, 2013	
Increased Engagement with Faculty	***701***
Increased Tutoring Services	***561***
Improved Technology and Technology Support	***402***
Extended Library Services	185
Enhanced Class Availability/Scheduling	170
Expanded Availability of Study Areas/Study Hall	67
Comprehensive Advising	33
Total	2,119

In November 2013, the Topic Selection Committee administered a survey to students, faculty, staff, members of the Board of Trustees, and community members, with the open-ended question: "What is the one thing that could be done to improve student learning at Navarro College?" Over 5,000 stakeholders responded. The responses were analyzed and coded by members of the committee using a standardized methodology overseen by the QEP Co-Chairs. The Co-Chairs analyzed the codes and identified emerging themes, which were then analyzed for frequency and ranked accordingly.

Non-learning responses were excluded from this analysis; hence, although there were over 5,000 responses, only the 2,119 responses that addressed student learning related strategies were included. The top three responses were selected to move forward, consistent with a significant numerical break between number three, with 402 responses, and number four, with 185 responses.

APPENDIX D: FOCUS GROUP FINDINGS TO DETERMINE THE QEP TOPIC

In February 2014, the Topic Selection Committee conducted focus groups as a follow-up to the "What one thing could be done to improve student learning" open-ended survey question, that was administered in fall 2013. Upon analysis, seven themes were identified from the open-ended responses. The following three themes occurred with the highest frequency: the need for increased faculty/student engagement, increased tutoring, and improved technology/technology support. Each theme was addressed by its own focus group, for a total of three groups at each of the three campuses. Students were asked to be more specific in terms of what they would like to see in each of these areas. Focus groups were conducted at Waxahachie (including Midlothian students), Corsicana, and Mexia. A total of 65 students participated across the College.

Using the CCSSE Focus Group Toolkit, the Committee developed its methodology, including recruitment strategy based upon original survey responses and representation from all four campuses. Facilitators for all focus groups followed the same script and protocol in conducting the focus group interviews. Responses were summarized at the time of the focus group and then aggregated and analyzed across all three sites.

The following strategies emerged from the focus group analysis:

- broader variety of tutoring and student awareness of tutoring availability
- increased technology support on all campuses
- open lines of communication inside and outside of the classroom which includes one-on-one instruction

Students wanted choice in tutoring, and they wanted to be better informed about tutoring services that were available. They wanted better technology support across all College campuses. And they wanted to maintain and increase student-faculty interaction and engagement.

APPENDIX E: FACULTY SURVEY FINDINGS

In Fall 2013, faculty were surveyed regarding challenges for student success. Faculty indicated that lack of academic preparation was a major challenge for students, along with time management/study skills and motivation. When asked about effective tutoring practices for students, faculty indicated that face-to-face tutoring was preferable, and that peer-led tutoring most effectively promoted student learning.

In terms of technology needs, faculty indicated that more access to computers in the classrooms and labs, as well as access to and training in Blackboard and course related software, would benefit student success. Faculty indicated that teaching methods producing the best results included, in rank order: 1) in-class group activities, 2) lecture and in-class work (tied for second place), and 4) other, which included numerous comments, including that no one method is best, that a combination of methods works best.

Faculty were asked to rate how they perceived student ability according to six criteria, using a five-level rubric. The criteria, rubrics, and their outcomes are presented in the following table.

Ability	*Highly proficient*	*Proficient*	*Moderately proficient*	*Could use some improve-ment*	*Failure to perform*
Reading, analyzing, and comprehending written material	0	1.2%	22.9%	63.9%	12.1%
Writing in a clear, correct, and coherent manner	0	1.2%	15.7%	59.0%	24.1%
Understanding mathematics and its application in the classroom	0	0	12.1%	66.3%	21.7%
Analyzing various forms of spoken information	0	3.6%	36.1%	55.4%	4.8%
Communicating orally in clear, coherent language	0	3.6%	38.6%	49.4%	8.4%
Thinking and analyzing in a critical manner	0	1.2%	15.7%	55.4%	27.7%

In reviewing the results, although all areas were rated as challenges, understanding mathematics was the only one not to have any rating in “proficient,” the lowest percent in “moderately proficient,” and 88% in “could use some improvement” and “failure to perform.”

APPENDIX F: MATH STUDENT SURVEY FINDINGS

In April 2014, the Topic Selection Committee surveyed mathematics students to identify their perceptions of strengths and challenges, as well as their preferences for support services. Students responded that tutoring services on campuses were mostly good; when asked for their preference on delivery of services, online tutoring and group tutoring were clustered for the top choice, and walk-in services and one-on-one services were clustered for second choice. Students indicated that they wanted tutoring services early in the day or in the late afternoon and continuing into the evening.

In terms of interacting with their mathematics instructor outside of class, students indicated that regular interaction was very important to their success, and that this interaction occurred most often via telephone, during office hours, via email, and before or after class, in that order. Seventy-three percent of students rated their mathematics instructor as very accessible.

Most students indicated that they have access to a computer at home and use it daily. They felt that access to computers on campus, such as in a lab, is very important to their success. Their areas of greatest need in terms of software, equipment, or learning management systems support are, in rank order: Blackboard, Graphing Calculator, MyMathLab, and Hawkes Learning System.

In assessing the *greatest weaknesses* of students in learning and academic achievement, 53.4% of respondents cited math skills as the greatest challenge. Writing skills were rated second and critical thinking was rated third. Consistent with this assessment, students rated math skills last in terms of student *strengths* in learning and academic achievement. Writing skills were rated second to last.

APPENDIX G: MAPPING MATH 1314 2013-2014 SLOS (OLD) TO 2014-2015 SLOS (NEW)

Demonstrates correlation between old SLOs and new SLOs for longitudinal tracking

Mapping New 2014-2015 MATH 1314 SLOs to Pre-2014 SLOs	
2014-2015 Student Learning Outcomes **New SLOs by Number**	***Pre*-2014-2015 SLOs** ***Old* SLOs by Number**
SLO 1. Demonstrate and apply knowledge of properties of functions, including domain and range, operations, compositions, and inverses	
1.1. Students demonstrate the successful completion of this outcome by correctly performing the steps to finding the domain and range.	*SLO 8. Show competency in functions*
1.2. Students demonstrate the successful completion of this outcome by correctly finding the combination of functions.	*SLO 9. Show competency in operations of functions*
1.3. Students demonstrate the successful completion of this outcome by correctly finding an inverse function.	*SLO 7. Show competency in finding an inverse function*
SLO 2. Recognize and apply polynomial, rational, radical, exponential, and logarithmic functions and solve related equations.	
2.1. Students demonstrate the successful completion of this outcome by correctly solving a polynomial equation.	*SLO 1. Show competency in solving and graphing quadratics*
2.2. Students demonstrate the successful completion of this outcomes by correctly solving the rational equation.	*SLO 5. Show competency in graphing rational equations*
2.3. Students demonstrate the successful completion of this outcome by correctly solving a radical equation.	*NEW*
2.4. Students will demonstrate the successful completion of this outcome by correctly solving an exponential equation.	*SLO 4. Show competency in solving exponential equations*
2.5. Students demonstrate the successful completion of this outcome by correctly solving a logarithmic equation.	*SLO 3. Show competency in solving logarithmic equations*
SLO 3. Apply graphing techniques	
3.1. Students demonstrate the successful completion of this outcome by correctly graphing a function using shifting techniques.	*NEW*

SLO 4. Evaluate all roots of higher degree polynomial and rational functions.	
4.1. Students demonstrate the successful completion of this outcome by correctly finding the zeros of a polynomial function.	*SLO 2. Show competency in solving polynomial equations*
4.2. Students demonstrate the successful completion of this outcome by correctly finding vertical and horizontal asymptotes.	*SLO 5. Show competency in graphing rational equations*
SLO 5. Recognize, solve, and apply systems of linear equations using matrices.	
5.1. Students demonstrate the successful completion of this outcome by correctly solving a system of equations using concepts of matrices.	*SLO 6. Show competency in solving systems of equations using matrices or determinants*

APPENDIX H: MTH 0305 INTRODUCTORY ALGEBRA HIERARCHY FOR GENERAL LEARNING OUTCOMES (GLOS), STUDENT LEARNING OUTCOMES (SLOS), AND OBJECTIVES (OBJ.)

GLO 1 – Students will be able to solve linear equations in one unknown, inequalities, absolute value equations and inequalities.	
SLO 1.1 – Students will solve line equations in one unknown	
Obj.1.1.1	Students will solve linear equations in the form $x + b = c$
Obj.1.1.2	Students will solve linear equations in the form $ax = c$
Obj.1.1.3	Students will solve linear equations in the form $ax + b = c$
Obj.1.1.4	Students will solve linear questions in the form $ax + b = cx + d$
Obj.1.1.5	Students will apply solving linear equations to word problems
Obj.1.1.6	Students will solve formulas for specified variables
SLO 1.2 – Students will solve linear inequalities and absolute value equations and inequalities	
Obj.1.2.1	Students will solve linear inequalities and graph the solution
Obj.1.2.2	Students will solve absolute value equations
Obj.1.2.3	Students will solve absolute value inequalities and graph the solution
GLO 2 – Students will be able to graph linear equations with two unknowns and solve systems of linear equations	
SLO 2.1 – Students will graph linear equations in two unknowns	
Obj.2.1.1	Students will plot points on the Cartesian Coordinate Plane
Obj.2.1.2	Students will graph a linear equation in two unknowns by finding two points
Obj.2.1.3	Students will graph a linear equation in two unknowns by finding the x-intercept and y-intercept
Obj.2.1.4	Students will graph a linear equation in two unknowns by using the slope and y-intercepts
SLO 2.2 – Student will find the equation of a line	
Obj.2.2.1	Students will find the slope between two given points
Obj.2.2.2	Students will determine if two given lines are parallel, perpendicular, or neither
Obj.2.2.3	Students will find the equation of a line using the slope and y-intercept
Obj.2.2.4	Students will find the equation of a line using the slope and given point

Obj.2.2.5	Students will find the equation of a line using two given points
Obj.2.2.6	Students will find the equation of a line parallel or perpendicular to a line given
SLO 2.3 – Students will solve systems of equations	
Obj.2.3.1	Students will solve systems of equations by graphing
Obj.2.3.2	Students will solve systems of equations by substitution
Obj.2.3.3	Students will solve systems of equations by addition (elimination)
Obj.2.3.4	Students will apply solving systems of equations to word problems
GLO 3 – Students will be able to simplify and perform operations on algebraic expression and polynomials	
SLO 3.1 – Students will be able to simplify algebraic expressions and polynomials	
Obj.3.1.1	Students will classify polynomials as monomial, binomial, trinomial, or polynomial
Obj.3.1.2	Students will simplify exponents using the rules of exponents
Obj.3.1.3	Students will evaluate polynomials for given values
Obj.3.1.4	Students will evaluate an expression in function notation
SLO 3.2 – Students will be able to perform operations on polynomials	
Obj.3.2.1	Students will add polynomials
Obj.3.2.2	Students will subtract polynomials
Obj.3.2.3	Students will multiply polynomials
Obj.3.2.4	Students will divide polynomials by a monomial
Obj.3.2.5	Students will divide polynomials by a polynomial

APPENDIX I. MTH 0306 INTERMEDIATE ALGEBRA HIERARCHY OF GENERAL LEARNING OUTCOMES (GLOS), STUDENT LEARNING OUTCOMES (SLOS), AND OBJECTIVES (OBJ.)

GLO 1 - Students will be able to factor polynomials and solve quadratic equations, rational equations, and radical equations.	
SLO 1.1 - Students will be able to factor polynomials	
Obj.1.1.1	Students will determine the greatest common factor between two or more terms
Obj.1.1.2	Students will factor polynomials by find the greatest common factor
Obj.1.1.3	Students will factor polynomials with a leading coefficient of 1
Obj.1.1.4	Students will factor polynomials of the form $ax^2 + bx + c$ when $a > 1$
Obj.1.1.5	Students will factor perfect square trinomials
Obj.1.1.6	Students will factor difference of squares
SLO 1.2 - Students will be able to solve quadratic equations	
Obj.1.2.1	Students will solve quadratic equations by factoring
Obj.1.2.2	Students will solve quadratic equations by the square root method
Obj.1.2.3	Students will solve quadratic equations by completing the square
Obj.1.2.4	Students will solve quadratic equations by the quadratic formula
SLO 1.3 - Students will be able to solve rational equations and radical equations	
Obj.1.3.1	Students will determine the restrictions for a rational expression
Obj.1.3.2	Students will solve rational equations
Obj.1.3.3	Students will apply solving rational equations to word problems
Obj.1.3.4	Students will solve radical equations
GLO 2 - Students will be able to perform operations on rational expressions, radical expressions, and complex numbers.	
SLO 2.1 - Students will be able to perform operations on rational expressions	
Obj.2.1.1	Students will multiply rational expressions
Obj.2.1.2	Students will divide rational expressions
Obj.2.1.3	Students will add rational expressions
Obj.2.1.4	Students will subtract rational expressions
Obj.2.1.5	Students will simplify complex fractions
SLO 2.2 - Students will be able to perform operations on radical expressions	

Obj.2.2.1	Students will evaluate radical expressions
Obj.2.2.2	Students will simplify radical expressions
Obj.2.2.3	Students will add radical expressions
Obj.2.2.4	Students will subtract radical expressions
Obj.2.2.5	Students will multiply radical expressions
Obj.2.2.6	Students will rationalize the denominator
Obj.2.2.7	Students will simplify expressions using rules of exponents
Obj.2.2.8	Students will translate rational exponents to radical expressions
Obj.2.2.9	Students will translate radical expressions to rational exponents
SLO 2.3 - Students will be able to perform operations on complex numbers	
Obj.2.3.1	Students will simplify square roots of negatives
Obj.2.3.2	Students will simplify powers of i
Obj.2.3.3	Students will write complex numbers in the form $a + bi$
Obj.2.3.4	Students will add complex numbers
Obj.2.3.5	Students will subtract complex numbers
Obj.2.3.6	Students will multiply complex numbers
Obj.2.3.7	Students will divide complex numbers

APPENDIX J: MAPPING MTH 0305 2012-2013 SLOS (OLD) TO 2013-2014 SLOS (NEW)

Demonstrates correlation between old SLOs and new SLOs for longitudinal assessment and evaluation considerations

MTH 0305 Mapping New 2013-2014 SLOs to Pre-2013 SLOs	
2013-2014 Student Learning Outcomes *NEW* SLOs by Number	**2012-2013 SLOs *OLD* SLOs by Number**
GLO 1. Students will be able to solve linear equations in one unknown, inequalities, absolute value equations and inequalities	*Not Applicable in 2012-2013*
SLO 1.1. Students will solve line equations in one unknown	*SLO 2: Solve linear equations*
SLO 1.2. Students will solve linear inequalities and absolute value equations and inequalities	*SLO 3: Solve absolute values* *SLO 4: Solve absolute value inequalities* *SLO 5: Solve linear inequalities*
GLO 2. Students will be able to graph linear equations with two unknowns and solve systems of linear equations	*Not Applicable in 2012-2013*
SLO 2.1. Students will graph linear equations in two unknowns	*SLO 7:* Graph linear equations
SLO 2.2. Students will find the equation of the line	*SLO 7: Graph linear equations*
SLO 2.3. Students will solve systems of equations	*SLO 8: Solve systems of equations* *SLO 9: Solve word problems using systems of equations*
GLO 3. Students will be able to simplify and perform operations on algebraic expression and polynomials	*Not Applicable in 2012-2013*
SLO 3.1. Students will be able to simplify algebraic expressions and polynomials	*SLO 1: Simplify and evaluate algebraic expressions*
SLO 3.2. Students will be able to perform operations on polynomials	*SLO 11: Add and subtract polynomials* *SLO 12: Multiply and divide polynomials*

APPENDIX K: MAPPING MTH 0306 2012-2013 SLOS (OLD) TO 2013-2014 SLOS (NEW)

Demonstrates correlation between old SLOs and new SLOs for longitudinal assessment and evaluation considerations

MTH 0306 Mapping New 2013-2014 SLOs to 2012-2013 SLOs	
2013-2014 Student Learning Outcomes *NEW* SLOs by Number	**2012-2013 SLOs *OLD* SLOs by Number**
GLO 1. Students will be able to factor polynomials and solve quadratic equations, rational equations, and radical equations	*Not Applicable in 2012-2013*
SLO 1.1. Students will be able to factor polynomials	*SLO 1: Perform operations with rational expressions* *SLO 2: Solve equations involving rational expressions*
SLO 1.2. Students will be able to solve quadratic equations	*SLO 2: Solve equations involving rational expressions*
SLO 1.3. Students will be able to solve rational equations and radical equations	*SLO 4: Solve word problems using systems of equations* *SLO 7: Solve radical equations*
GLO 2. Students will be able to perform operations on rational expressions, radical expressions, and complex numbers	*Not Applicable in 2012-2013*
SLO 2.1. Students will be able to perform operations on rational expressions	*SLO 3: Solve systems of equations*
SLO 2.2. Students will be able to perform operations on radical expressions	*New*
SLO 2.3. Students will be able to perform operations on complex numbers	*New*

APPENDIX L. SELECTED LEARNING STYLES CHARACTERISTICS AND STRATEGIES FOR STUDENTS (AMATYC, 2006)

Learning Styles Characteristics		*Strategies for Students*
Active/ Tactile/ Concrete	Retains and understands information as a result of doing something manual or involving the sense of touch.	• Use mathematics as a concrete demonstration to make sense of a problem situation. • Draw a picture, make a table, or build a physical model of a problem. • Have students act out a concept
Active/ Social	Retains and understands information as a result of discussing or explaining to others.	• Participate in study groups. • Discuss concepts with the instructor and other students.
Analytic	Learns concepts and rules from experts.	• Listen to lectures. • Watch a demonstration.
Dynamic	Learns by exploring and looking for other possibilities for solving problems.	• Create and complete mathematics projects. • Use trial and error to find mathematics patterns.
Global	Learns in large jumps, absorbs material randomly, is able to solve complex problems quickly and in novel ways.	• Relate new mathematics topics to previous knowledge.
Innovative	Learns mathematics by personally relating mathematics to himself/herself using feelings.	• Discuss mathematics ideas with others. • Look for personal meaning in mathematics.
Intuitive	Discovers possibilities and relationships, is comfortable with abstractions and mathematical formulations, dislikes memorization and routine calculations.	• Seek interpretations and theories that provide proofs for theorems or formulas.
Reflective	Thinks about information quietly first and prefers to work alone.	• Incorporate reflection time as a part of study time.
Sensing/ Common Sense	Learns facts by connecting concepts to real-world situations; prefers to see the usefulness and practical application of mathematics.	• Consult other sources for specific real-world examples of mathematics concepts and procedures. • Seek hands-on learning experiences.
Sequential	Understands linear steps and follows logical paths to find solutions.	• Ask instructor to supply steps to solutions for problems.
Verbal	Prefers written and spoken explanations.	• Make summaries or outlines of course material. • Listen to classmates' explanations. • Read written explanations aloud. • Explain how to solve a problem.
Visual	Remembers pictures, diagrams, flowcharts, formulas, and procedures.	• Seek diagrams, schematics, course materials that can be viewed. • Create concept maps. • Color code notes and flashcards with highlighters.

APPENDIX M: ASSESSMENT SAMPLES FOR MATHEMATICS TUTORING CENTER STRATEGY

Sample Student Survey of Learning Assistance

Name:_____

Semester:_____

1. **Thinking about the time you have spent in the TEA(M)2 center, please indicate your level of agreement with the following statements.**

	strongly agree	agree	neither agree or disagree	disagree	strongly disagree
Tutors are available when I need help with my mathematics course	O	O	O	O	O
Tutors are knowledgeable and able to answer my questions	O	O	O	O	O
Tutors explain course materials the same way that my instructor does	O	O	O	O	O
I feel that the TEA(M)2 center helped me better understand my course	O	O	O	O	O

Sample Student Focus Group Follow Up for TEA(M)^2 Tutoring Assistance

A: Introduction

Thank you for joining us today to discuss this. We are working to gather student thoughts on mathematics tutoring. As part of our Quality Enhancement Plan initiative, Navarro College is providing tutoring to students and trying to ensure this fits with what they are being taught in their classes. We would like to get feedback from you concerning your experiences at the TEA(M)^2 Center. I will be your discussion facilitator today, and ____ will be writing your thoughts down for us to refer to throughout the focus group. ____ will be taking notes to ensure we capture everyone's feedback.

We are going to treat this as a group discussion today, and I will be asking you a few questions. I'd like you to talk about each question while we take notes on what you are saying. Please feel free to speak up and share your thoughts. There are no right or wrong answers, so please provide your honest opinion, even if it is different from someone else's point of view.

B: Core Questions

We understand that you have provided survey feedback on tutoring and learning assistance. We'd like to gather some additional input about this to help shape our QEP initiative in the future.

1. What is a specific skill or assignment that you came to the TEA(M)^2 Center to better understand?
    a. How did the help you receive help you to better understand this?
    b. How did the assistance you receive hinder you understanding?
2. How did the TEA(M)^2 Center tutors or resources help you with your course?
    a. If you have to identify a key thing that helped you, what would that be?
3. Thinking back to that specific skill or assignment that brought you to the center, how do you think this will impact you in future courses?
    a. How can you apply this knowledge to other assignments or courses?
4. What is one thing that the tutors could do or provide that would help you better understand mathematics?

Those are all the questions we have. Is there anything else that you would like to say about your experience with the center? Thank you again for your input and willingness to share your opinions and experiences. The ideas shared here today will help shape the plans for the QEP initiative in the future.

Tracking of TEA(M)^2 Center Usage

Navarro College has invested in tracking software that will be used in the Learning Commons to help assess the usage of the center. While this does not tell us about the experiences that people have, this will tell us about how much the tutoring facilities are being used. The following information will be examined in relation to the TEA(M)^2 Center to help assess the impact and effectiveness of the QEP initiative:

Measurement: Track staffing and amount of time spent by students at the TEA(M)^2 Center

a) Number of full-time tutors
b) Number of part-time tutors
c) Number of peer tutors
d) Number of hours mathematics faculty spend in center
e) Number of hours students spend in center
f) Number of hours students receive tutoring by course and section

APPENDIX N: FACULTY ENGAGEMENT ASSESSMENT

Faculty Course Engagement/Empowerment Activity Form

Faculty Member:

Course:

Implementation Semester:

Pre-Implementation Plan

What is the focus of your new course engagement and/or empowerment activity?
[Response]

What activities will be used to improve course engagement and/or empowerment? Please be specific.
[Response]

What measurement do you plan to use to determine success for this activity?
[Response]

Post- Evaluation of Engagement/Empowerment Activity

Was your activity successful? Please give specific details that you used to determine success.
[Response]

What problems did you incur as you implemented this activity? Please be specific.
[Response]

Did students appear to be more engaged in class?
[Response]

If this activity did not work, what challenges did you encounter and how did these challenges impact implementation?
[Response]

What modifications will be made to this activity, if any?
[Response]

How and when will you present this information to the department?
[Response]

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