TABLE OF CONTENTS

EXECUTIVE SUMMARY

The members of Grayson County College have chosen developmental mathematics as the focus of their Quality Enhancement Plan, directed toward improving educational outcomes of developmental mathematics students based on the results of a focused, campus-wide initiative that included all stakeholders. The results of the initiative strongly indicate that GCC developmental mathematics students are not succeeding at a level the institution deems acceptable. This failure is preventing far too many students from progressing; as a result, they are unable to pursue their educational and career goals. GCC has made an institutional commitment to researching and reviewing best practices in developmental education, as well as enacting changes that will serve to close this gap in achievement. The college is committed to turning what has been a gatekeeper subject into a gateway subject for students.

The QEP Development Team worked throughout the fall of 2010 to develop a plan to redesign developmental mathematics. The plan involves a complete redesign of both the sequence and the courses employed, emphasizing learning outcomes and strategies structured to mold underprepared, college-level mathematics students into empowered, ready-for-success mathematics students in one or two semesters instead of the three semesters currently required. This endeavor will be accomplished by meeting the established goals of the QEP, which are:

- increase the number of students who successfully complete the developmental mathematics sequence; and
- 70% of developmental mathematics students will attain at least 70% of the student learning outcomes for their developmental mathematics courses.

Several strategies have been selected to make these goals a reality at GCC:

- reducing mathematics anxiety of developmental mathematics students;

- increasing student ownership of the educational process for developmental mathematics students;
- developing a dedicated mathematics lab to provide supplemental instruction; and
- redesigning the developmental mathematics sequence and courses.

At the heart of the QEP is the restructuring of the pathways that students use to navigate their developmental mathematics requirements. The traditional developmental sequence is one that is assumed to end with enrollment in and successful completion of college algebra; however, for many GCC students, Math for Liberal Arts or Elementary Statistics is a better option. Two pathways will be designed that recognize the complex and differing needs of GCC students. In this pursuit, the college is following the lead of two highly-esteemed organizations: The Carnegie Foundation for the Advancement of Teaching and The American Mathematics Society of Two-Year Colleges.

The assessment cycle that has been developed for the QEP will guide GCC's efforts to refine and continually improve these processes. The college will support its members and students as it begins the task of making the developmental mathematics program a model of student success.

INSTITUTIONAL SETTING

Grayson County College (GCC) is in the heart of Grayson County, Texas, and provides a vital link for higher education. GCC's central location makes it easy for high-school graduates to obtain an affordable education close to home or for older adults to begin or continue a college-bound track and/or meet professional licensing requirements.

Unique course and program offerings are among GCC's diverse curriculum, including Viticulture and Enology (i.e., grape growing and wine making, respectively). The college also offers a highly- respected nursing program, as well as traditional one- and two-year degrees in general academic, business, technical, and other health-related fields. Students may select courses in more than 60 academic and technical programs.

As of January 2011, GCC's student body was comprised of an unduplicated headcount of 5,127 students, with 74% classified as Caucasian. The largest minority groups representing the student body are African American with 8%, Native American with 7%, and Hispanic with 7%. Approximately 2% of GCC's student body is made up of international students, with 1% classified as Asian or Pacific Islanders. Females comprise the largest sector of the student body at 62%.

Approximately 20% of all GCC students were enrolled in developmental courses (reading, writing, and math) in the spring of 2011. Of those enrolled in developmental education, 88% are typically enrolled in a developmental math course. Writing and reading developmental course enrollments are 20% and 22%, respectively. The number of developmental math students enrolled during the spring 2011 semester reached 919 versus 881 in all credit-bearing math courses in the same semester.

The developmental mathematics sequence at Grayson County College currently requires three semesters of instruction if the student places into the lowest level based on testing with either of two state-approved assessment instruments, the Computer-Adaptive

Placement Assessment and Support System (COMPASS) from ACT or the Texas Higher Education Assessment (THEA) from the State of Texas. The three levels are Developmental Algebra, Math 0310; Elementary Algebra, Math 0320; and Intermediate Algebra, Math 0330. Each of these courses has a laboratory component which students have found to be unsupportive in its current form. The relative success of each course has remained fairly consistent over the last five years. Developmental Algebra shows the most variability, with a success rate from 58% to 66%. Elementary Algebra success rates vary between 51% and 53% Intermediate Algebra between 50% and 54%. Considering that only successful students proceed to the next level, and many of them do not persist, the picture is quite grim.

The success of these students exiting the developmental sequence to earn college credit in mathematics has historically been poor. According to the Texas Higher Education Coordinating Board, of the 2006 cohort of students requiring developmental instruction in mathematics, writing, and reading, only 2.5% successfully completed a college-level math course with a grade of A, B, or C within three years. If one considers students who require instruction only in developmental math, the statistics are not much better, with only 11.9% completing a college-level math course within three years.

In preparing for the selection of a Quality Enhancement Plan, the administration ensured that the support structure for the QEP process was in place. GCC organized teams including the SACS Leadership Team, the QEP Development Team, and the College Effectiveness Council, Goal Teams and appointed an Interim QEP Director. These teams and the QEP Director provided leadership and served as guides through accreditation and the selection of the QEP.

SACS Leadership Team

A SACS Leadership Team (Appendix A) was developed to guide the institution through the reaccreditation process. It is comprised of the college president, four vice presidents, the director of institutional effectiveness, the faculty senate chair, and the interim director of the

QEP. The SACS Leadership Team was created in January of 2009, and its purpose and responsibilities were aligned with the directives of the *Handbook for Institutions Seeking Reaffirmation* upon its creation. In particular, the SACS Leadership team is charged with the responsibility of overseeing the development and implementation of the Quality Enhancement Plan.

Appointment of Interim QEP Director

Work toward the development of a QEP topic began in September 2009 with the selection of Dr. Jean Sorensen, English Professor, as the Interim QEP Director. Dr. Sorensen was charged with leading the campus through the identification and selection of an appropriate QEP topic. To aid Dr. Sorensen in the process, GCC's College Effectiveness Council (CEC) and its goal teams guided and informed the campus of the decision-making process in an effort to define a plan that would focus on the key issues of student learning and support.

QEP Planning Team

Upon the establishment of the QEP Planning Team, Dr. Sorensen invited seven people to serve on the team and to assist with the selection of ten initial topics based upon institutional data and strategic-planning initiatives. The team included the following individuals:

Ms. Nancy Luthe — Student Services Assistant

Ms. Lisa Hebert — College Librarian

Dr. Stella Thompson — Developmental English Professor

Ms. Kathleen Elberson — Developmental and College Math Professor

Dr. Patrice Parsons — Biology Professor

Ms. Barbara Roland — Drug and Alcohol Abuse Counseling Professor

Dr. Keri Harvey — Early Childhood Education Director

College Effectiveness Council

The CEC consists of administrators, faculty, staff, and students. A membership list for the CEC is available (Appendix B). The CEC is charged with making planning decisions

and offering recommendations to the college president, the board of trustees, and the executive council. The CEC supports strategic planning initiatives, accreditation, assessment, and program reviews for continuous improvement; provides in-depth development of action plans for strategic goals of GCC; and promotes communication and representation across the campus and among colleagues. Most importantly, the CEC is charged with identifying significant initiatives to include in the Quality Enhancement Plan.

The CEC falls under the direction of the President's Executive Council with four goal teams: Student Success, Student Learning, Community and Outreach, and Accountability. The CEC functions not as a hierarchy, but as a collaborative body that forwards the goals and mission of the institution. As outlined by the organizational structure (Appendix C), the work completed by the CEC serves the SACS Leadership Team and Quality Enhancement Development Teams, which were ultimately responsible for QEP topic identification, development, and implementation. The various goal teams that comprise the CEC support the institution's goals, reflecting a renewed commitment to student success. The college strategic goals are as follows:

- GCC will intensify efforts to ensure student success and student support.
- GCC will demonstrate academic quality by tracking and documenting student learning.
- GCC will respond to learning opportunities that will meet the ever-changing needs and interests of its diverse and dynamic college community.
- GCC will stress accountability based upon on-going, systematic assessment practices and fiscally-implemented improvements. (Grayson County College, 2009)

Goal Teams

Two of the four goal teams, Student Success and Student Learning, were involved in the inquiry that fed into the QEP topic identification process. This involvement follows naturally from the fact that the QEP must be focused on both student learning outcomes and the environment

which supports learning, and it must provide documented evidence of student learning. These goal teams were established in the fall of 2009, and each was assigned a specific purpose, goal, and outcome.

The Student Success Goal Team:

- Goal — to intensify GCC's efforts to ensure student success and student support;
- Purpose — to institutionalize and integrate the Student Success initiative throughout GCC and the community by dedicating resources and sustained effort for continuous improvement in student success; and
- Outcome — to report to the College Effectiveness Council at its November meeting
    - how GCC can improve student success.

The Student Learning Goal Team:

- Goal and Purpose — to demonstrate GCC's academic quality by tracking and documenting student learning; and
- Outcome — to report to the College Effectiveness Council at its November meeting
    - how GCC can improve student learning.(Grayson County College, 2009)

IDENTIFICATION OF A TOPIC

As GCC began work to identify a topic for its QEP, institutional data along with emerging themes from the strategic planning process, institutional surveys, and workshops were analyzed and explored as potential topics. Dr. Jean Sorensen led this effort as a member of the SACS Leadership Team.

Institutional Data Sources

The interim director, in consultation with the CEC, Strategic Planning Goal Teams, and the SACS Leadership Team, began working to identify potential topics. To begin the process, institutional data was gathered and analyzed.

GCC used several sources of data as a basis for topic exploration. The President's Executive Council made the decision to begin administering the Community College Survey of Student Engagement (CCSSE) in the fall of 2004. Specifically, "*CCSSE*'s survey instrument, *The Community College Student Report,* provides information on student engagement, a key indicator of learning and, therefore, of the quality of community colleges. The survey, administered to community college students, asks questions that assess institutional practices and student behaviors that are correlated highly with student learning and student retention" (CCSSE, 2011, ¶ 4). In addition, GCC was part of the field study of the Survey of Entering Student Engagement (SENSE) in the fall of 2008. Not only did GCC administer the surveys; time and care were taken to evaluate the results in order to make the most of the data collected.

Community College Survey of Student Engagement Data Analysis Committee

Grayson County College began administering the CCSSE to students in the fall of 2004, but the spring 2008 CCSSE cohort was of particular interest, as the need to identify a QEP topic was on the horizon. As part of a continual process of institutional assessment and with the charge of identifying potential strategies to enhance student engagement, learning, and success, GCC engaged in a thorough process of analysis of these results (Appendix D) which began in August of 2008 with faculty professional development led by guest speaker Dr. Kay McClenny, Director of the CCSSE program. This session helped GCC to realize the depth of the data inherent in the CCSSE report and the need to explore this valuable resource. In order to more fully profit from the survey results, the CCSSE Data Analysis Committee (C-DAC) was formed and chaired by Dr. Jean Sorensen, a standing member of the SACS Leadership Team. A one-day retreat of administrators, faculty, staff, and students convened on February 27, 2009, to take an in-depth look into the data and to determine ways of improving student learning and increasing student success.

The C-DAC Chair presented the C-DAC's findings and themes to the SACS Leadership Team. The themes were summarized in terms of perceived strengths and weaknesses:

Strength Theme: GCC is seeing the fruits of a greater conscious effort to engage students both in and out of the classroom.

- Students feel empowered.
- Students feel as if GCC supports them, but better, clearer, and earlier communication can improve this support.
- Students will continue to succeed based on the support they receive from institution-wide endeavors that encourage and reinforce student effort. In particular:
    - the Student Success Center
    - tutoring

Weakness Theme: GCC needs to find more effective ways to connect to students sooner and challenge them to participate more in the classroom.

- Expectations of students need to be increased beyond the classroom as far as synthesis and application.
- The timing, methods, and diversity of GCC's communication needs to be improved.
- More outreach to first-year students is needed, perhaps through College 101, GCC's orientation program for new students.

In addition to the identification of themes, the C-DAC generated a "wish-list" (Appendix E) of all participants' suggestions based on the results of the analysis. A summary of this list is easily stated: provide more and earlier contact with students, offer more support for learners, and establish better use of technology and communication. Enhancing academic expectations of students was also a theme, focusing on *Turnitin.com* as a means to deter plagiarism and on the development of rubrics for the grading of student writing to encourage more writing assignments across the curriculum.

Survey of Entering Student Engagement (SENSE)

In addition to the CCSSE, GCC also administered the SENSE survey to entering students in the fall of 2008. The findings are organized into six principles: Personal

Connections; High Expectations and Aspirations; A Plan and a Pathway to Success; An Effective Track to College Readiness; Engaged Learning; and An Integrated Network of Financial, Social, and Academic Support. GCC was provided survey results which were compared to the cohort group. A result of particular interest focused on An Effective Track to College Readiness. According to the survey, GCC's students take developmental reading and mathematics courses at about the same rate as the cohort, approximately 30 percent and 50 percent, respectively. However, far fewer students report needing remediation in writing (20 percent of GCC students versus 32 percent of the cohort). The most apparent disparity is in the number of students who take a student success course: only three percent of GCC students versus 25 percent of the cohort.

Realizing the depth of the data inherent in the survey results to learn more about GCC's entering student population, the college sent a group of faculty and staff to the Second Annual Entering Student Success Institute (ESSI) in April 2009. The team included: Dr. David Foster, Economics Professor and Faculty Association President; Dr. Jeanie Hardin, Vice President for Instructional Services and SACS Leadership Team member; Dr. Jean Sorensen, English Professor and Interim QEP Director; Mr. Mark Taylor, Assistant Dean for Academic Studies; and Ms. Barbara Malone, Director of Counseling Services.

As a part of the ESSI experience, the team participated in a number of break-out sessions at the meeting where they were asked to look much deeper into the data. For instance, they compared the responses of the full- versus part-time students, traditional versus non-traditional students, non-Asian minorities versus white students, developmental versus non-developmental students, and first-generation versus non-first-generation students. The team then identified the findings that captured its attention and concern. The most troubling item involved the disparity between the developmental and non-developmental students. In particular, a higher percentage of developmental students reported relying on family and friends

for their academic advising instead of on Counseling Services advisors or teachers. As a result, the team found a need to improve the first-year experience of GCC's developmental students.

A summary of the key findings and implications of the SENSE data indicates the need to (1) include Learning Frameworks in the General Education core; (2) mandate College 101 for all entering students; (3) better communicate the availability of support services; and (4) develop a system to identify "at risk" students.

These findings, as well as data from around the state that provided evidence of the improved retention of students in a frameworks course, influenced the Core Curriculum Committee's recommendation to expand GCC's institutional option of computer literacy to include a psychology or education course (dual listing as PSYC 1300 or EDUC 1300) in Learning Frameworks as a pilot program beginning fall 2009.

Institutional Surveys

In an effort to obtain a broad-based response from all stakeholders, the QEP Development Team administered an online survey in the fall of 2009 to both students and employees. The results of the employee survey indicated a desire for student success initiatives, including: mandating assessment and orientation for all new students; implementing a study-skills course; instituting learning communities; establishing better communication among the various campus constituencies; creating engaging classrooms with best practices used; improving both usage and availability of technology; and improving developmental mathematics.

A total of 273 students responded to the survey. Of the respondents, 61% had 0-30 hours of college credit, and 39% had accumulated 31 or more hours. It is clear from the responses that students believe they need more academic support, whether in the form of study-skills instruction, tutoring, or interactive classroom experiences. Mathematics was the only subject that students mentioned specifically and repeatedly in terms of needing more support. The number one wished of our students was an expanded mathematics lab, both in terms of capacity and time availability. In addition, they noted the need for more time on task

and more in-depth coverage of material in all of their courses. Interestingly, among the two groups surveyed, mathematics was the only subject specifically singled out in terms of needed enhancements beyond expansion of facilities and increased availability of course sections.

Student Success Workshop

On June 29, 2009, the Student Success Goal Team met with the following GCC goal in mind: to meet the current and future educational needs of a diverse population. In order to facilitate this goal, the team was given the following charge:

- define student success at GCC;
- identify what motivates GCC to change;
- identify the current status of retention initiatives in Student Services and Instruction; and
- institutionalize and integrate the Student Success initiative throughout GCC and the community by dedicating resources and sustained effort for continuous improvement in student success.

As part of the day-long workshop, participants focused on the milestones of student progression through the college experience and beyond including: Introduction to College, College Transition, Progression to Degree, Graduation Transition, and Lifelong Learning. Each group brainstormed initiatives that would support students during their time at each particular milestone. The most notable among the selected topics were developmental education, peer tutoring in mathematics, faculty advisors in counseling, just-in-time support for reading and writing, and a learning frameworks course.

QEP SELECTION PROCESS

A systematic process for selecting the QEP topic was established and led by Dr. Sorensen. With the assistance of the QEP Planning Team, Dr. Sorenson developed ten initial

topics, based on the institutional data, strategic planning results, and surveys for consideration by the faculty.

Ten Initial Topics

Based upon the available data and topics most likely to bring about changes in student learning, the ten topics ultimately put forth by the committee were as follows:

1. improving student success by requiring all new students to take a course dedicated to how students learn, i.e., a mandatory First Year Learning Experience;
2. improving student success by making changes to the three college-level courses that students are most likely to fail or drop;
3. improving student success in developmental math through (1) reduced class size, (2) increased time for instruction, and (3) learning communities for support;
4. improving interdisciplinary connections by grouping pairs of college courses so that students build learning communities through their increased associations;
5. improving information literacy across the curriculum as a way to improve critical thinking and to build lifelong-learning skills;
6. improving the advising and mentoring of students by focusing initially on health science programs to help students with goal setting and achievement;
7. improving student engagement through student skill development, professional development of the faculty, and student-support services;
8. improving technology across the curriculum through faculty professional development in methods and strategies in assigning technology-based assignments for increasing student engagement;
9. improving reading across the curriculum through faculty professional development in methods and strategies with the focus on reading-supportive and reading-intensive courses; and
10. improving communication skills across the curriculum through faculty professional

development in assigning written and oral presentations to increase student engagement.

Ten Topics Narrowed to Five

To narrow the field of ten topics to five, GCC employees and students voted via an online survey for their top five topics. All votes were made anonymously, and the votes were weighted equally. The response to the survey resulted in 405 votes.

The five key areas for improvement chosen by the faculty, staff, administrators, and students were: Developmental Math, Top Three College-Level Courses, Technology Engagement, Information Literacy, and Student Engagement. Mini proposals were developed for these five topics and put forth for the faculty's consideration. A brief synopsis for each of the five topics selected is as follows:

1. Developmental Math Improvement: improve student success in developmental math through (1) reducing class size, (2) increasing time for instruction, and (3) establishing learning communities for support. (Note: Learning communities would use early-warning systems to identify students who are struggling and could include college-wide participation in problem-solving methods such as those designed by G. Polya in *How To Solve It*.)

2. Top Three College-Level Courses Improvement: improve student success in the three college-level courses where students are most likely to receive grades of D, F, or W through (1) curricular redesign, (2) supplemental instruction, and (3) learning support strategies such as an early-alert warning system.

3. Technology Engagement Improvement: improve student success across the curriculum by using technology to engage students in learning through (1) active and collaborative learning techniques; (2) student perception of effort; and (3) professional development of faculty in creating "low threshold applications" requiring fewer resources, including time, design, and completion of projects.

4. Information Literacy Improvement: improve student success across the curriculum by teaching information literacy to enhance critical thinking and to build the skills for lifelong learning through (1) professional development of faculty and staff in preparing assessments requiring students to use, analyze, synthesize, and evaluate information; (2) additional tracking and survey studies of library instruction and resources; and (3) follow-up studies of transfer and employment success of alumni.

5. Student Engagement Improvement: improve student success across the curriculum using strategies to engage students through (1) professional development of faculty and staff in fostering student-GCC interactions; (2) increasing support services during students' first semester at GCC; and (3) student perception of effort.

Five Topics Narrowed to Three Topics for Final Selection

The top five topics were drafted as two-page mini proposals, identically formatted into seven categories for evaluation based on these criteria: (1) design of the topic as an excellent choice for GCC and (2) rating of GCC's ability to implement the choice. Each of the seven categories had a standard for judging the provided evidence as "acceptable" or "exemplary."

The design categories included four criteria for evaluating each mini-proposal:

(1) Overview of QEP Topic Linked to GCC's Mission and Values;

(2) Evidence Topic Broad-Based and Relevant for GCC;

(3) Potential of Topic to Improve Student Learning; and

(4) Timeline to Address Potential Actions that Might Improve Student Learning.

The implementation categories included three criteria for evaluating each mini-proposal:

(1) Departmental and Unit Involvement for Topic;

(2) Feasibility of Topic; and

(3) Ability of GCC to Provide Resources to Support Topic.

The faculty were asked to vote through an online survey that required them to rate each of the five mini proposals using the three criteria listed above. In scoring the results, the two

categories of design and implementation received special weighting so that the four-three split of criteria within categories was balanced evenly between the importance of each proposal's design and GCC's ability to implement that design. The top three topics were Developmental Math, Top Three College-Level Courses Improvement, and Technology Engagement.

Selecting the Final Topic

The Board of Trustees (BOT) and the President's Executive Council (PEC) were central to the final topic selection. It is important to note that the BOT is an elected body at GCC and, as such, represents the interests of the community at-large. Securing its input was vital to ensure that GCC had the support of the community in moving forward with any proposed plan. Dr. Sorensen presented the top three topics to the BOT and PEC for consideration. College President Alan Scheibmeir facilitated the BOT's discussion that decisively narrowed the choice of topics to two: Developmental Math and the Top Three College-Level Courses Improvement.

On April 21, 2010, Dr. Scheibmeir led the PEC in discussion, voicing strong support for improving student success in developmental math. He and Dr. Hardin reiterated the findings of the C-DAC, ESSI, and Student Success Workshop and emphasized the commitment of GCC's Math Department in proposing this topic. Upon review of the mini proposals and the need for helping students succeed early in their college careers, the college president and the PEC chose Developmental Math as GCC's QEP topic. The soundness of choosing to facilitate the success of GCC's students through improvements in developmental math courses was the unanimous choice of the PEC. The final choice of topic was announced to the college community on April 22, 2010.

PROCESS USED TO DEVELOP THE QEP

Once the QEP topic was selected, GCC moved to the task of identifying the specific goals for the project, as well as the strategies that would be employed to achieve them.

The first order of business was to select a permanent QEP Director. Since the QEP topic centered on developmental math, it seemed logical that the director of the project should have a background in mathematics. Therefore, Dr. Scheibmeir appointed GCC Mathematics Professor Kathleen Elberson as the full-time QEP Director (Appendix F). In order to facilitate the transition to her new role, Ms. Elberson attended the SACS Summer Institute in Tampa, Florida, which focused on the topic of QEP.

Development Team

With a topic identified and a faculty member established to lead the development of the QEP, the focus shifted to identifying the best ways to improve developmental mathematics at GCC. The first action undertaken by Ms. Elberson was to work with the leadership of the college to appoint a QEP Development Team (Appendix G) that would be representative of all stakeholders. The team includes faculty from across the curriculum, tutoring facilitators, counseling personnel, distance-learning employees, and administrators.

In order to acknowledge the important connection and the need for collaboration between the high schools and the community college, two area high-school mathematics teachers were invited and agreed to offer their time and experience.

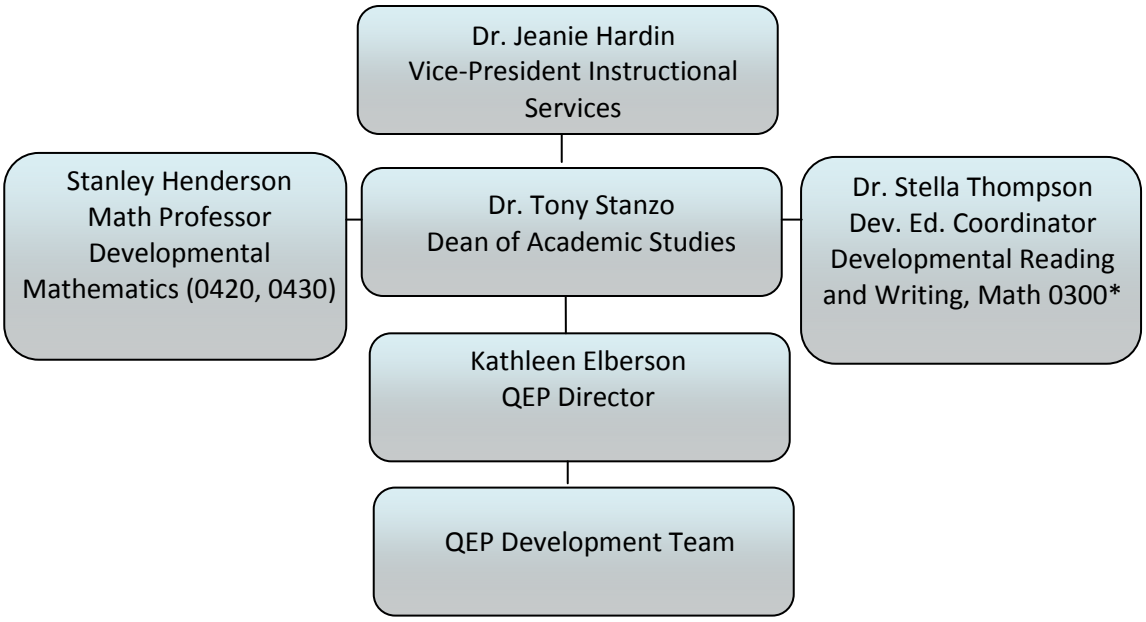
The QEP is first and foremost a student learning initiative, so student input into the development process is vital. To ensure that GCC students had a voice and to recognize that they are perhaps the most important stakeholders, three students were selected to serve on the QEP Development Team. Other stakeholders included administration members who serve in ex-officio capacities.

And finally, in recognition of the vital instructional role played by adjunct faculty, Ms. Elberson attended adjunct and new-faculty orientations during the fall of 2010 to emphasize the crucial place that adjunct faculty hold within the institution and, consequently, the importance of their voices being heard in the process of QEP development. As a result, four adjunct mathematics professors agreed to serve on subcommittees of the Development Team.

The final composition of the QEP Development Team serves as a testament to the institutional recognition that developmental mathematics is a concern for everyone at GCC and not merely as a "Math Department issue," as evidenced by the broad-based support for the initiative.

Organizing for Success

To facilitate the necessary work required to develop the QEP, Ms. Elberson worked together with the college leadership to develop an organizational structure that would demonstrate the QEP's integral relationship to Instructional Services and would serve to spread the responsibilities of development across as many areas of the college as possible. The structure evolved during the fall of 2010 to take the form shown below as leadership gained a better understanding of how best to utilize and structure the resources of the college.



*Math 0300 is a basic arithmetic course that the State of Texas does not allow the mathematics department to offer.

Development Timeline

In order to ensure timely completion of the tasks necessary to the development process, the following organizational timeline was developed. For a list of sub-committee members, refer to Appendix H.

Who	Task	Due Date	Year
QEP Development Team	Determine Goals for QEP	8/30 – 8/31	2010
Math Faculty	Conduct Survey of Developmental Math Students	9/7 – 9/13	
Assessment Subcommittee	Begin Development of Student Learning Outcomes	9/22	
Marketing Subcommittee	Develop Concepts for Logo and Slogan	10/4	
Literature Review Subcommittee	Prepare Draft of Initial Literature Review	10/4	
Developmental Math Peer Review Subcommittee	Prepare Draft of Initial Review of Peer Institution Developmental Math Strategies	10/4	
QEP Development Team	Review and Select Strategies for Implementation	Week of October 11th	
Literature Review Subcommittee	Refine and Add to Literature Review Based on Selected Strategies	Week of October 18th	
Assessment Subcommittee	Refine SLOs	11/10	
Professional Development Subcommittee	Prepare Draft of Professional Development Activities for Spring Convocation	11/19	
QEP Development Team	Identify Actions to be Implemented	12/2	
Budget Subcommittee	Prepare Draft of Five-Year Budget for the QEP	April	2011
Marketing Subcommittee	Develop Full-Marketing Blitz Campaign for Summer and Fall Implementation	March	
Professional Development Subcommittee	Prepare Professional Development Activities for Return of Faculty, Fall 2011	April	
QEP Development Team	Prepare Final Report for Submission	July	

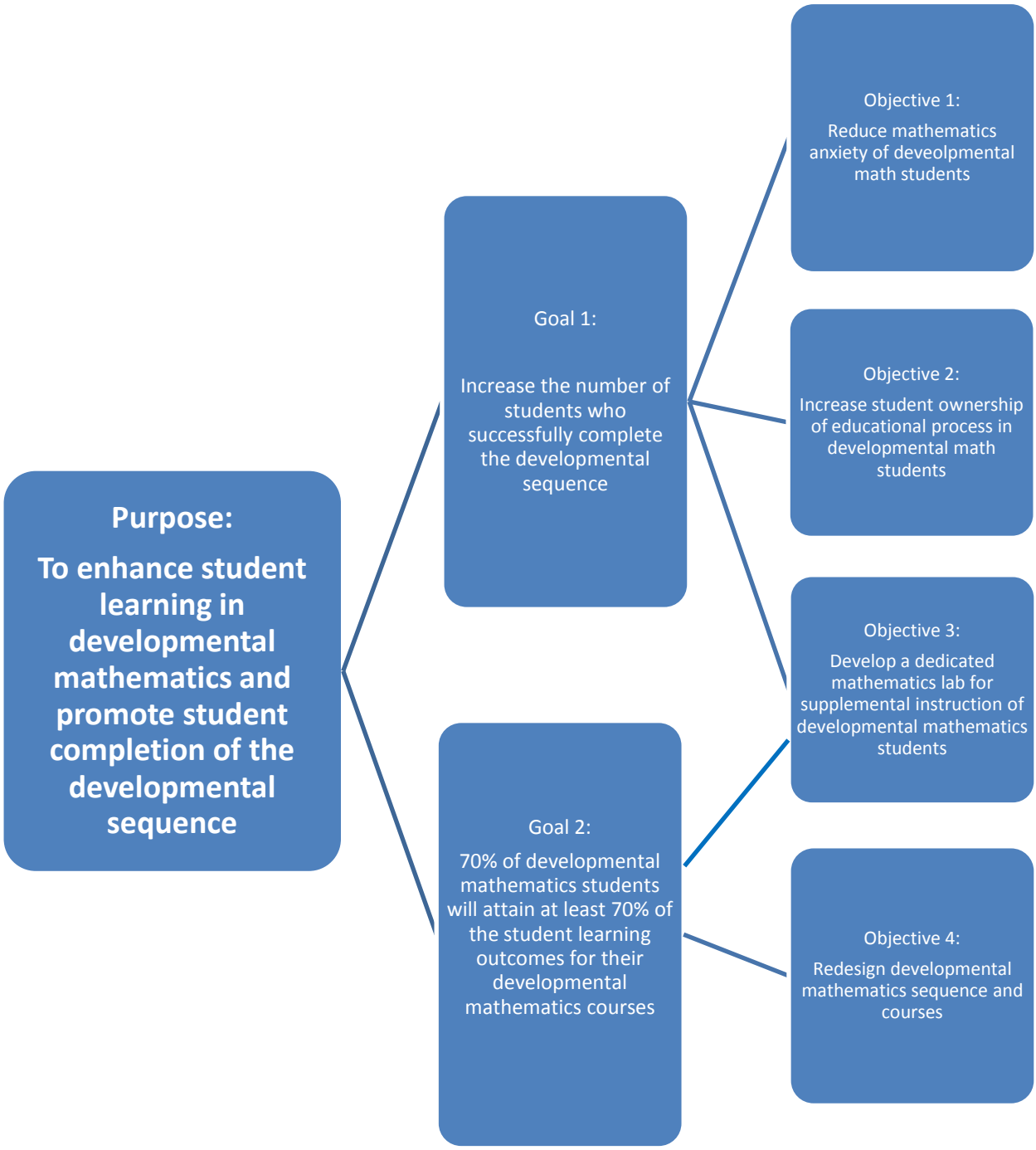
In order to obtain broad-based input for the development of the project, Ms. Elberson surveyed the faculty at the fall convocation to solicit their thoughts on the direction the QEP should take and whether they would be willing to serve on a subcommittee of the QEP

Development Team. Business Services and Student Services employees completed the surveys at their regular meetings of the semester. The results (Appendix I), with an overwhelming combined percentage of 51%, indicated a need to focus on student-support services and instructional design. Clearly, the GCC community believes that student-support services and instructional design should be the avenues utilized to improve student-learning outcomes in developmental mathematics.

In addition to surveying GCC employees, the Mathematics Department developed and administered a survey to all developmental mathematics students to better understand the issues relating to their success from their unique viewpoints. When asked what GCC could do to help them in their math classes, the response from these students was for the institution to provide better support to include tutoring and a slower pace for working through materials; most students responded that they did not know how GCC could help them in their developmental math classes. When asked what the major obstacles were in math, the overwhelming majority responded that motivation/study habits were the largest obstacle.

Subcommittees

With over 60 volunteers who stepped forward to offer their time, the response to the request for employees (to serve on subcommittees which would do much of the work of developing the QEP) was impressive, The Assessment, Literature Review, and Developmental Education Peer Review Subcommittees were the first to begin meeting regularly, as their input would be essential to the overall development efforts. The Assessment Subcommittee met to begin the process of defining the overall goals and objectives of the QEP. Their recommendations were taken to the QEP Development Team for discussion and approval. The process was a fluid one. The initial recommendations were fine-tuned as the program began to be more fully developed. Ultimately, the purpose, goals and objectives of the QEP took the following form:



The specific learning outcomes developed for each of the objectives above can be found in the Desired Student Learning Outcomes section of this report.

These goals and objectives clearly honor the findings of the employee focus survey in that both instructional design, in the form of redesigned courses and a redesigned sequence,

and student support, in the form of a dedicated mathematics lab and an increased effort to address the affective issues central to student success, are cornerstones of the plan. The objectives also show a clear correlation to the feedback received from the developmental students themselves. Although not all students expressed an opinion, when they did, they noted a desire for a walk-in tutoring lab, more overall support of their efforts, more time in class, and more group work. Many students listed math anxiety, a lack of motivation, and poor study habits as major obstacles to their success in mathematics. These issues are clearly addressed in the proposed objectives.

Community Outreach

In order to ensure community support and involvement in the QEP, Ms. Elberson visited campus advisory councils and the Denison Rotary Club in the fall of 2010 to inform their members of the changes being made and to solicit their input. The feedback was extremely supportive. In fact, the GCC EMT Advisory Council passed a resolution in support of GCC's QEP.

LITERATURE REVIEW AND BEST PRACTICES

To obtain as much information as possible regarding current best practices in developmental mathematics, a thorough review of the literature was conducted by the Literature Review Subcommittee. The preliminary inquiry phase of development suggested the following topics for further research: best practices for advising and placement, course redesign models, use of technology, strategies to reduce math anxiety, study skill strategies, student support services—tutoring, and student support services—dedicated math lab. A summary of the research most influential to the project, organized by topic, follows.

Placement

One of the most comprehensive and well-designed studies of developmental education is the National Study of Developmental Education (NSDE), funded by a grant from the Exxon

Education Foundation, which began in 1988 and was funded through 1994. Since 1994, the work has been continued, with additional funding from various sources. According to Boylan, Bliss, & Bonham (1997), the importance of the NSDE cannot be underemphasized, as the findings may be generalized to any developmental education program due to the randomized nature of the experimental design. Far from stating that the pursuit of mandatory placement should be abandoned, the Boylan, et.al (1997) state:

> The fact that there is a negative relationship between mandatory placement and student success measures also bears explanation. Again, it is important to note that although mandatory placement was negatively correlated with some aspects of student performance, it did not cause that performance. The negative correlation can probably be explained in the following way. When placement is mandatory, as a result of assessment, those students most in need of remediation are required to participate in it. When placement is voluntary, many of the students in the greatest need of remediation "slip through the cracks." Mandatory placement, therefore, insures that larger numbers of weaker students participate in developmental programs. (p. 8)

Morante, according to Boylan, et.al (1997), states "testing should be mandatory because too many students, especially those who most need assistance, will avoid assessment whenever possible" (p. 8). In "National Study of Developmental Education II: Baseline Data for Community Colleges," Gerlaugh, Thompson, Boylan, & Davis (2007), assert that "according to literature in the field, mandatory placement is an integral step in providing successful developmental programs" (p. 2).

As part of the National Developmental Educators (NADE) Mathematics Special Professional Interest Network, NADE published *Best Practices in Developmental Mathematics* in 2003. Placement was one of the areas of particular interest. According to Armington,(2003), "The continual evolution of placement policies at colleges across the country suggests that the placement issue is more complex that it first appears" (p. 14). He asserts that correct placement is not only a matter of accurate testing, but also one of creating a learning environment in which student background is not widely variable; as such, the classroom should be as homogenous with respect to student ability as possible. Bright students with very little algebra background

can and do place into intermediate algebra courses due to their use of critical thinking on the multiple choice placement test. This placement creates problems for both the student and the instructor since the student is not adequately prepared to function in a classroom in which at least an elementary familiarity with algebraic practice is assumed. Clearly, test scores in isolation are often not enough for correct placement (Armington, 2003)..

Several institutions provided information for NADE's *Best Practices in Developmental Mathematics* regarding how they deal with the problem of placement. According to Armington (2003), Susan McClory of San Jose State University reports that at her institution students are placed into one of four different instructional formats based not only on a range of scores, but also on where within the range students fall. For instance, students who fall below a given cut-off score are enrolled in a two-semester course, and those who fall above are placed in a one-semester course. Of those enrolled in the two-semester course, a further cut is made at the first quartile, with low-performing students meeting more often and in classes with low student-to-teacher ratios. The upper three quartiles meet twice a week for lecture and twice a week for discussion. These methods provide unique and interesting ways of addressing the need for classroom homogeneity.

Armington (2003) reports that Montclair State University has responded to the placement problem by gradually developing an in-house placement exam that works quite well. This project took many years and a commitment to carefully tracking student data in order to evaluate the effectiveness of the measure. The university reports that the test functions extremely well in placing students. According to Armington (2003),

> There are several noteworthy aspects of the revision process undertaken by Montclair State University. First, decisions were based on data obtained from tracking student success over time. Second, the mathematics faculty were closely involved in determining whether students were being properly placed into mathematics courses as well as in the selection of an appropriate testing instrument. Third, emphasis was placed on assisting students by helping them prepare for placement testing. And finally, the university continues to monitor the effectiveness of its placement program through ongoing data collection. (p. 15)

Course Redesign

Course redesign is a current topic common in educational circles. One of the most vocal proponents of course redesign is the National Center of Academic Transformation (NCAT). Its research culminated in six models of redesign: the supplemental model, the replacement model, the emporium model, the fully-online model, the buffet model, and the linked workshop. Each of these models is a rethinking of the traditional classroom lecture model (National Center of Academic Transformation, 2005). The unifying link among all six models is the use of technology.

However, the models put forth by NCAT are not the only contenders in the course-redesign arena. Byrk & Triesman (2010) states its goal as "Make Math a Gateway, Not a Gatekeeper" (para 1). Under the leadership of Anthony Bryk, President of The Carnegie Foundation for the Advancement of Teaching (CFAT) and Uri Treisman of the Dana Center at the University of Texas in Austin, a new focus of mathematics education in American colleges and universities is being championed. Instead of the traditional focus on college algebra for most non-science, -technology, -engineering, and –mathematics (-STEM) majors, the group is proposing an emphasis on statistical literacy instead. It proposes a "statway" or statistics pathway that would allow developmental students to complete both their developmental requirements and their college-level statistics courses in one year. One reason for the proposal is the all-too-often-asked question in every algebra classroom: "Why do I need to know this information?" All algebra teachers have heard this question from students and recognize that the standard answers do little to assuage students' convictions that this difficult, perhaps insurmountable enterprise is nothing more than a road to navigate on their way to an associate's degree or to a four-year school. Bryk & Treisman (2010), in an article published in the *Chronicle of Higher Education*, assert that students "…need to think, 'I can understand this, I can do this, this is important to know'" (para. 4). As they further state, "Statistical reasoning supports decision making under conditions of uncertainty, an inescapable condition of modern

life" (para. 5). Thus, mathematics is important for all educated citizens and, therefore, for all students.

Of course this model does not negate the need for algebra; it proposes that students in non-STEM fields could be better served by a "gateway" course that leads to a useful and attainable level of mathematical proficiency within a reasonable amount of time. The Byrk & Treisman (2010) opt for saving this all-too-often "gatekeeper" course for those students who truly need the education for their further studies.

A related proposal is being developed by the Developmental Mathematics Committee of the American Mathematical Society of Two Year Colleges (AMATYC), known as New Life for Developmental Mathematics or New Life. The goals are quite similar to those of the Carnegie Foundation. However, the New Life approach is not limited to a specific pathway for students to pursue; rather, it is a complete rethinking of developmental mathematics. Jack Rotman, the Chairperson of the Developmental Math Committee of AMATYC, has produced a number of short video information clips on the project. In the videos, Rotman outlines a vision for developmental mathematics that throws out the conventional wisdom that these students need to eventually succeed in a college algebra class. Instead, he asks what they need to know for their intended course of study and for their lives. This emphasis on the need for practicality and usefulness was also foundational in the work of CFAT.

Like CFAT, the New Life project seeks to compress the amount of time needed to complete college-level coursework for the majority of non-STEM majors to two semesters. Rotman makes plain the consequences of a developmental sequence that involves too many courses. He notes that with the current three-course structure, only 19% of those entering at the lowest level will ever emerge on the other side to begin college-level course work. His underlying assumptions are that it would be possible to have a 70% completion rate for each developmental course (very high expectations) and that 75% of those completers would go on to the next course in the sequence (more realistic expectations). If this requirement were

dropped to two courses and all underlying assumptions were kept, the successful completion rate would double to 38% (AMATYC, 2011).

However, a restructuring of the course sequence is just the beginning of the rethinking planned by New Life. It proposes two pathways to math credit completion: a fundamentals course for those students not planning on pursuing a math-intensive field and a transitions class for those planning on pursuing fields requiring more extensive mathematics courses. The proposed fundamentals course seems to very closely resemble a quantitative literacy course with four goals, including numeracy, proportional reasoning, algebraic reasoning, and functions and modeling.

The assertion that the pathway to mathematics requirement completion should be shortened is definitely supported in the literature. In an article entitled "Success Rates for Students Taking Compressed and Regular Length Developmental Courses in the Community College," published in the *Community College Journal of Research and Practice*, Sheldon & Durdella (2010) find that there is a significant difference in course completion rates among students who complete a compressed course and those who complete a traditional course. Students were more likely to complete the compressed rather that the traditional course and these differences were observed across "all categories of age, gender, and ethnicity" (p. 3). The compressed courses were eight weeks long, half that of traditional sixteen-week courses. While the redesigns proposed by both Carnegie and AMATYC involve much more than just a compression of the time required to complete the developmental requirement, the time element is one important feature of both proposals.

Technology in the Developmental Mathematics Curriculum

Use of technology is another hot-topic issue that elicits strong feelings; few professional educators are neutral on the topic. An abundance of literature advocates for an increased use of technology, stating that it results in increased gains in student learning. As mentioned in the course redesign topic, the National Center for Academic Transformation (NCAT) is a vocal

advocate of course redesign involving the use of technology. At the heart of the technology movement is the recognition that students learn math by doing math. The proponents of increased technology use point out that an intelligent software package does not tire of providing examples and correcting students' work; these programs can provide a nearly endless supply of practice for motivated students. From an article by Carol Twigg (n.d.) entitled "Math Lectures: An Oxymoron," the following excerpt sums up this point well: "By using an instructional software package … students are able to spend much more time on task than when they simply watch or listen to a lecture given by someone else" (para. 12).

While it would be easy to simply jump on the technology bandwagon, it is important to note that there are several studies showing that care needs to be taken regarding how these changes are implemented and if they even should be implemented. Simply replacing the lecture format with a computer and a program and expecting that students will succeed seems naïve at best. According to the Massachusetts Community College Executive Office (2006) several interesting conclusions are reached:

> At its outset, the 100% Math Initiative focused largely on the development, piloting, and dissemination of technological tools for classroom instruction and homework support. While participating faculty appreciated the place of technology in teaching developmental mathematics students, two issues arose. First, they quickly realized that the web-based instruction and presentation tool was not fully ready for consistent classroom use and it did not facilitate the creation of original content as they had hoped. Second, the faculty didn't believe it was appropriate to incorporate this technology into their classrooms until they had created an overall pedagogical approach to addressing the needs of developmental mathematics students. (p. 10)

These educators concluded that while they clearly needed to incorporate more engaging classroom strategies, technology was not the panacea many hoped it would ultimately become. They recommended the use of engaging activities such as critiquing other students' work, writing in a journal, coaching classmates, playing games that simulate 'real life' situations, and leading classroom discussions.

Research conducted by Lou, Abrami, & d'Appollonia (2001), which was reported in an article entitled "Small Group and Individual Learning with Technology: A Meta Analysis," published in *Review of Educational Research,* finds that "in general, small-group learning with CT (computer technology) had more favorable effects than individual learning with CT on student cognitive, process and affective outcomes" (p. 476). In other words, students did better and felt better about the work completed using computer technology. This important result cannot be underemphasized.

A great deal of research indicates that developmental students need a support structure. At a workshop delivered at the Kellogg Institute for Developmental Education in July 2000, David Arendale of the University of Minnesota Twin Cities reported that "students who study alone are most likely to drop out" (Armington, 2003, p. 8). In the National Association of Developmental Educators' "Best Practice in Developmental Mathematics," Meredith Higgs of Middle Tennessee State University as cited by Armington (2003), reports on research conducted by Dupree from a 1998 article entitled "Small-group Instruction: Impact on Basic Algebra Students," published in the *Journal of Developmental Education,* that shows small-group instruction has a significant impact on the achievement of certain populations of students who are especially vulnerable: "the effects of small-group instruction on the outcomes of developmental algebra students indicated that small-group instruction could significantly increase mathematics confidence for such historically under-represented groups as females, Hispanic-American, and Native-American students" (Armington, 2003, p. 4). While not all of GCC's student body falls into these categories, a significant number do, and it should be kept in mind that strategies that help the most vulnerable of students can also help those who are less vulnerable as well.

The success of computer-directed instruction is also addressed by Deborah Blackner in her dissertation entitled "Prediction of Community College Students' Success in Developmental Math with Traditional Classroom, Computer-based On-campus and Computer-based at a

Distance Instruction with Locus of Control, Math Anxiety and Learning Style." Blackner (2000) finds that the three instructional methods had differing outcomes; these differences could be attributed to the level of mathematics being pursued. Students who were enrolled in a beginning algebra course showed greater achievements using computer-aided instruction than those enrolled in intermediate algebra, who worked in a traditional-lecture format.

Mathematics Anxiety

The fact that math anxiety is a real issue is reflected in the fact that there are numerous scales that have successfully documented and measured it. The Mathematics Anxiety Rating Scale (MARS) was one of the first instruments used. In an article from the *Journal of Instructional Psychology*, Bai, Wang, Pan, & Frey (2009) outline their modification of the traditional rating scale, the Mathematics Anxiety Scale, Revised (MAS-R). The previously-accepted standard MARS relied on 98 questions in order to pinpoint a student's level of math anxiety. The revised scale is a vast simplification with only fourteen questions. Another improvement over previous anxiety scales allows for students to respond positively in terms of anxiety. In other words, it does not measure only negative feelings about math, but positive ones as well. It should be noted that the scale was created solely to measure math anxiety, and it does not address a causal relationship between mathematics anxiety and mathematics performance. It is merely an instrument that can be used to measure the level of anxiety a student feels about mathematics. It could be the case that students with high levels of math anxiety are still able to function well in a mathematics course. It could also be true that students with a low level of anxiety do not perform well, despite their lack of tension about the subject.

In "The Nature, Effects, and Relief of Mathematics Anxiety," published in a 1990 volume of the *Journal for Research in Mathematics Education*," Ray Hembree (1990) of Adrian College conducted a meta-analysis of the current research on mathematics anxiety with the aim of answering three research questions:

- Is there a causal direction in the relationship between mathematics anxiety and mathematics performance?
- Does test anxiety subsume mathematics anxiety?
- Are behaviors related to mathematics anxiety more pronounced in females than males? (p. 35)

An excerpt from his paper summarizes the results as follows:

1. Higher achievement consistently accompanies reduction in mathematics anxiety.
2. Treatment can restore the performance of formerly high-anxious students to the performance level associated with low mathematics anxiety. (Hembree, 1990, p. 44)

In essence, if a student's level of mathematics anxiety is reduced, his or her level of performance can increase.

The article "Mathematics Anxiety, Instructional Method and Achievement in a Survey Course in College Mathematics" by Pam Clute (1984) reported that students who suffer from mathematics anxiety tend to do poorly in environments in which they are asked to discover mathematics facts for themselves. Such students tend to perform better in classes where a more expository approach is taken. Due to the enormous benefits of having students interact with and explore mathematics, and in light of the discovery that math-anxious students have a difficult time doing so, it is imperative to discover and implement methods that will help diminish their levels of anxiety.

Study Skills

"Learning and Teaching Strategies" by Ronald Hoffman & Saundra McGuire (2010), published in the *American Scientist,* outlines six proven strategies that the authors have used in their university chemistry classes. While they were not teaching developmental math, it can easily be argued that good learning strategies are useful, no matter the subject. In fact, Saundra McGuire is not only a chemistry professor at Louisiana State University; she is also

director of the school's Center of Academic Success and a frequent speaker on the topic. The following are study strategies for students as outlined in the article:

1. Take notes by hand. Recopy and paraphrase these notes soon after class.
2. If you miss class, get the notes of a classmate and copy them; don't simply download the notes from the internet. In this way you will be discussing the class content with a fellow student.
3. Use your text! Do the examples as if they were homework, and you will have a model to check not only answers but process.
4. Form study groups, but don't neglect working on your own.
5. Teach the material to each other.
6. Set attainable goals.

Dr. McGuire (2010) is a noted speaker, and in her presentation at the SACS Summer Institute she reflected on the attributes of students who are expert learners. These particular students

- actively engage with the material;
- take responsibility for their own learning;
- motivate themselves and guide their own learning;
- know HOW to learn;
- attribute failures to correctable causes and successes to personal competence; and
- use learning strategies selectively and strategically, based on their learning style.

In an article published in the *Psychology Journal* entitled "Self-Regulation of Homework Completion," Hefer Bumbennutty (2009) finds that students' "self-regulatory processes and motivational beliefs were associated with their academic success" (p. 148). He recommends that "learning about self-regulation and how to enhance and maintain high motivational beliefs should become an important component of educational programs for college students" (p. 148). He suggests that students keep a homework log to help them improve their performance and

set specific academic goals. This process was seen to lead to better performance on exams. It is believed that the effect is due to better time-management skills.

Tutoring

The 1997 article by Boylan, Bliss, & Bonham (1997), "Program Components and Their Relationship to Student Performance," published in the *Journal of Developmental Education,* found that while there did not at first appear to be a positive correlation between tutoring and program success, a further investigation found that when the tutoring programs included tutor training, there was, in fact, a positive correlation. It is important to note that in order for tutoring programs to reach their full potential in terms of aiding student success, the institution must provide adequate training for its tutors. In research on supplemental instruction programs, reported in "Teaching and Learning in an Era of Change," Webster & Dee (1997) found supplemental instruction by "super tutors" who attend classes with their tutees and received training in tutoring were instrumental in helping students to succeed.

Dedicated Math Lab

Several articles outline ways in which a dedicated mathematics laboratory may be used. For instance, as listed on the National College Transition Network, Pam Meader (2007), in her article entitled "Preparing Students for College-Level Math," describes the weekly requirement for her students in a hands-on lab; she asks students to journal about the learning process and the development of critical thinking. In these weekly labs, students pursue discovery learning in a relaxed and comfortable environment.

"Remediation Beyond Developmental Education: The Use of Learning Assistance Centers to Increase Academic Preparedness in Community Colleges," by Dolores Perin (2004), is a qualitative case study of fifteen community colleges. The study found that learning-assistance centers and specialized-skill labs increased preparedness in the students who used them. The centers provide a variety of learning assistance tools, including computer-assisted

instruction, learning workshops, and self-paced remediation. In addition, support for tutors is also provided and labs are a place for them to receive professional development.

In *Beyond Crossroads: Implementing Mathematics Standards in the First Two Years of College,* Blair (2006), encourages quality processes in mathematics instruction at all two-year colleges. In the chapter that addresses student learning and the learning environment, the authors state that learning should take place across the campus and not just in the mathematics classroom. Among the suggested methods to reach students outside of class is the mathematics resource center. It is noted that successful math centers provide the following resources for their students:

- multiple and varied resources;
- peer and professional tutoring;
- computers and other technology that support instruction;
- workshops focusing on learning styles and reducing mathematics anxiety; and
- opportunities to work individually and in groups. (p. 25)

Inquiry-Driven Pedagogy

There are many proponents of this method. In fact, the late 1990s were a period of intense development for this educational paradigm. To sum up the work and recommendations of the majority of the research, the intention is to transition "From Sage on the Stage to Guide on the Side." In an article by the same name published in *College Teaching*, Alison King (1993) asserts that instructors need to stop viewing students as empty receptacles to be filled with knowledge and start seeing them as active participants in knowledge creation. This approach does not mean that the professor no longer has a role in knowledge sharing; rather, the professor has a different role to play—that of facilitator. As King (1993) states, "The professor is still responsible for presenting the course material, but he or she presents that material in ways that make the students do something with the information—interact with it—manipulate the ideas and relate them to what they already know" (p. 2). She cautions that "students do not

spontaneously engage in active learning; they must be prompted to do so" (p. 3). The professor must be an active participant "who orchestrates the context, provides resources, and poses questions to stimulate students to think up their own answers" (p. 3). King has conducted research and published on the positive effects of this strategy, stating that students who have been asked to formulate their own questions and respond to their classmates' questions perform better on tests over lecture material than students who are taught by more conventional methods. The results of this type of classroom dynamic are positive, especially when "the cooperative approach uses some sort of group goal and stresses individual accountability. Apparently, when students are individually accountable for their learning and a group goal is established, group members have incentive to help each other learn the material" (King, 1993, p. 9).

Erica McWilliam (2008) expands even further in her article *Unlearning How to Teach*, calling for the professor to move from "guide on the side" to "meddler in the middle" (p.1). McWilliam (2008), states that unless the professor is willing to shed the mantle of authority and become an active participant in the inquiry process of the class, outcomes will not be optimal. She uses the phrase "useful ignorance" to describe the state that a professor must allow himself or herself to occupy in order to help students become active learners and meaning makers. McWilliam asserts that "'not knowing' needs to be put to work without shame or bluster" (p. 266). Faculty who have until now been the deliverers of content must become "co-creators" of value. They must be engaged in an exchange of ideas and information with students that sidelines the traditional view of education as the consuming of information for regurgitation on exams. Instead, teachers and students work side by side to create meaning that lasts beyond the chapter or unit exam.

Jose Bowen is another outstanding proponent for change in education. His article "Teaching Naked: Why Removing Technology from your Classroom Will Improve Student Learning," published in *The National Teaching & Learning Forum,* calls for a rethinking of what

instructors do with their time in class. Bowen (2006) asserts that professors should move the simple conveyance of information to outside the classroom using widely-available computer and technological resources to allow students to watch or listen to lectures on their own time. This strategy allows the teacher to do what teachers do best—interact with students. His call echoes the previously-discussed authors and addresses when and how students will interact with content. Bowen notes that professors should not give up precious class time with students to simply provide information that can be accessed much more efficiently and often in a more convenient and entertaining fashion; class time should be used to connect. His recommendations dovetail with those of McWilliam in that he advises instructors not to prepare for class, but instead to be "naked" in front of students and let the interactions lead the way. He points out that many of the most rewarding experiences any professor can remember often have to do with discussions that arose in class that were not part of a prepared lecture, the "Aha!" moments. This approach does not suggest that teachers are without a "bag of tricks" in the form of questioning and classroom-discussion techniques; it simply advocates teachers allow the students and their classroom interaction to determine when and how to use learning strategies.

Kelvin Thompson (2001) explores these issues in "Constructivist Curriculum Design for Professional Development: A Review of the Literature." *Constructivism* is a term used to describe educational experiences where a student is called upon to construct meaning instead of being a receptacle passively receiving the transmission of information. Of most interest to GCC is the fact that research shows adult learners value experience at least as much as "textbook" learning. Since most students at a community college can best be characterized as adult learners, this information is pertinent. Thompson (2001) cites research on the topic of adult learners by Conner:

> First, learners should be informed why something is important to learn. Second, learners should be shown how to direct themselves through information. Third, the topic being presented should be related to the learners' experiences. Fourth,

> people will not learn until they are ready to learn and are motivated. Fifth, learners may need help overcoming inhibitions, behaviors and beliefs about learning. (p. 5)

Thompson (2001) emphasizes that students come to college with backgrounds of differing types—informational, attitudinal, emotional, and experiential—and that instructors must attend to and use diversity advantageously. Blair (2006) also addresses issues relating to students: "For today's students, learning is participatory—*knowing* depends on practice and participation" (p. 53). The authors list four types of active learning:

- Collaborative/Cooperative Learning;
- Discovery-Based Learning;
- Interactive Lecturing and Question-Posing; and
- Writing. (p. 54)

These professionals offer practical advice for making the educational experience relevant for students.

The work of all these researchers points to the same concept: to create a classroom environment where students are engaged in a search for meaning. This process occurs when students are a part of the process and not vessels to be filled, when instructors attend to what students want to know and how they want to learn.

LITERATURE REVIEW IMPLICATIONS FOR GCC

The literature review gave the Development Team the direction needed to decide on an overall strategy that would be employed to reach the goals that had been developed by the team. The review took a broad look at the current trends in best practices for developmental mathematics education, with a special focus given to the areas identified in the inquiry phase of development. Of interest to GCC in the area of advising and placement is the fact that the study found that there is a negative association between mandatory placement and student success.

Placement

While Grayson requires mandatory testing and placement in developmental mathematics, there is one important and potentially revealing point to consider: the students are able to self-select the level of developmental math in which they enroll. In GCC's survey of developmental mathematics students, several admitted to self-placing in a higher developmental level than their test scores indicated. This practice must end so that the effects of the mandatory testing can be realized.

While the evidence is largely unsubstantiated at this point, the mathematics faculty at GCC report that a large proportion of their developmental mathematics students are not correctly placed. A certain percentage of incorrect placements may be attributed to inaccurate and inflated self-placement, but a larger percentage is likely due to inaccurate placement based on testing instruments being used, or rather, on how the data resulting from testing are being used. COMPASS and THEA are the two instruments currently in place at GCC. According to the guidelines in the *Compass Guide to Effective Student Placement and Retention in Mathematics* (2009) provided by ACT, creator of COMPASS, Grayson is accepting far too low a level of achievement on the test for placement into its three developmental levels. This fact may partially explain the problems GCC students have encountered with placement. For instance, ACT recommends an algebra score of 46-65 for intermediate algebra courses (GCC's 0330). The current cut-off score for 0330 is 26-38. ACT recommends that schools use their own institutional data to inform cut-off score decisions, but this seems to be quite a departure from the exam publisher's recommendations. More thought needs to be given to the scores currently in use, given the fact that GCC students seem often to be placed in too high a level.

The State of Texas mandates the use of the one of four commercially-available placement tests; as a result, GCC would be unable to completely convert to an institutionally-created placement exam. However, the college could use the four accepted tests to decide which students need further testing and thereby be more able to tailor placement to institution.

Course Redesign

While the models mentioned by NCAT in the course redesign literature review all have their vocal proponents, none was judged by the development team to be a good fit for GCC. The transitions course more closely follows currently-accepted developmental math programs, although it should be noted that it is a good deal more rigorous than the program currently in place at GCC.

Math Anxiety

Math anxiety is a huge problem for many students, particularly those who struggle with the subject. Many GCC students responded in a survey that their biggest obstacle when it comes to math is anxiety, either with the subject itself or with testing. Others listed anxiety as something that they need help overcoming.

Tutoring

While GCC currently has a “super tutor” program, the number of students available to serve has historically been limited. Clearly, tutoring should play a role in any successful developmental mathematics program. While it is ideal to have trained tutors who accompany students to their classes and then offer supplemental instruction, employing adequately-trained tutors is a crucial part of the equation.

Dedicated Math Lab

In addition to providing support for the students themselves, a GCC math center will also serve as a location to offer training for the tutoring program. Peer tutoring has been shown to be most effective when student tutors have received adequate training. Without a physical location and necessary resources to provide such training, it would be very difficult to ensure the quality training GCC needs in order for tutoring to provide maximum benefits for students.

Clearly, developmental mathematics students need support, and this support must extend beyond both the four walls of their classrooms and the encouragement of their

instructors. A mathematics resource center, or math lab, can play a vital role in providing the needed support for students to succeed.

Inquiry-Driven Pedagogy

Many of the professionals at work today in the classroom were taught via the lecture mode of instruction. But there are many other options available to educators, and research shows that these are often far more effective in helping students attain the educational outcomes intended for a course. The most intriguing pedagogy for GCC's work is the inquiry-driven or discovery method. This frame of educational reference places the student at the center of the classroom instead of the teacher and seeks to create a more engaging educational experience.

APPLICATION OF THE LITERATURE REVIEW

The work of both the Carnegie Foundation for the Advancement of Teaching and the American Mathematics Association for Two-Year Colleges (AMATYC) served as excellent models for the team on how to proceed. These institutions share a focus on improving developmental mathematics instruction, as well as a vision for how to bring about the needed changes. The Carnegie Foundation and Dr. Uri Treisman of the Dana Center are engaged in what they term a "joyful conspiracy" to transform mathematics instruction for development students from a gatekeeper to a gateway. AMATYC's Developmental Mathematics Committee shares this vision and is working through its New Life for Developmental Mathematics initiative to bring about the same transformation. Rather than simply giving recommendations to fix the current system, both these institutions recommend a complete rethinking of the way in which instructors educate students who struggle with mathematics. They encourage educators to consider that what students need most is a pathway to completion of their mathematics requirements which serves their current and future needs. For many students, their needs do not include college algebra. The current developmental mathematics curriculum is geared

almost exclusively towards preparing students for a college-level algebra course. However, for many students, a general course in quantitative literacy or a statistics course would be a better option. According to the Carnegie Foundation for the Advancement of Teaching (2011),

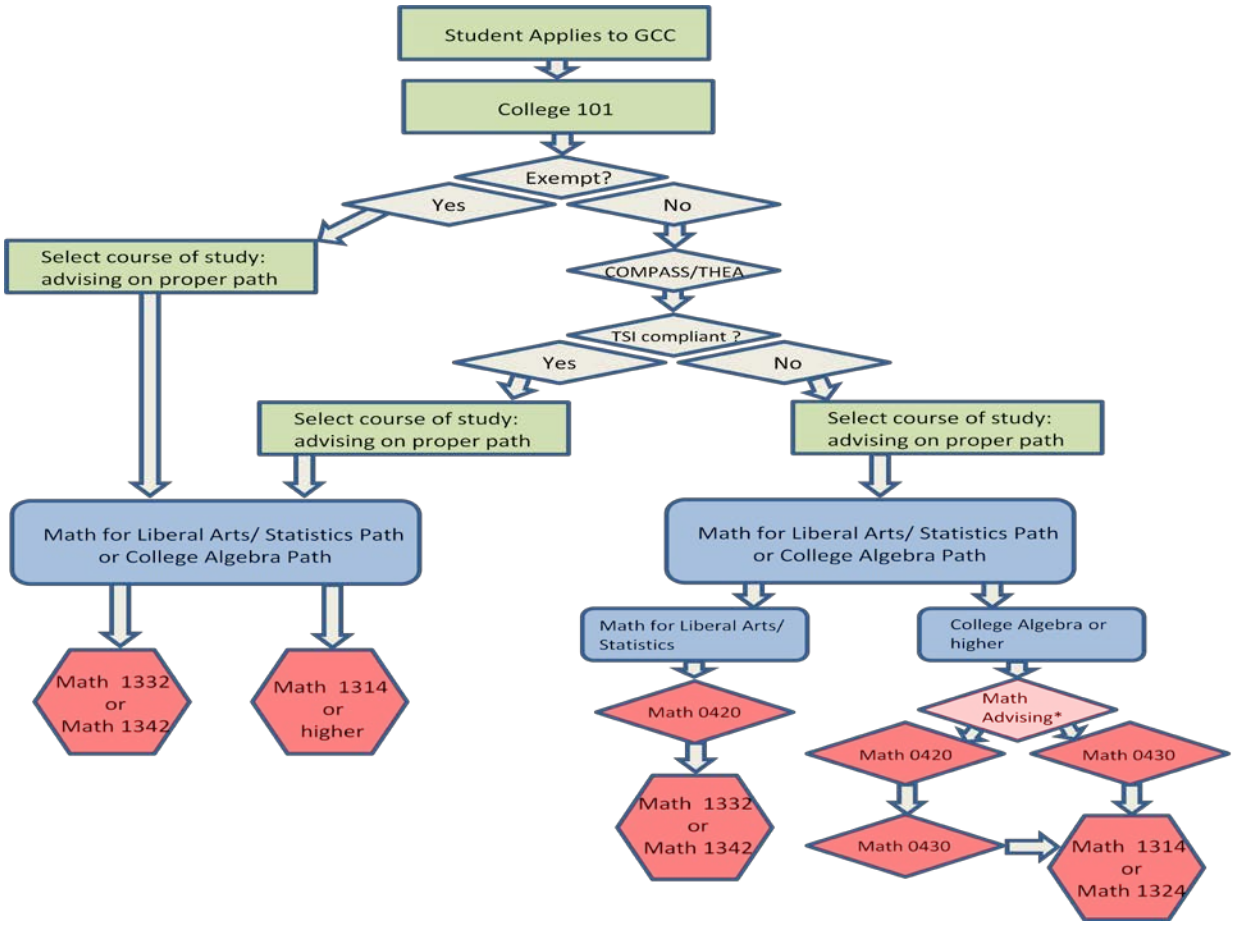
> Many community college students find themselves struggling unsuccessfully to complete multiple developmental mathematics courses that mirror their earlier failed mathematics experiences. Students are disengaged and unmotivated by courses they see as having no relevance to their aspirations or the world around them….It is Carnegie's belief that community college students will have greater motivation to succeed and persist if their mathematics study is engaging, meaningful, relevant and useful. (para. 2 & 4)

These beliefs are echoed in the work of AMATYC's New Life program (2010):

> The New Life model is based on academic professionals building a curriculum to meet their student's needs. We suggest that our students need to see bodies of mathematics as connected in various ways ... and we believe that our students are capable of developing this deeper body of knowledge. Inspiration has a place in our classrooms, for both our students and ourselves. (para. 7)

The QEP Development Team looked at the work of these two esteemed institutions and weighed their recommendations against the other options available for curricular redesign. Team members ultimately decided in favor of the more transformative changes being proposed by AMATYC and the Carnegie Foundation.

The next step involved deciding how to implement these changes in a way that would work within the GCC institutional setting. Ms. Elberson considered both the state mandates for developmental mathematics instruction as well as the changes endorsed by the QEP Development Team and constructed a visualization of the new curricular pathways. The result is shown below:



Math 1332 is Math for Liberal Arts Majors.
Math 1342 is Elementary Statistics.
Math 1314 is College Algebra.
Math 0420 is the first developmental course in the sequence.
Math 0430 is the second course in the developmental sequence.

This plan recognizes that not all students are on a career or educational path that ends in college algebra, and it significantly shortens the time necessary to complete the developmental mathematics requirement for most students.

The redesign of the overall pathway to completion of developmental mathematics was not the only change recommended by the QEP Development Team. The team members also saw a clear need to address the other obstacles as identified by students. The two new

courses, Math 0420 and Math 0430, are completely redesigned to meet the needs of students in the following ways:

- The topics to be covered will address the real academic needs of the students on each of the pathways—no more one-size-fits-all developmental math courses. These topics will follow the recommendations of AMATYC's New Life program, taking into account the particular needs of GCC academic programs. Each program at GCC was reviewed to discover the perceived gaps in student knowledge that make success difficult. These results were compiled and will be used to create a curriculum that is both comprehensive in nature and tailored to the needs of GCC's programs and students.
- Courses will be four hours in length to allow for more in-depth coverage of these course topics. In addition, there will a concerted effort to move away from the lecture method of course delivery and towards a more student-centered approach.
- In addition to the four hours of weekly instruction, there will be a mandatory recitation hour that will allow for instructors to address the very real problems of motivation, study skills, and math anxiety.
- Placement scores will be closely aligned with the course content requirements to facilitate more accurate placement of students on the college-algebra path into the correct developmental course to meet their needs.
- The last piece of the puzzle is the supplemental mathematics lab that will serve to assist students on their paths:
    - Walk-in tutoring will be offered in addition to the currently existing tutoring-by-appointment.
    - Workshops will be offered frequently on topics that students find particularly difficult, such as fractions and factoring, allowing instructors to refer students who need a little extra help to a program that is designed to meet their needs.

- Supplemental education materials will be available to aid students who need more independent practice or access to resources for a class project.

In recognition of the fact that these changes represent a significant departure from current practice, a pilot program will be launched in the fall of 2011 to learn as much as possible about how the proposed system will work at GCC. It will consist of two sections of Math 0420, offered in two different time configurations by two different instructors, in an effort to collect as much data as possible. Math 0430 will be offered as a pilot in the spring of 2012. These course sections will be closely monitored and assessed so that needed changes can be made before the proposed implementation of the program in the fall of 2012.

ACTIONS TO BE IMPLEMENTED

Reflecting on the goals of the QEP gives direction and purpose to the actions planned for implementation. The goals and objectives are reiterated below:

- **Goal 1**: Increase the number of students who successfully complete the developmental sequence.
  - Reduce mathematics anxiety of developmental students.
  - Increase ownership of the educational process in developmental mathematics students.
  - Develop a dedicated mathematics lab for supplemental instruction of developmental mathematics students.
- **Goal 2**: 70% of developmental mathematics students will attain at least 70% of the student learning outcomes for their developmental mathematics courses.
  - Develop a dedicated mathematics lab for supplemental instruction of developmental mathematics students; and
  - Redesign the current developmental sequence and courses.

Note that the objective to create a dedicated mathematics lab is shared between the two goals. This objective is a reflection of the fact that the mathematics lab will support several different strategies in terms of student success: its role as a hub for supplemental instruction and support will serve students both in attaining the specific learning outcomes for the course and in attaining the extra-curricular skills necessary to be successful in that learning.

These goals and outcomes will be reached through a careful rethinking and redesigning of the current system in order to provide more meaningful educational outcomes and the support needed to attain those outcomes. As discussed earlier in the narrative, GCC is adopting the recommendations of AMATYC's New Life group and the Carnegie Foundation for the Advancement of Teaching to redefine what it means to develop a student's mathematical proficiency and even what it means to be mathematically proficient. Algebra is no longer the "gold standard" by which the institution will judge a student's readiness to complete college-level mathematics. There are, and should be, alternatives to a college algebra course.

One of the first actions to be implemented has already taken place. Ms. Elberson visited with the program directors and department chairs across campus in the fall of 2010 to ask them to re-examine the mathematics course that serves to fulfill a student's general education math core requirement. Many campus programs were requiring college algebra or at least recommending that students favor it over the other options for core mathematics completion. The directors and chairs were educated about the different courses available to fulfill the core requirement and asked to consider whether a "math for liberal arts" or an "elementary statistics" course would be more appropriate to serve the needs of their programs and their students. Many responded that they just assumed college algebra was needed—it had always been that way—or had not ever really given it much thought. Both Associate of Arts in Teaching and Computer Maintenance changed curricula based on these recommendations at the February 2011 meeting of the GCC Curriculum Committee. Other programs were already offering

students multiple options for core completion, and program directors and department chairs were simply made more aware of the possible benefits of these options. A list of discipline-specific mathematics needs can be found in Appendix J.

The next set of actions to be implemented concerns the actual redesign of the developmental mathematics program. As discussed in the institutional profile, the college currently offers three algebra-based developmental courses with the goal of preparing students for college-level coursework in mathematics. The problems with this model have been discussed—too long a time to complete, a lack of relevance to ultimate coursework, and a lack of support services offered in conjunction with classroom instruction. Considering these facts, along with students' responses of what they believe they need in order to succeed, GCC has established a much more relevant, efficient, and supportive developmental program. Appendix K shows a schematic for how the new sequence will operate. A more detailed explanation of each new course follows.

Math 0420 – Mathematical Literacy for College Students

As noted earlier, the current developmental sequence addresses a single topic in mathematical development: algebra. The fact that there are many other important areas of mathematical thinking cannot be disputed. In a March 30, 2011, webinar hosted by NISOD, Dr. Uri Treisman noted that this emphasis on algebra is nothing but an "accident of history."

Math 0420 will be a four-hour course with an additional required fifth-hour of classroom recitation intended to prepare students for Math for Liberal Arts (Math 1332) or Elementary Statistics (Math 1432). The topics to be covered are inspired by the Mathematical Literacy for College Students course being developed by the New Life project of AMATYC and include numeracy, proportional reasoning, algebraic reasoning, functions and modeling, and basic probability and statistics. Student learning outcomes for the course will be discussed in the sections of this report on outcomes and assessment.

The curriculum for this course is being assembled by the mathematics faculty at GCC, which is not alone in the undertaking. When Ms. Elberson visited with the various program directors and chairs about the mathematics requirements of each of their respective disciplines, she also asked them to prepare a list of mathematical competencies they felt that students need in order to succeed in their courses. While a full listing of the responses can be found in the appendix, it is worth noting that the very topics selected for inclusion in Math 0420 are quite a good fit. The text for the course is *Mathematics in Action: An Introduction to Algebraic, Graphical, and Numerical Problem Solving Strategies* (2012), the first in a three-book series. The following is an excerpt from the authors' preface that clearly states the rationale for GCC's selection:

> Our team, of fourteen faculty…used the AMATYC *Crossroads* standards to develop this three-book series to serve a very large population of college students who, for whatever reason, have not yet succeeded in learning mathematics. It became apparent to us that teaching the same content in the same way to students who have not previously comprehended it is not effective, and this realization motivated us to develop a new approach. *Mathematics in Action* is based on the principle that students learn mathematics best by doing mathematics in a meaningful context. (p. xiv)

The mathematics faculty will also be employing several ancillary texts to provide a source of rich and meaningful content-specific problems. The *Practical Problems in Mathematics* series, published by Cengage, will serve as a supplement for this much-needed resource.

The pedagogical strategies that will be implemented to deliver the course will also be a departure from the standard lecture format. Students today need to be engaged in order to learn, and many of GCC's students requested more engagement in their coursework. Faculty will be working to incorporate the pedagogical strategies recommended in the research on best practices and cited in the literature review to create a more learner-centered classroom with an inquiry-driven focus. These changes will take place over time, with faculty implementing at least one of these strategies per semester in each of their developmental courses.

The literature review explored the negative impact that math anxiety has upon students' abilities to explore and discover mathematics on their own or in small groups. The support for students in this course has also been carefully considered. The fifth hour of the class, a mandatory recitation session, has been formulated to deal with affective issues such as math anxiety and the students' attitude towards ownership of the education process. Strategies will be taught to help students overcome these barriers to success. GCC will employ one of the most recognized texts on the subject of overcoming mathematics anxiety—Sheila Tobias' *Overcoming Math Anxiety.* Students will work with their instructors on a one-on-one basis early in the semester to create a contract (being developed Fall 2011) which outlines in the steps that students will take in order to be more successful and accountable in their mathematics courses. In addition, students will experience a more relaxed environment, allowing them form bonds with their classmates that research shows will help them persevere in the face of difficulty. Study skills germane to mathematics courses will also be taught. Many students may also be enrolled in a general study skills or Learning Frameworks course, but there are differences in how a student studies effectively for a mathematics course. GCC will address these issues and teach students how to make the most of their math study time.

Math 0430 – Transition to College Algebra

While many students do not need college algebra for their degree plans, many do, and this course will provide underprepared students with the basics needed to succeed. Like Mathematical Literacy for College Students, Transition to College Algebra is a four-hour course with a mandatory fifth hour of recitation. Students who are on a path to college algebra may either begin here or with Math 0420, depending on the results of their placement testing. The fact that only students on their way to an algebra course will be enrolled in this course will help with the homogeneity that research shows is important to success in developmental math.

The topics to be covered are again drawn from the recommendations of the New Life Project of AMATYC, including: numbers and polynomials, functions, and geometry and basic

trigonometry. Actual learning outcomes for the course can be found in the section of this report on outcomes and assessment. The text for the course is *Mathematics in Action: Algebraic, Graphical, and Trigonometric Problem Solving* and is the third in the series. The Cengage *Practical Problems* series will serve as a source of ancillary material for this course as well, with faculty selecting problems that fit within the context of the course.

The pedagogical changes that will take place in Math 0420 will be mirrored in this course. Students will be active learners, and care will be taken to ensure that best-teaching practices will be employed by all instructors. Likewise, the support for students will be the same as for Math 0420. Math anxiety reduction, ownership of the educational process, study skills, and group cohesion will all be emphasized in the mandatory fifth hour of class. Students who take both courses will be well-grounded in effective strategies for succeeding in both the academic and affective areas of their college-level mathematics experience.

Placement

Students will be placed into each of these courses on the basis of their major and their scores on one of two currently-used placement instruments—the COMPASS and the THEA. Students who are majoring in subjects that do not have a college algebra requirement will be required to take only Math 0420 if they do not meet the minimum qualifying score noted below for each of the currently-used placement tests at GCC:

THEA:	230 or above
COMPASS:	Algebra domain – 39 or better
	Elementary Algebra domain – 63 or better

These scores represent the minimum qualifying scores defined by the Texas Higher Education Coordinating Board.

Students who are majoring in subjects that have a college algebra requirement must begin their developmental work with Math 0420, followed by Math 0430, if they do not meet the minimum qualifying score listed below:

THEA: 230 or above

COMPASS: Algebra domain – 39 or better

Elementary Algebra domain – 63 or better

Students who do meet these minimum qualifying scores, but do not meet the institutionally-defined scores required for entry directly into college algebra as noted below will begin their developmental studies with Math 0430.

THEA: 270 or above

COMPASS: Algebra domain – 46 or better

Students who meet the scores above will be allowed to enter directly into college algebra. To progress to either the next developmental level or to college-credit mathematics, a student must make a grade of C or better in the current developmental course.

Dedicated Mathematics Lab

It has been established that a mathematics resource center, or mathematics laboratory, can be of great benefit to students. The GCC Math Hub will play an integral role in the overall QEP design. While classroom time and resources will be dedicated to helping students succeed, the institution anticipates that many may need more support than the classroom can provide. GCC envisions the Math Hub as serving several roles in the overall planned course redesign, including:

- walk-in tutoring;
- supplemental Instruction in the form of regularly scheduled workshops designed to address common conceptual stumbling blocks such as fractions, factoring, etc.;
- a resource for students working on group projects—computer support, resources, and a place to congregate;
- computer support for those students wishing to use technology to practice skills;
- workshops focused on mathematics anxiety and study skills to supplement the work done in the classroom or for students who need more support; and

- ❖ workshops conducted on mathematics topics requested by faculty across disciplines—for instance, welding faculty might request a timely workshop on factoring to coincide with the demands of coursework.

The center will be open evenings and some weekends per month to accommodate students with challenging work and academic schedules. It will be staffed by a full-time coordinator (Appendix L) with at least a bachelor's degree in mathematics in addition to adjunct support. The director will be charged with the following responsibilities:

- ❖ data collection on Hub usage;
- ❖ data collection on student learning outcomes for workshops;
- ❖ coordination of workshops;
- ❖ facilitation of some workshops;
- ❖ coordination of adjunct instructor staffing, which will likely be needed to provide adequate coverage during peak usage; and
- ❖ coordination of tutoring.

Each full-time math faculty member has committed to serve as a professional tutor by providing one hour per week of his or her office hours in the Hub. These faculty members will also facilitate workshops as needed.

Professional Development

As noted above, many of the changes being proposed will involve a gradual transition to current pedagogy. Therefore, faculty, particularly adjunct faculty, will need to be given a firm grounding in the new methods GCC will be implementing. Most mathematics adjuncts employed at GCC are teaching at the developmental level; since they are usually only on campus when teaching their courses, a concerted effort must be made to include them in all training.

The changing pedagogical paradigm from primarily lecture to primarily student-centered inquiry will require that full-time faculty receive training on how best to conduct their classes.

Training sessions will be held throughout the duration of the project. The old adage "sage on the stage" must be replaced with the new model of "guide on the side" or even "meddler in the middle." However, this process takes time, and faculty reflection and conversation will be essential in moving towards a more learner-centered model of instruction.

The process of faculty development will unfold and develop over the course of the project. Mathematics faculty will be encouraged to research and adopt one of the recommended best practices found in Appendix M in each of their developmental math courses. They will keep careful notes on how the intervention worked in their classes and how it could be improved. The Math Department will conduct monthly meetings to share results and to discuss the relative effectiveness of the different strategies. The department will employ a standard rubric to determine the success of the intervention of each faculty member's experience during implementation in terms of both student engagement and learning outcomes.

- Student Engagement: Faculty will note their perception of the results of the intervention, comparing the results with their past experiences in teaching the same material (see rubric below). They will be encouraged to include notes as to why they believe that the intervention either did/did not produce the desired outcomes and how it could be improved upon in the future.

	Less Successful	Equally Successful	More Successful
Student Participation			
Student Attitude			

In addition, students will be asked to provide feedback by writing a paragraph about their experiences with the intervention. This feedback will provide instructors with a rich source of formative data, albeit indirect, that they may use to fine-tune further iterations of the intervention.

- Learning Outcomes

- student performance on an instructor-designed formative assessments measure of student learning; and
- student performance on a summative measure of student learning (i.e., exam questions, project completion, etc.).

These assessment results will be shared at the regular meetings of the developmental mathematics faculty. The formative results will be used to make changes to the process as it is developing. The summative results, together with the student perceptions of the intervention, will guide decisions about the utility of the strategy in enhancing student learning outcomes.

As faculty gain more experience with implementing these new strategies, they will have a much better idea of the interventions that best improve outcomes in developmental math. They will also have a much better idea about the training needed for adjunct and full-time developmental mathematics faculty. These strategies will be accomplished in a variety of ways:

- A faculty development professional with experience in the interventions who has been most successful will be contracted to conduct one-day workshops for faculty during the pre-service week of each long semester.
- Formal monthly meetings will be held for all developmental mathematics instructors to share their successes and to support one another through difficulties. The schedule will be designed to accommodate adjuncts who may have trouble attending a daytime meeting. It is vital that all adjuncts take part in the process; therefore. a small stipend will be offered for their participation.
- Faculty who have been particularly effective with a given intervention will be asked to lead periodic workshops to train others in the best use of the strategy.

In this manner, GCC will continually assess and improve its strategies and implementation of best-practice techniques. It will take time to find the right fit for GCC and its students, but faculty will support each other and students every step of the way.

QEP Steering Committee

Upon approval and full implementation of the QEP, a QEP Steering Committee will be created to replace the Development Team as the institutional-level body charged with directing the Quality Enhancement Plan efforts. The committee will consist of all members of the GCC mathematics faculty, the Math Hub Coordinator, three science professors, and four Workforce Division professors. The purpose of this committee will be to coordinate and implement improvements that are deemed necessary as a result of assessment. In short, this committee is charged with closing the assessment loop and making sure that all stakeholders have a voice in GCC's ongoing efforts.

STUDENT LEARNING OUTCOMES AND ASSESSMENT

In order to assess the achievement of the goals of the QEP, GCC has developed student learning outcomes and will assess, analyze, and use the results of this analysis to improve student learning in developmental mathematics. The two goals and four objectives for the QEP are reiterated below:

Goals:

1. Increase the number of students who successfully complete developmental mathematics.
    a. Reduce mathematics anxiety of developmental math students (Objective 1).
    b. Increase ownership of the educational process in developmental students (Objective 2).
    c. Utilize a dedicated mathematics hub for supplemental instruction of developmental mathematics students (Objective 3).
2. 70% of developmental mathematics students will attain at least 70% of the student learning outcomes for their developmental mathematics courses.

a. Develop a dedicated Mathematics Hub for supplemental instruction of developmental mathematics students (Objective 3).
b. Monitor the redesign of the developmental mathematics courses and sequence (Objective 4).

Note that Goals 1 and 2 share the objective of utilizing the Mathematics Hub, as it is hoped that it will serve to ensure that both goals are met. The assessment process and measures for each of these initiatives will be described in turn.

Goal 1: Increase the number of students who successfully complete the developmental mathematics sequence.

To assess the extent to which GCC will accomplish this goal, the success rate for the current developmental courses and sequence will be employed as a baseline against which to compare the success of the overall redesign. The target for this measure is to see an increase in the number of students who successfully complete the development sequence. As a baseline for this measure, GCC will consider the successful completion rates for each of the developmental courses in the sequence for the past five years. Successful completion is defined as a grade of C or better in the course.

Academic Years Ago

	1	2	3	4	5	Average
Math 0320	**53.58%**	**56.82%**	**55.41%**	**51.49%**	**51.84%**	**53.80%**
Math 0330	**51.82%**	**52.46%**	**54.67%**	**50.19%**	**51.41%**	**52.08%**

While the new classes are not a match for the old, the relative success of the redesign is measured by comparing Math 0420 to Math 0320 and comparing Math 0430 to Math 0330.

For each of the objectives intended to support this goal, measures and targets have been developed to assess success.

(1) Reduce the mathematics anxiety of developmental math students.

To assess this outcome, the MAS-R or Mathematics Anxiety Scale—Revised (Appendix N) will be used to quantify and measure mathematics anxiety. The measure was adapted from previous measures of mathematics anxiety by Dr. Haiyan Bai at the University of Central Florida. Dr. Bai has granted GCC permission to use this instrument for the QEP assessment (Appendix O).

The baseline data will be obtained by administering the MAS-R to each cohort of students at the beginning of the semester. The achievement targets include

- ❖ developmental mathematics students who will show a 25% decline in their level of mathematics anxiety as measured by the MAS-R when retested at the end of the semester.

In order to ascertain if the redesign is more effective than the current practice in reducing mathematics anxiety, GCC will co-administer the survey to all students in sections of current developmental mathematics courses (Math 0310, 0320, and 0330) during the fall of 2011 and the spring of 2012. This data will deepen GCC's understanding of the impact of the programs by acting as a control group in which math anxiety as a formal component of the curriculum will not be addressed.

(2) Increase ownership of the educational process in developmental mathematics students.

To assess this objective, several measures have been developed.

- ❖ 10% decrease in absenteeism of developmental math students.
  - o The baseline measure will be absenteeism in the previous developmental mathematics sequence. Absentee rates will be carefully documented for the fall 2011 and spring 2012 cohort of developmental mathematics students in Math 0310, 0320, and 0330.
  - o The results of this intervention will be judged by comparing them to the absenteeism rates in Math 0420 and Math 0430.

- ❖ 75% of the students will meet the agreed-upon stipulations of an educational contract with the professor.
  - o These contracts will be developed in each section in a participatory fashion, with students and faculty working to create a mutually-acceptable set of agreements. The items that should be considered are categorized as follows in terms of what a student should do in each environment to be most successful:
    - inside the classroom;
    - outside the classroom; and
    - attitudinal considerations.
  - o The determination of whether or not the contract has been fulfilled and to what level will be made on a one-on-one basis between the professor and student.

(3) Utilize a dedicated Mathematics hub for supplemental instruction of developmental mathematics students.

To assess this objective, GCC will consider several measures intended to capture how successful the Hub is in providing support and supplemental instruction to developmental mathematics students.

- ❖ 75% of the students who use the Math Hub will return to use it again. As noted, GCC will employ a full-time Math Hub Coordinator who will track student usage.
- ❖ GCC will look at the correlation between frequency of the Math Hub usage and final average grade in developmental math for each student who uses the Hub. The measure will be the coefficient of the correlation. The target for this measure is to see a positive and statistically significant correlation between the two for each year's cohort of Math 0420 and Math 0430 students.

Goal 2: 70% of developmental mathematics students will attain at least 70% of the student learning outcomes for their developmental mathematics courses.

Student Learning Outcomes have been written for Math 0420 and Math 0430 and will be measured in every section of every course. Data will be systematically collected, analyzed and sent to the QEP Assessment Committee and the AAC.

(4) Monitor the redesign of the developmental mathematics courses and sequence.

Math 0420 is a newly designed course, and therefore, there is no baseline data for comparison. However, the following SLOs will be used for measuring the effectiveness of the course. The outcomes for Math 0430 are similar to the outcomes for the current Math 0330. A baseline developmental math capstone exam will be administered to students in all sections of Math 0330 and the pilot sections of Math 0430 during the pilot year. The results of this baseline developmental math capstone exam will be used to measure the success of Math 0430 in preparing students for college algebra as compared to Math 0330.

The student learning outcomes for the two proposed courses, Math 0420 and Math 0430, are found below. These are inspired by the New Life for Developmental Mathematics subcommittee of the Developmental Math Committee of AMATYC.

Developmental Mathematics Program Learning Outcomes (Appendix P) and GCC Institutional Learning Outcomes (Appendix Q) link to every SLO listed below. The Developmental Mathematics PLOs and GCC ILOs can be found in the appendices.

Math 0420 – Mathematics Literacy for College Students

- Numeracy—Students will:
  - demonstrate operation sense (C, 1);
  - demonstrate competency in using fractions (C, 1); and

- apply quantitative reasoning to be able to solve problems involving quantities or rates. (D, 1, 2, 3, 6).

❖ Proportional Reasoning—Students will:

- apply quantitative reasoning strategies to solve real-world problems with proportional relationships (D, 1, 2, 3, 6).

❖ Algebraic Reasoning—Students will:

- describe the effect that a change in the value of one variable has on the value(s) of other variables in the algebraic relationship (D, 1, 2, 3, 6); and
- construct and use equations or inequalities to represent relationships involving one or more unknown or variable quantities to solve problems (D, 1, 2, 3, 6).

❖ Functions and Modeling—Students will:

- translate problems from a variety of contexts into mathematical representation and vice versa (D, 1, 2, 6);
- describe the behavior of common types of functions using expressions, graphs and tables (D, 1, 2, 3, 6); and
- use appropriate terms and units to describe rate of change (D, 1, 2, 3, 6).

❖ Basic Probability and Statistics—Students will:

- explain and/or interpret data using measures of central tendency and measures of variability (D, 1, 2, 3, 6);
- use technology to generate basic models given appropriate data (D, 1, 5, 6); and
- compute basic probabilities using both empirical and theoretical probability (D, 1).

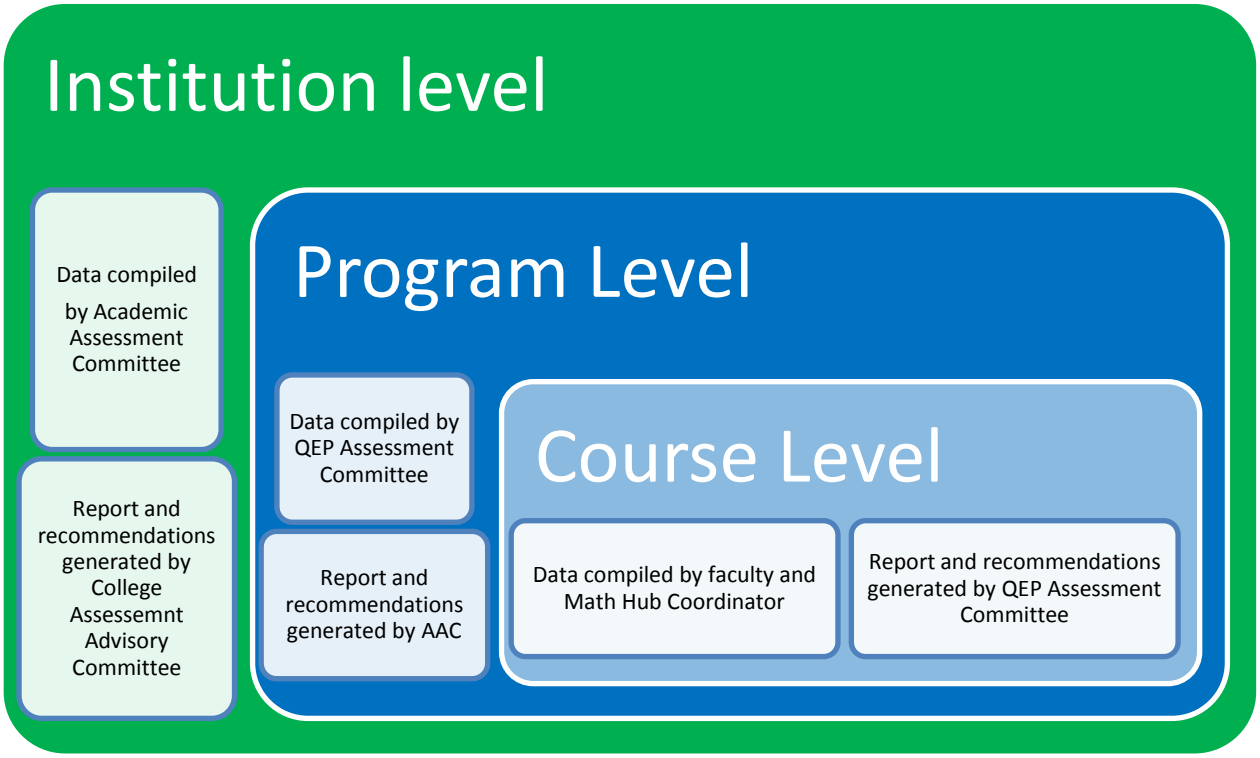
Math 0430—Transition to College Algebra

- Numbers and Polynomials—Students will:
  - show procedural fluency with polynomial expressions focusing on factoring (C, 1);
  - use equations, inequalities, and systems of equations and inequalities to represent real-life situations and find solutions via symbolic, numeric and graphic methods (D, 1, 2, 3, 6);
  - use exponential and power equations to represent real-life situations and find solutions via numeric and graphic methods (D, 1, 2, 3, 6); and
  - use algebraic methods to solve radical and rational equations (C, 1).
- Functions—Students will:
  - identify whether a given relation is a function and identify its domain and range (C, 1);
  - represent exponential, logarithmic, linear, and power functions in symbolic, graphic and numeric form (C, 1);
  - represent real-life situations with either a discrete or continuous model, as appropriate (D, 1, 2, 3, 6); and
  - represent real-life situations with appropriate functions and describe the rate of change of the function (D, 1, 2, 3, 6).
- Geometry and Trigonometry—Students will:
  - use the properties of basic geometric shapes to represent and solve real-life problems (D, 1, 2, 3, 6); and
  - use the basic trigonometric functions in the context of right triangles to solve real-life problems (D, 1, 2, 3, 6).

At the end of each semester, a standardized assessment will be administered to all sections of each course to determine the extent to which the learning outcomes have been attained.

Assessment Plan

The assessment of the QEP will take place on three fundamental levels: course, program, and institutional. In recognition of the multi-tiered aspect of assessment, GCC has put into place three committees responsible for ongoing evaluation of the QEP as shown in the representation below:



At the heart of the ongoing process of review and continual improvement is the QEP Assessment Committee, which will be responsible for collection and review of all course-level and Math Hub assessments. This review of assessment data will take place each semester to facilitate a continuous process of improvement. The next two layers in the hierarchy serve the campus as a whole, and the QEP makes up only a portion of these committee members' duties—the Academic Assessment Committee (AAC) and the College Assessment Advisory Council (CAAC). The assessment at the program and institutional levels will take place each spring so that necessary improvements can be implemented for the following fall.

Program-level assessment will be carried out by the AAC. An overview of the AAC can be found in the GCC Instructional Services Assessment Handbook (2010). A brief excerpt follows:

> The purpose of the Academic Assessment Committee is to assist with and review academic assessment processes and results for continuous improvement. This committee reports to the Vice President of Instruction on implementation of academic assessment processes. This committee ensures the integrity of the assessment process including student learning outcomes, program effectiveness and alignment with the college mission to include the following:
>
> 1) Review curriculum mapping of course-level outcomes, program-level outcomes and institutional-level outcomes.
> 2) Review course-embedded assessment results at the end of each semester and provide gap analysis for improvement plan.
> 4) Oversight of the program review process for effectiveness tied into improved learning. (p. 8)

Assessment Schedule

The following is a detailed schedule of all assessment that will be carried out to measure the success of the QEP. The baseline year is included, as important data will be collected and will serve to determine the success of the interventions relative to the developmental mathematics curriculum currently in use at GCC. Each of the interventions is listed, along with the measure that will be used to assess its success. The party responsible for administration of each measure is listed. The referenced Developmental Mathematics Program Learning Outcomes are found in the appendices, as are the GCC Institutional Learning Outcomes.

Baseline Year (Fall 2011 to Spring 2012)

When	PLO	ILO	Objective	Measure	Responsible party	QEP Goal
Fall 2011	A	8	Anxiety Reduction (1)	MAS-R *Pre-&Post-test*	All developmental math instructors	I
	n/a	8	Increased Ownership (2)	Absenteeism	All developmental math instructors	I
	B1	8		Individual contracts	Instructors in all sections of Math 0420 pilot	I
	B2	8	Math Hub (3)	Correlation between math grade and usage	Math Hub Coordinator and QEP Director	I
	n/a			Repeat usage	Math Hub Coordinator	I
	C,D	1,2, 3,5 6	Course Redesign: Math 0420 (4)	End-of-course assessment	Instructors in all sections of Math 0420 pilot	II
Review of all assessment results will be conducted by QEP Assessment Committee. Recommendations for improvement will be carried out by QEP Steering Committee.						
When	**PLO**	**ILO**	**Objective**	**Measure**	**Responsible party**	**QEP Goal**
Spring 2012	A	8	Anxiety Reduction (1)	MAS-R *Pre-&Post-test*	All developmental math instructors	I
	n/a	8	Increased Ownership (2)	Absenteeism	All developmental math instructors	I
	B1	8		Individual contracts	Instructors in all pilot sections of Math 0420 and 0430	I
	B2	8	Math Hub (3)	Correlation between math grade and usage	Math Hub Coordinator and QEP Director	I
	n/a			Repeat usage	Math Hub Coordinator	I
	C,D	1,2 3,5 6	Course Redesign: Math 0420 (4)	End of course assessment	Instructors in all pilot sections of Math 0420 and Math 0430	II
	C,D	1, 2, 3, 5, 6	Course Redesign: Math 0430 (4)	Developmental Math Capstone	Instructors in all sections of Math 0330	II

Review of all assessment results will be conducted by QEP Assessment Committee. Recommendations for improvement will be carried out by QEP Steering Committee.
Review of all program-level assessment results will be conducted by AAC. Recommendations for improvement will be carried out by QEP Steering Committee.
Review of all institution-level assessment results will be conducted by CAAC. Recommendations for improvement will be carried out by QEP Steering Committee.

Full Implementation

When	PLO	ILO	Objective	Measure	Responsible Party	Goal
Fall	A	8	Anxiety Reduction (1)	MAS-R *Pre-&Post-test*	Instructors in all sections of Math 0420 and Math 0430	I
	n/a	8	Increased Ownership (2)	Absenteeism	Instructors in all sections of Math 0420 and Math 0430	I
	B1	8		Individual contracts	Instructors in all sections of Math 0420 and Math 0430	I
	B2	8	Math Hub (3)	Correlation between grade and usage	Math Hub Coordinator and QEP Director	I
	n/a			Repeat usage	Math Hub Coordinator	I
	C,D	1, 2, 3, 5, 6	Course Redesign: Math 0420 and Math 0430 (4)	Standardized end-of-course assessment	Instructors in all sections of Math 0420 and 0430	II
Review of all assessment results will be conducted by QEP Assessment Committee. Recommendations for improvement will be carried out by QEP Steering Committee.						
When	**PLO**	**ILO**	**Objective**	**Measure**	**Responsible Party**	**Goal**
Spring	A	8	Anxiety Reduction (1)	MAS-R *Pre-&Post-test*	Instructors in all sections of Math 0420 and Math 0430	I
	n/a	8	Increased Ownership (2)	Absenteeism	Instructors in all sections of Math 0420 and Math 0430	I
	B1	8		Contract	Instructors in all sections of Math 0420 and Math 0430	I

	B2	8	Math Hub (3)	Correlation between grade and usage	Math Hub Coordinator and QEP Director	I
	n/a			Repeat usage	Math Hub Coordinator	I
	C,D	1, 2, 3, 5, 6	Course Redesign: Math 0420 and Math 0430 (4)	Standardized end-of-course assessment	Instructors in all sections of Math 0420 and 0430	II
Review of all assessment results will be conducted by QEP Assessment Committee. Recommendations for improvement will be carried out by QEP Steering Committee.						
Review of all program-level assessment results will be conducted by AAC. Recommendations for improvement will be carried out by QEP Steering Committee.						
Review of all institution-level assessment results will be conducted by CAAC. Recommendations for improvement will be carried out by QEP Steering Committee.						

IMPLEMENTATION TIMELINE

An implementation timeline has been developed to assist the QEP Steering Team through the five year implementation and execution of the QEP. This timeline will serve as a general guide and may change as the implementation and evaluation of the plan unfolds.

Date	Action
Fall 2011 Year-0	• Discontinue internet sections of Math 0330 • Pilot two sections of Math 0420 • Begin implementing learner-centered strategies in all developmental sections with focused reflection and assessment • Open Math Hubs at Denison (Main) and Van Alstyne (South) campuses • Hire full-time Math Hub Coordinator for Main campus • Assign Lori Henderson, full-time Math Professor, to coordinate “Hub South” as a portion of teaching load • Hire and train adjunct faculty as needed to work in both Hubs • Hire and train peer tutors as needed for both Hubs • Develop curriculum for pilot section of Math 0430 to be implemented spring 2011 • Assess o Anxiety reduction in all developmental math sections (0310, 0320, 0330, 0420) o Increased ownership of educational process in pilot sections of 0420 ▪ Absenteeism ▪ Results of student-created contracts

	○ Math Hub effectiveness in supplementing instruction ▪ Correlation between usage and final grade ▪ Repeat usage ○ Math 0420 via end-of-course assessment • Develop baseline for new sequence ○ Track attendance to measure ownership ○ Administer developmental capstone exam in all sections of 0330 to assess effectiveness of redesign in preparing students for college algebra • Evaluate results of all assessment ○ QEP Director will compile report for review by QEP Assessment Committee
Spring 2012 Year-0	• Implement recommended changes to pilot sections of Math 0420, Math Hubs, and professional development as needed • Discontinue internet sections of Math 0320 • Pilot four sections of Math 0420 • Pilot two sections of Math 0430 • Continue implementing learner-centered strategies in all developmental sections with focused reflection and assessment • Operate Math Hubs at Main and South campuses • Hire and train adjunct faculty as needed to work in both Hubs • Hire and train peer tutors as needed for both Hubs • Assess ○ Anxiety reduction in all developmental math sections (0310, 0320, 0330, 0420, 0430) ○ Increased ownership of educational process in pilot sections of 0420 and 0430 ▪ Absenteeism ▪ Results of student-created contracts ○ Math Hub effectiveness in supplementing instruction ▪ Correlation between usage and final grade ▪ Repeat usage ○ Math 0420 via end-of-course assessment • Develop baseline for new sequence ○ Track attendance to measure ownership ○ Administer developmental capstone exam in all sections of 0330 and Math 0430 to assess effectiveness of redesign in preparing students for college algebra • Evaluate results of all assessment ○ QEP Director will compile report for review by QEP Assessment Committee ○ QEP Assessment Committee will compile yearly report for the Academic Assessment Committee (AAC) ○ AAC will compile report for Campus Assessment Advisory Council (CAAC)
Fall 2012 Year-1	• Bring in professional development speaker to reinforce emerging learner-centered pedagogies • Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed • Discontinue all sections of Math 0310, 0320, and 0330 • Offer additional sections of Math 0420; sections can be added to meet demand • Offer additional sections of Math 0430; sections can be added to meet demand • Continue implementing learner-centered strategies in all developmental sections with focused reflection and assessment • Operate Math Hubs at Main and South campuses

	• Hire and train adjunct faculty as needed to work in both Hubs
	• Hire and train peer tutors as needed for both Hubs
	• Assess
	  o Anxiety reduction in all developmental math sections (0310, 0320, 0330, 0420,and 0430)
	  o Increased ownership of educational process in pilot sections of 0420 and 0430
	  ▪ Absenteeism
	  ▪ Results of student-created contracts
	  o Math Hub effectiveness in supplementing instruction
	  ▪ Correlation between usage and final grade
	  ▪ Repeat usage
	  o Math 0420 via end-of-course assessment
	  o Math 0430 via developmental capstone
	• Review results of all assessment
	  o QEP director will compile report for review by QEP Assessment Committee

Spring 2013 Year-1	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed
	• Discontinue all sections of Math 0310, 0320, and 0330
	• Offer additional sections of Math 0420; sections can be added to meet demand.
	• Offer additional sections of Math 0430; sections can be added to meet demand.
	• Continue implementing learner-centered strategies in all developmental sections with focused reflection and assessment
	• Operate Math Hubs at Main and South campuses
	• Hire and train adjunct faculty as needed to work in both Hubs
	• Hire and train peer tutors as needed for both Hubs
	• Assess
	  o Anxiety reduction in all developmental math sections (0420 and 0430)
	  o Increased ownership of educational process in pilot sections of 0420 and 0430
	  ▪ Absenteeism
	  ▪ Results of student-created contracts
	  o Math Hub effectiveness in supplementing instruction
	  ▪ Correlation between usage and final grade
	  ▪ Repeat usage
	  o Math 0420 via end-of-course assessment
	  o Math 0430 via developmental capstone
	• Review results of all assessment
	  o QEP director will compile report for review by QEP Assessment Committee
	  o QEP Assessment Committee will compile yearly report for the Academic Assessment Committee (AAC)
	  o AAC will compile report for Campus Assessment Advisory Council (CAAC)

Fall 2013 Year-2	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed • Continue data collection and assessment process • Continue professional development • Review results of all assessment o QEP director will compile report for review by QEP Assessment Committee
Spring 2014 Year -2	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed

	• Continue data collection and assessment process
	• Continue professional development
	• Review results of all assessment
	  o QEP director will compile report for review by QEP Assessment Committee
	  o QEP Assessment Committee will compile yearly report for the Academic Assessment Committee (AAC)
	  o AAC will compile report for Campus Assessment Advisory Council (CAAC)

Fall 2014 Year -3	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed • Continue data collection and assessment process • Continue professional development • Review results of all assessment o QEP director will compile report for review by QEP Assessment Committee

Spring 2015 Year -3	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed
	• Continue data collection and assessment process
	• Continue professional development
	• Review results of all assessment
	  o QEP director will compile report for review by QEP Assessment Committee
	  o QEP Assessment Committee will compile yearly report for the Academic Assessment Committee (AAC)
	  o AAC will compile report for Campus Assessment Advisory Council (CAAC)

Fall 2015 Year – 4	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed • Continue data collection and assessment process • Continue professional development • Review results of all assessment o QEP director will compile report for review by QEP Assessment

Spring 2016 Year – 4	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed
	• Continue data collection and assessment process
	• Continue professional development
	• Review results of all assessment
	  o QEP director will compile report for review by QEP Assessment Committee
	  o QEP Assessment Committee will compile yearly report for the Academic Assessment Committee (AAC)
	  o AAC will compile report for Campus Assessment Advisory Council (CAAC)

Fall 2016 Year – 5	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed • Continue data collection and assessment process • Continue professional development • Review results of all assessment o QEP director will compile report for review by QEP Assessment • Begin draft of 5th-year impact report
Spring 2016 Year – 5	• Implement recommended changes to all sections of Math 0420 and 0430, Math Hubs, and professional development as needed • Continue data collection and assessment process

	• Continue professional development
	• Review results of all assessment
	  o QEP director will compile report for review by QEP Assessment Committee
	  o QEP Assessment Committee will compile yearly report for the Academic Assessment Committee (AAC)
	  o AAC will compile report for Campus Assessment Advisory Council (CAAC)
	• Prepare 5th-year impact report for submission to SACSCOC

BENEFITS TO THE INSTITUTION

While the benefits of a successful QEP to GCC's developmental mathematics students are clear, it should be noted that they do not stop with the QEP. Increasing the number of students who successfully complete developmental math and persist in their studies will affect all disciplines on campus. Stronger math students are stronger students overall. The Math Hub, which will facilitate student success, will serve all mathematics students on campus. In addition, the Hub will be responsive to the needs of faculty across the campus, as the staff will offer workshops on an as-needed basis to address mathematical concepts that are particularly troublesome to students, no matter the discipline. The increased emphasis on student-centered pedagogy will no doubt spur debate and hopefully will lead to its implementation in other disciplines. Students who have learned to be more responsible for their own learning will not leave this new-found power at the doors of their math classrooms. While the QEP is necessarily focused, GCC looks forward to the transformative effects that will extend beyond developmental mathematics.

BUDGET

The five-year budget to support implementation of the QEP is projected at $658,115. The following budget projection represents fair estimates for personnel, operating expenses, communication expenses, and professional development (including travel). Estimates beyond

the initial implementation year will further be determined based on ongoing assessment results, faculty and staff responses, and available resources.

QEP 5-Year Budget Projections

	FY 2010-11	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16
Personnel						
QEP Director*	19,260	19,260	20,000	20,000	20,000	20,000
Math Hub Coordinator	0	42,795	42,795	42,800	42800	42,800
Adjunct Faculty- Math Hub	6,420	46,365	47,000	47,000	47,000	47,000
Department Operating Expenses						
DOE Miscellaneous	3,500	7,600	7,600	7,600	7,600	7,600
Communication						
Communication Expenses	500	500	500	500	500	500
Travel						
Travel	17,000	14,000	14,000	14,000	14,000	14,000
TOTAL	**46,680**	**130,520**	**131,895**	**131,900**	**131,900**	**131,900**

Five Year Total $658,115

***** Director salary is an add-on to a full-time faculty member salary with release time for director duties.

Rationale:

Personnel
- QEP Director—Full-time faculty given four class releases
- Math Hub Coordinator—Full-time faculty who works and schedules coverage
- Adjunct Faculty in the Math Hub—Hourly pay for adjuncts to work in the Math Hub

DOE
- Classroom manipulative for math courses being offered
- Marketing of the QEP to engage faculty and students in the project
- Miscellaneous office supplies
- Communications
- Copying and related costs

Travel
- Professional Math Development for QEP:
  - AMATYC Conference in Austin, Texas
  - NADE Conference in Orlando, Florida
  - SACS Annual Conference for QEP Team

RESOURCES

American College Testing (2007). Setting the right course for college success. *Compass Guide to Effective Student Placement and Retention in Mathematics.* Retrieved October 14, 2010, from: http://www.act.org/compass/pdf/MathPlacementGuide.pdf

American Mathematical Association of Two-Year Colleges. (2010). New Life Guide: New Life Compared to other Redesign. Retrieved October 12, 2010, from: http://dm-live.wikispaces.com/New+Life+Compared+to+Other+Redesign

Arendale, D. (2000). Strategic plan of the National Association for Developmental Education. *Journal of Developmental Education, 33*(3), 2-4, 6, 8, 10.

Armington, T. (Ed.) (2003). *Best Practices in Developmental Mathematics, 2nd Edition.* Mathematics Special Professional Interest Network, National Association for Developmental Education.

Bai, H., Wang L., Pan W. & Frey M (2009, September). Measuring mathematics anxiety: Psychometric analysis of a bidimensional mathematics anxiety. *Journal of Instructional Psychology*. Retrieved October 4, 2010, from: http://findarticles.com/p/articles/mi_m0FCG/is_3_36/ai_n42026373/?tag=content;col1.

Blackner, D. (2000). Prediction of community college students' success in developmental math with traditional classroom, computer-based on-campus and computer-based at a distance with locus of control, math anxiety and learning style. (Doctoral Dissertation). Retrieved April 12, 2011, from: http://digital.library.unt.edu/ark:/67531/metadc2540/m1/

Blair, R. (eds.), (2006). Beyond crossroads: Implementing mathematics standards in the first two years of college. American Mathematical Association of Two Year Colleges. Memphis, TN.

Bowen, Jose A. (2006). Teaching naked: Why removing technology from your classroom will improve student learning. *The National Teaching &Learning Forum,* 16(1).

Boylan, H., Bliss L., & Bonham B (1997). Program components and their relationship to student performance. *Journal of Developmental Education.* 20(3). Retrieved from: http://www.ncde.appstate.edu/publications/ride/documents/RiDE%2020-4.pdf.

Bryk, A., & Treisman U. (2010) Make math a gateway, not a gatekeeper. *Chronicle for Higher Education* 56(32).

Bumbennutty, H. (2009). Self-regulation of homework completion. *Psychology Journal,* 6(4).

Carnegie Foundation for the Advancement of Teaching (2011). Developmental Math: Quantway, Overview. Retrieved August 22, 2011, from: http://www.carnegiefoundation.org/quantway.

Clute, P. (1984). Mathematics anxiety, instructional method and achievement in a survey course in college mathematics. *Journal for Research in Mathematics Education* 15(1).

Community College Survey of Student Engagement (CCSSE), (2011). About CCSSEE. Retrieved August 22, 2011, from: http://www.ccsse.org/aboutccsse/aboutccsse.cfm.

Gerlaugh, K., Thompson, L., Boylan H., & Davis H. (2007) National study of Developmental education II: baseline data for community colleges. *Research in Developmental Education* 20(4). Retrieved October 14, 2010, from: http://www.ncde.appstate.edu/publications/ride/documents/RiDE%2020-4.pdf

Grayson County College (2010). 2010-2015 Strategic Plan. (CHECK APA)

Grayson County College (2010). Instructional Services Assessment Handbook.

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education* 21(1).

Hoffman, R. & McGuire S. (2010) Learning and teaching strategies: From personal experience and research comes advice on what works and why. *American Scientist* 98(5). Retrieved October 4, 2010, from: http://www.americanscientist.org/issues/pub/2010/5/learning-and-teaching-strategies.

King, Alison. (Winter 1993). From sage on the stage to guide on the side. *College Teaching* 41(1).

Lou Y., Abrami P. & d'Apollonia S. (2001). Small group and individual learning with technology: A meta analysis. *Review of Educational Research* 71(3).

Massachusetts Community Colleges Executive Office (2006). 100% math initiative: building a foundation for student success in developmental mathematics. Retrieved April 12, 2011, from: http://www.masscc.org/pdfs/mathinitiativefinal.pdf.

McGuire, S. (2010, July). Teaching students how to learn: Metacognition is the key! Breakout Session. Southern Association of Schools and Colleges Commission on Colleges Summer Institute on Quality Enhancement and Accreditation, Tampa, FL.

McWilliam, Erica. (2008, August) Unlearning how to teach. *Innovations in Education and Teaching International* 45(3).

Meader, Pam. (March, 2007) Preparing students for college level math. Presented at the meeting of the Commission of Adult Basic Education, Philadelphia, PA. Retrieved October 4, 2010, from: http://docs.google.com/viewer?a=v&q=cache:7bdEfw7rxMAJ:www.collegetransition.org/profdev/strands/Pam%2520Meader%2520-%2520Preparing%2520Adults%2520for%2520College%2520Level%2520Math.pdf+pam+meader&hl=en&gl=us&pid=bl&srcid=ADGEEShByWGSy5KR3FysEfeX54wyqUrEARrSvS-O2L83nLmHOZDnWWCV8Xj27WnysgG5luxrs-byMKBGzc3t6yJ-n6GQa4KTxp72hdtOQm1aMdVOfAtUsaWbXH2QJo_8Rhdl9lABN0EU&sig=AHIEtbQUkJMcaTaUWH9p2yKYp2QWbceG6w

National Center for Academic Transformation (2005). Program in Course Redesign: Improving the Quality of Student Learning. Retrieved May 5, 2010, from: http://www.thencat.org/PCR.htm.

Perin, D. (2004) Remediation beyond developmental education: The use of learning assistance centers to increase academic preparedness in community colleges. *Community College Journal of Research and Practice*, 28, 559-582. Abstract retrieved from: http://ccrc.tc.columbia.edu/Publication.asp?UID=67.

Sheldon, C. & Durdella, N. (2010). Success Rates for Students Taking Compressed and Regular Length Developmental Courses in the Community College. *Community College Journal of Research Practice,* 34(1/2).

The Consortium for Foundation Mathematics (2012). *Mathematics in Action: An Introduction to Algebraic, Graphical, and Numerical Problem Solving.* Addison Wesley, Boston.

Thompson, K. (2001). Constructivist curriculum design for professional development: A review of the literature, *Australian Journal of Adult Learning*, 41(1).

Twigg, C. (n.d.). Math lectures: an oxymoron? The National Center for Academic Transformation. Retrieved October 10, 2010, from: http://www.thencat.org/PlanRes/Math%20Lectures%20Editorial.htm

Webster, T. & Dee, K. (1997) Supplemental instruction benefits students in an introductory engineering course. Proceedings of the Frontiers in Education Conference, 1997: Teaching and Learning in an Era of Change, 1, 101-108. doi bookmark: http://doi.ieeecomputersociety.org/10.1109/FIE.1997.644821

Appendix A. SACS Leadership Team

Dr. Alan Scheibmeir	President
Mr. Giles Brown	Vice President for Business Services
Dr. Jeanie Hardin	Vice President for Instructional Services
Mr. Gary Paikowski	Vice President for Information Technology
Mr. Marc Payne	Vice President for Student Services
Dr. Tony Stanzo	Dean of Academic Studies
Mrs. Kathleen Elberson	Professor of Mathematics & QEP Director
Dr. Jean Sorensen	Professor of English, Literature & Humanities & interim QEP Director
Mrs. Shelle Cassell	Director of Public Information and Marketing
Dr. Debbie Smarr	Director of Institutional Effectiveness & SACS Liaison
Mr. Rick Lynn	Faculty Association President
Mr. Stanley Henderson	Professor of Mathematics

Appendix B. College Effectiveness Council

Standing membership of the CEC includes president, vice presidents, deans, directors, coordinators, faculty association president, chairs, and librarian. Two-year rotating membership as appropriate includes faculty, students, and staff.

Dr. Alan Scheibmeir, President, Chair
Dr. Debbie Smarr, Director Institutional Effectiveness, Facilitator
Ms. Shelle Cassell, Director of Marketing and Public Information
Ms. Theresa Barnett, Athletic Director

Goal Team Leaders
Dr. Keri Harvey - Student Success
Dr. Jean Sorensen - Student Learning
Dr. Kim Teel - Community and Outreach
Ms. Kim Faris - Accountability

Vice Presidents
Dr. Jeanie Hardin, Vice President Instruction
Mr. Giles Brown, Vice President Business Services
Mr. Gary Paikowski, Vice President Information Technology
Dr. Roy Renfro, Vice President Resource and Community Development
Mr. Marc Payne, Vice President Student Services

Deans
Dr. Tony Stanzo, Dean Academic Studies
Dr. Steve Davis, Dean Workforce Education
Dr. Kim Teel, Dean of the South Campus
Mr. Mark Taylor, Assistant Dean

Director-Instructional Services
Ms. Kathleen Elberson, Director of QEP
Dr. Patty Pool, Executive Director of CWL
Vacant, Director of Distance Learning

Directors and Coordinator-Student Services
Ms. Kim Faris, Director of Admissions & Records and Registrar
Ms. Barbara Malone, Director of Counseling
Mr. Gregg Miles, Director of Student Activities
Mr. Tim Green, Director of Safety
Ms. Cynthia Taylor, Residence Hall Coordinator

Directors and Coordinator-Business Services
Mr. Danny Hyatt, Director of Fiscal Services
Mr. Lacy Shotwell, Director of Fiscal Plant
Ms. Donna King, Director of Financial Aid
Ms. Cindy Powell, Executive Director of Texoma Tech Prep
Ms. Marilyn Power, Coordinator of Human Resources

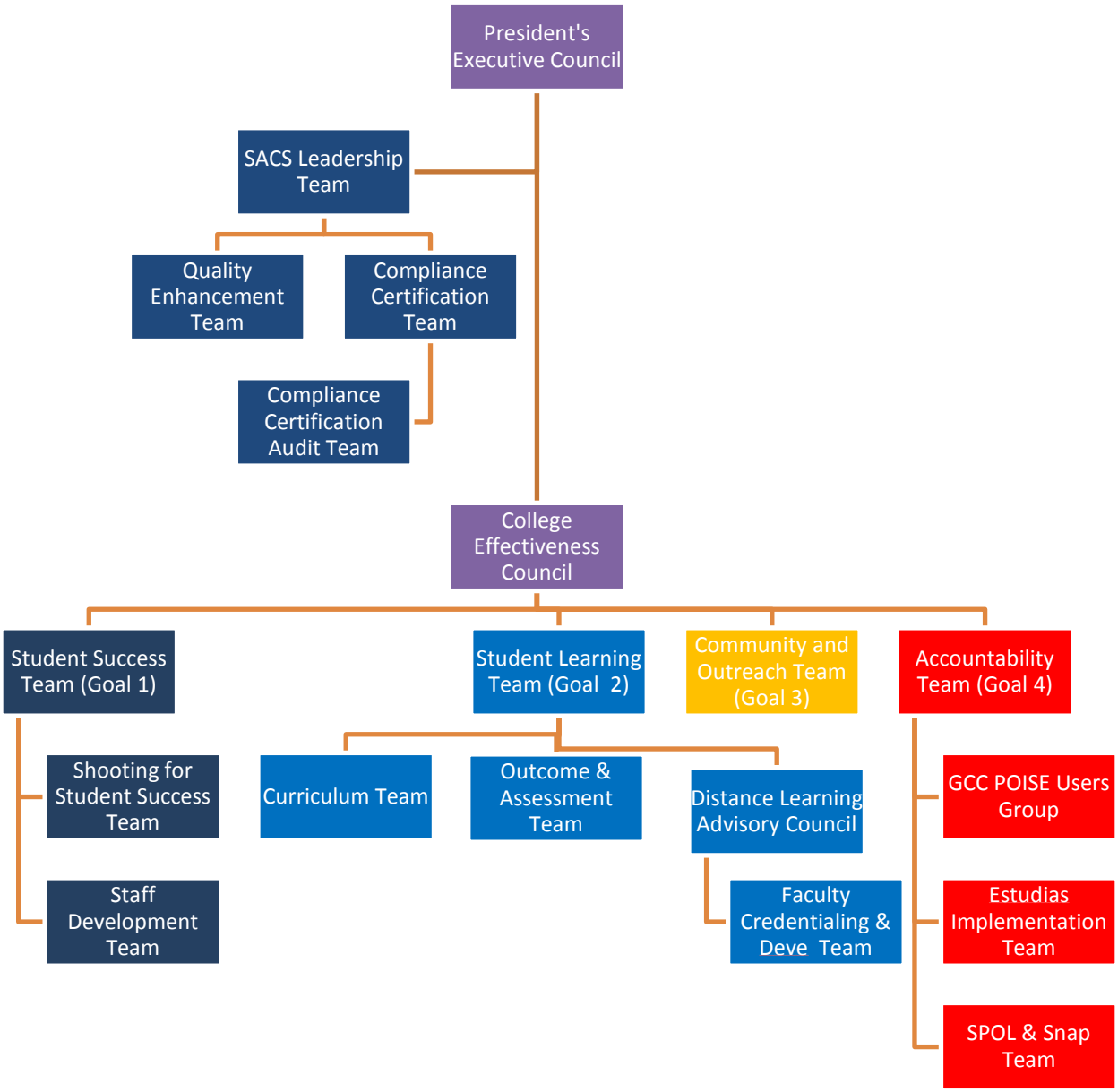
Faculty Association and Chairs
Dr. Rick Lynn, Faculty Association President
Dr. Wade Graves, Chair, Business & Technology
Mr. Steve Black, Chair, Fine Arts & Humanities
Mr. Mary Yetta McKelva, Chair, Literature & Language
Ms. Sherre Mercer, Chair, Mathematics
Mr. Ron Velten, Chair, Social Sciences
Ms. Laurie Williams, Chair, Sciences
Mr. Dwayne Barber, Chair, Career Services and Industrial Technologies
Ms. Jean Flick, Chair, Health Sciences and Director ADN Program

Librarian
Lisa Hebert

Student
Student Government Association President, Lauren Bolin
Student Government Association Vice-President, Vy Nguyen

Staff (4) 2-year rotating membership
Representatives to be appointed by the President's Executive Council
Ms. Frances Haratyk (term ends FY 2012-13)
Ms. Rosemary Bruce (term ends FY 2012-13)
Ms. Tahleigh Allen (term ends FY 2011-12)
Vacant (term ends FY 2011-12)

Appendix C. QEP Organizational Structure



Appendix D. CCSSE Survey Results

Student Respondents

Credit classes were randomly selected – stratified by time of day (morning, afternoon, and evening) – from institutional class data files to participate in the survey. Of those sampled at our institution, 433 students submitted usable surveys. The number of completed surveys produced an overall "percent of target" rate of 72%. Percent of target rate is the ratio of the adjusted number of completed surveys to target sample sizes. (The adjusted survey count is the number of surveys that were filled out properly and did not fall into any of the exclusionary categories.[1])

2008 Student Respondent Profile

To compare the characteristics of student respondents with the characteristics of the underlying student population for each participating college, *CCSSE* uses the data reported by the institution in its most recent IPEDS Enrollment Report for the following variables: gender, race and ethnicity, student age, and enrollment status (part- or full-time). The data are aggregated to compare the 2008 *CCSSE* Cohort survey respondent population to the total student population of the 2008 *CCSSE* Cohort member colleges.

Gender (survey item #30)

Of the 433 student respondents at our college who answered this item, 47% are male and 53% are female. This mirrors the full population of the *CCSSE* Cohort community college students, comprised of 41% males and 59% females.

Age (survey item #29)

2008 *CCSSE* student respondents at Grayson County College range in age from 18 to 64 years old. Approximately 87% are between 18 to 39 years old; 63% are 18 to 24 years old while 24% are 25 to 39 years old.

Racial Identification (survey item #34)

Seventy-five percent of student respondents identify themselves as White/non-Hispanic, 4% as Hispanic/Latino/Spanish, 6% as Black or African American, and 1% as Asian. Three percent of the student respondents are Native American. One percent marked "other" when responding to the question, "What is your racial identification?"

International Students (survey item #33)

Ten percent of our students responded yes to the question, "Are you an international student or foreign national?"

Enrollment Status (survey item #2)

Seventy-six percent of the student respondents at Grayson County College report attending college full-time, while 70% of the 2008 *CCSSE* Cohort colleges' total student population attended full-time. Only 24% of surveyed students report being part-time college students, compared to 62% as reported to IPEDS. This inverse representation is a result of the sampling technique and the in-class administration process. For this reason, survey results are either weighted or disaggregated on the full-time/part-time variable so that reports will accurately reflect the underlying student population.

The results for the following student respondent categories are weighted according to the most recent IPEDS population data.

Limited English Speaking Students (survey item #32)

Students with limited English speaking skills, or those whose native language is not English, comprise a significant proportion of students in community colleges. At our institution, 10.6% of enrolled students are non-native English speakers.

First-Generation Status (survey item #36)

Twenty-six percent indicate that their mothers' highest level of education is a high school diploma (with no college experience), and 29.6% indicate that level for their fathers.

Educational Attainment (survey items #1 and #35)

Seventy-one percent of the respondents report starting their college careers at this community college. Approximately 73.2% of students indicate that their highest level of educational attainment is a high school diploma or GED; 18.4% report either a certificate or an associate degree; 4.6% have earned a bachelor's degree; and .6% have earned an advanced degree.

Credit Hours Earned (survey item #23)

Thirty-five percent of surveyed students have completed fewer than 15 credit hours; 22.5% have completed 15-29 credit hours; and 26.9% have completed more than 30 credit hours.

Grades (survey item #21)

Forty-seven percent of students report that they earned grades of *B*+ or higher, while 2.4% of students report that they earned grades of *C*- or lower.

External Commitments (survey item #10)

One percent of students work 21 or more hours per week; 20.6% of students care for dependents at least 10 hours per week; and 70.2% of students spend at least 1-5 hours per week commuting to class.

Appendix E. C-DAC Wish-list

1. Turnitin.com as a possibility for reducing the amount of plagiarism
2. Requiring college 101
3. Electronic textbooks as a possibility for reducing textbook costs for students.
4. Website needs revamped.
5. Campus maps.
6. Earlier orientation with sessions.
7. A grading rubric for instructors not in those courses.
8. Better email system.
9. More training for new faculty and staff.
10. Funding for classroom activities.
11. Better technology for instructors (laptops versus desktop).
12. Common language across campus.
13. Site map for the website.
14. Alphabetized faculty directory by positions (staff, administration, adjuncts, faculty).
15. Increase student success sessions required.
16. Use of “Strengths Quest” (Noel Levitz?) to help students focus on strengths not deficiencies.

Appendix F. Job Description for QEP Director

Position Title: QEP Director	Immediate Supervisor: Dean of Academic Studies
Division/Department: Instructional Services	Current Employee:

I. Purpose of Position:

To lead and facilitate the SACS QEP Process for reaffirmation in 2012 with accountability for each of the following:

- Foster "consensus among key constituency groups that the QEP, rather than being merely a requirement for reaffirmation of accreditation, can result in significant, even transforming, improvements in the quality of student learning."
- Facilitate "broad-based institutional participation of all appropriate campus constituencies in the identification of the topic or issue to be addressed by the QEP."
- Perform "careful review of research and best practices related to the topic or issue."
- Project "allocation of adequate human and financial resources to develop, implement, and sustain the QEP."
- Develop "implementation strategies that include a clear timeline and assignment of responsibilities."
- Estimate "the costs of the physical and human resources necessary for developing, implementing, and sustaining the plan."
- Evaluate the QEP multifaceted, with attention both to key objectives and benchmarks to be achieved in the planning and implementation of the QEP as well as to the overall goals of the plan."
- Prepare "the QEP according to the guidelines for submission to the COC."
- Document "the extent to which the QEP has achieved its goals and enhanced student learning in the Impact Report, which will be submitted for review by the Commission five years prior to the institution's next reaffirmation."

II. Key Responsibility/Result Areas: (see attached QEP Timeline)

1. Selecting the Topic - accomplished April 23, 2010
2. Defining the Student Learning Outcomes
3. Researching the Topic (assisted by interim QEP team leader)
4. Identifying the Actions to be Implemented
5. Establishing the Timeline for Implementation
6. Organizing for Success
7. Identifying Necessary Resources - Proposed 2010-11 budget attached
8. Assessing the Success of the QEP (assisted by director of institutional research and analytics)
9. Preparing the QEP for Submission to the COC
10. Preparing the *Impact Report (5th year report)*

Appendix G. QEP Development Team

QEP Development Team

Ms. Donna Byrum	Adult Basic Education
Ms. Paula Cavender	Workforce Education
Mr. Shawn Eagleton	Mathematics Professor
Ms. Kathleen Elberson	Mathematics Professor
Ms. Carla Fanning	Psychology Professor
Ms. Shelby Garner	Nursing Professor
Dr. Keri Harvey	Education Professor
Ms. Lori Henderson	Mathematics Professor
Ms. Stanley Henderson	Mathematics Professor
Ms. Jeffri Hodge	Disability Services/Tutoring Coordinator
Ms. Dana Kermanian	Counseling Services
Ms. Donna McKinney	Testing Coordinator
Ms. Sherre Mercer	Mathematics Professor
Ms. Susan Morrow	Mathematics Professor
Ms. Carol Pace	Accounting Professor
Dr. Patrice Parsons	Biology Professor
Dr. Tony Stanzo	Dean of Academic Instruction
Dr. Stella Thompson	Developmental Reading/Writing Professor
Mr. Dennis Westman	Distance Learning Coordinator
Mr. Mark Taylor	Assistant Dean of Academic Instruction
Ms. Michelle Urquizo	Facility Service/Adjunct Math Professor
Ms. Diane Getrum	High School Math Teacher, Tom Bean ISD
Ms. Carolyn Emory	High School Math Teacher, Bells ISD
Ms. Cammie Cesarez	Student
Mr. Josh Cole	Student
Ms. Kristine Curtis	Student
Ms. Uma Chidambaram	Adjunct Math Faculty
Ms. Yvonne Butler	Adjunct Math Faculty
Ms. Marina Khalaf	Adjunct Math Faculty
Dr. Alan Scheibmeir	President
Dr. Jeanie Hardin	Vice President for Instruction
Mr. Giles Brown	Vice President for Business Services
Mr. Gary Piakowski	Vice President for Information Technology
Mr. Marc Payne	Vice President for Student Services
Dr. Debbie Smarr	Director of Institutional Effectiveness

Appendix H. QEP Development Team Sub-Committee Membership (NEED TITLES)

Marketing:
Dr. Wade Graves, Faculty
Mr. Steve Black, Faculty
Dr. David Foster, Faculty
Dr. Brandy Fair, Faculty
Ms. Mary Linder, Faculty
Ms. Carla Fanning, Facutly
Ms. Shelby Garner, Faculty

Assessment:
Ms. Donna Byrum, Adult Basic Education
Ms. Rick Lynn, Faculty
Ms. Selena Sanders, Faculty
Ms. Kathy Bredburg, Faculty
Mr. Micheal Dill, Faculty
Ms. Lori Henderson, Faculty
Dr. Stella Thompson, Developmental Studies Coordinator
Dr. Chase Machen, Faculty
Ms. Aleha Carpenter, Faculty

Developmental Education Peer Review:
Ms. Sherre Mercer, Faculty
Mr. Brandon Poteet, Faculty
Ms. Carleen Moore, Faculty
Ms. Marina Khalaf, Adjunct
Ms. Donna McKinney, Testing Coordinator
Mr. Shawn Eagleton, Faculty

Literature Review:
Mr. Mark Taylor, Assistant Dean of Academic Studies
Ms. Jeffri Hodge, Disability Services Coordinator
Mr. Stanley Henderson, Faculty
Ms. Joanna Barnes, Faculty
Mr. Jim Johnson, Faculty
Dr. Marlea Trevino, Faculty
Dr. Melinda McBee, Faculty
Ms. Yvonne Butler, Adjunct
Ms. Uma Chidambaram, Adjunct
Ms. Patrice Parsons, Faculty
Ms. Dana Kermanian, Counseling Services

Professional Development:
Ms. Pamela Curtis, Faculty
Ms. Vonda Skjolsvik, Faculty
Ms. Barbara Roland, Faculty
Ms. Linda Merritt, Faculty
Ms. Cindy Powell, Texoma Tech Prep
Dr. Keri Harvey, Faculty
Ms. Paula Cavender, Enrollment Services

APPENDIX I. Campus Survey Results Fall 2009

Developmental Math Students

Circle the class in which you are enrolled: 0310: **150** 0320: **154** 0330: **137**

Please answer the following questions completely. Please be honest with your responses. This survey is anonymous and will be used as part of our Quality Enhancement Plan (QEP) to improve our developmental math program at GCC.

1. Is this your first math class at GCC? Yes: **259** No: **182**

   a. If yes, when and where was your last math class?
   Answers varied among local high schools and community college. Many didn't state when…

   b. If no, what class(es) have you had before? *0300: 9%* *0310: 34%* *0320: 34%* *0330: 13%* *1314: 2%* *No response: 8%*

2. Did you switch math course levels (either up or down) this semester?
   Discarded

3. Did you receive any advising prior to registering for this course or any previous developmental math course? **Yes: 43%** **No: 57%**
   a. If yes, do you feel it was helpful? **Yes: 83%** **No: 10%** **No response: 7%**
   b. How could we improve the advising process for developmental math?

4. Do you feel that the speed of the instruction of this course is appropriate?

   Yes: 83% **No: 17%**

   If no, do you feel it should move more quickly or more slowly?
   Quickly: 36% **Slowly: 61%** **No Response: 3%**

4. Do you feel that you would benefit from a self-paced course? **Discarded**

5. Have you contacted your instructor outside of class time for help?

   Yes: 14% **No: 86%**

   If not, why not? *No time: 8%* *Haven't needed to: 51%* *Have a tutor: 6%* *Unapproachable: 2%* *Going to Success Center: 3%*

6. Have you requested a tutor? **Yes: 15%** **No: 85%**

   a. If yes and you have met with your tutor, do you find it to be helpful?

   Yes: 75% **No: 10%** **No Response: 15%**

b. How could the tutoring services be improved? (This can be based on previous semesters.)

7. Have you completed a lab assignment? **Yes: 72%** **No: 28%**

If yes: **Success Center: 63%** **MyMathLab online: 27%** **Both: 8%**

No response: 2%

a. What was the most helpful thing about your experience?

The most helpful things about the lab according to students in order of preference:

Staff in the lab (36%) *Step-by-step direction (11%)*
Reinforcement of lessons (10%) *Videos and DVDs (10%)*

b. What was the least helpful thing about your experience?

The least helpful things about the lab according to students in order of preference:

Trouble with MyMathLab (13%) *Nothing (12%)*
Takes too much time (7%) *Too crowded and noisy (3%)*

8. Have you used the Success Center on Campus?

Yes: 69% **No: 30%** **No response: 1%**

a. If yes: Describe your experience.

The overwhelming majority found it to be very helpful (57%). The next largest response group "Okay or Fine" (14%). Most students are pleased and find it a pleasant environment in which to work.

b. What could we do to improve the experience?

Students felt we should hire more tutors (9%) and have a larger space (4%). However, the largest group of respondents feel that it doesn't need improvement (22%).

c. If no: Why not?

The most prevalent reason for not using the Success Center is lack of time (52%). Students doing their labs online (14%) made up the next largest group who do not use the lab. The next largest group who do not use the lab are those who see no need to do so (8%).

9. If you would, please describe your past experiences with math. These can be positive or negative, as long as you are honest.

This question was perhaps the most open-ended of all the questions we posed. For a large majority of students, math has not been a pleasant experience. In fact, 39% report negative experiences. Surprisingly, the next largest group are those who feel that their past experiences have been positive (17%). The next largest group is those for whom math was a negative experience until they arrived at Grayson (15%). The only other response that ranked in the double digits is bad instruction in the past (11%).

10. When did you first experience difficulty with understanding/learning math?

The results were as follows:

Always: 7% *Elementary School: 15% (Most of these students were enrolled in 0310)*
Middle School: 10% *High School: 39%* *College: 14%*
Returning after many years: 4% *Never: 4%*

11. What do you feel are your major obstacles to success in math?

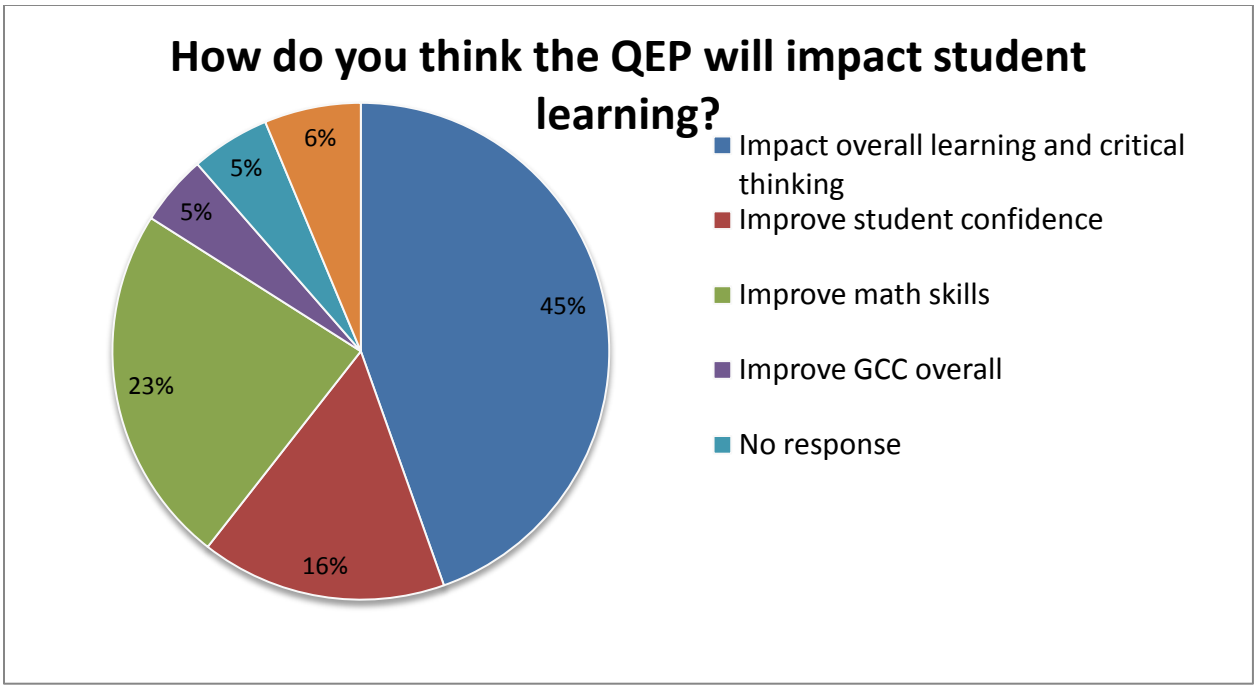
The results on this question were the most varied of all the questions we asked. However, the most often stated result was lack of motivation/study habits (20%). 48% either didn't respond at all or just said "math." I grouped the two as neither is particularly helpful to us as we plan our strategies…

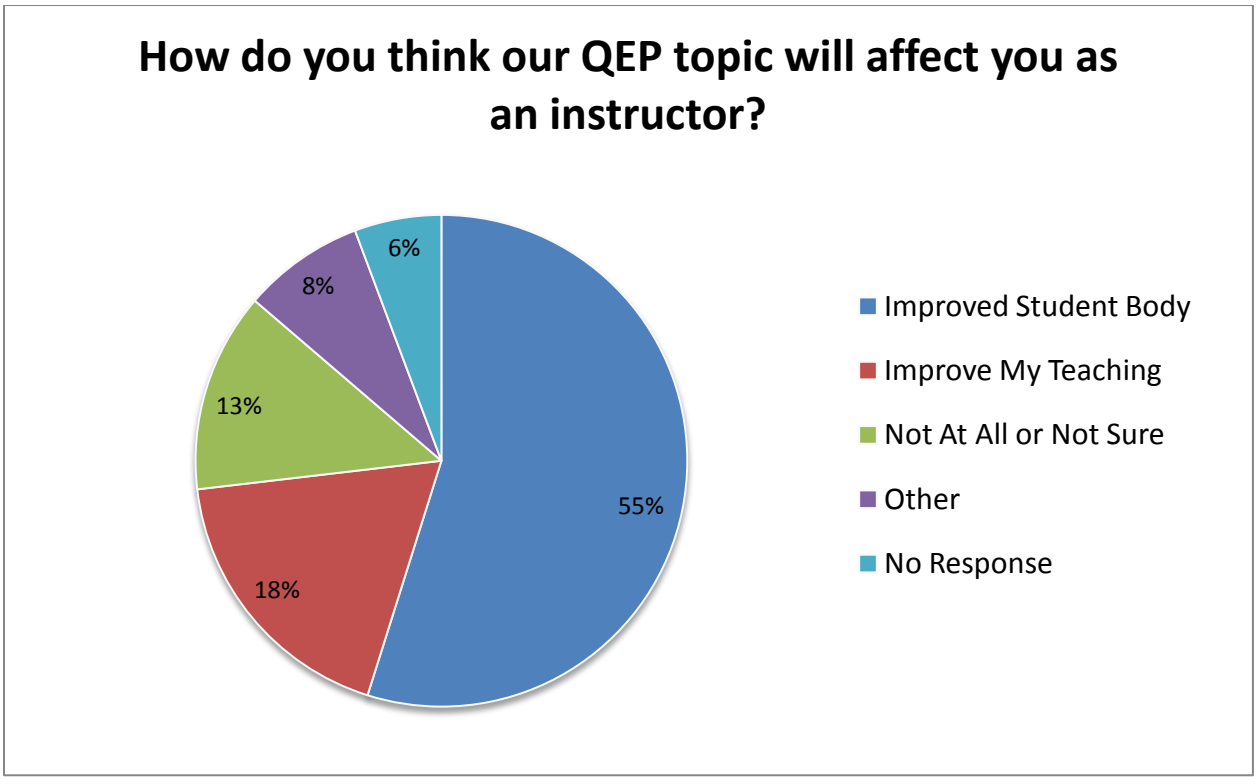
The other responses were as follows:

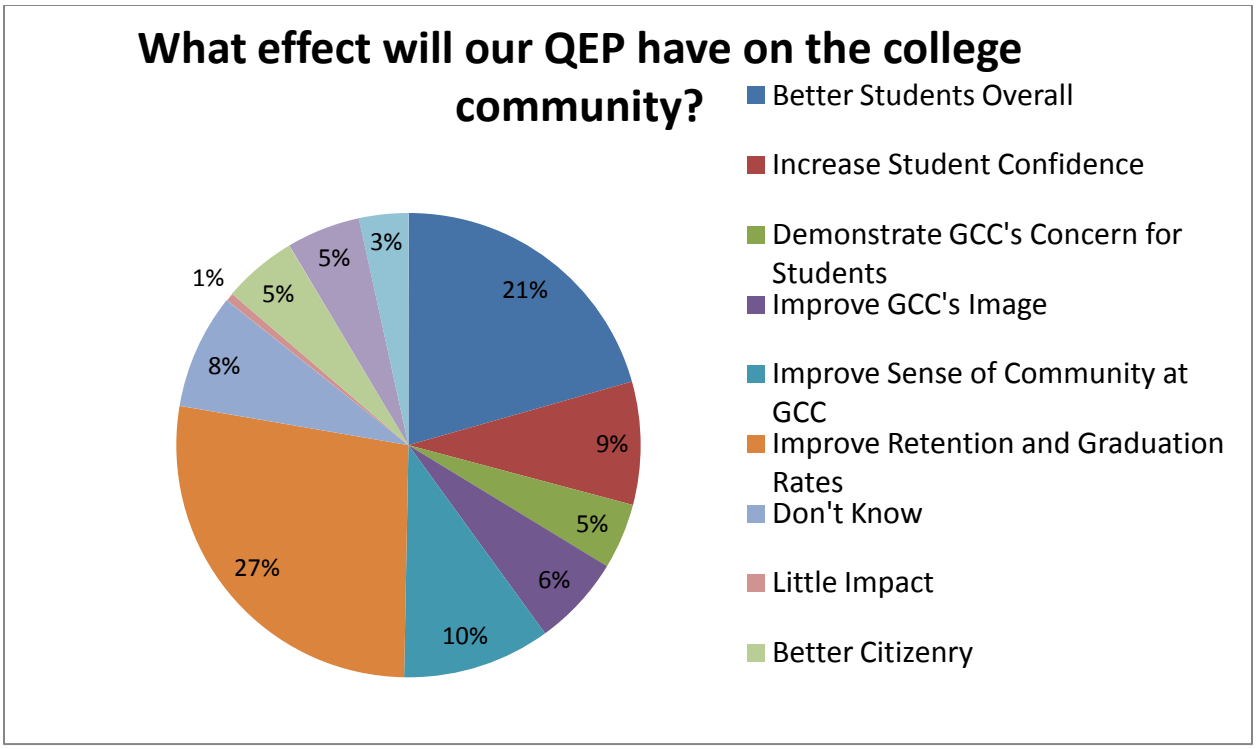
Too fast (3%) *Don't see the point: 1%*
Algebra (6%) *Nothing: 3%*
Fractions (5%) *Bad teaching: 3%*
Factoring (1%) *Learning disabilities: <1%*
Anxiety (5%) *Need more instruction time (1%)*

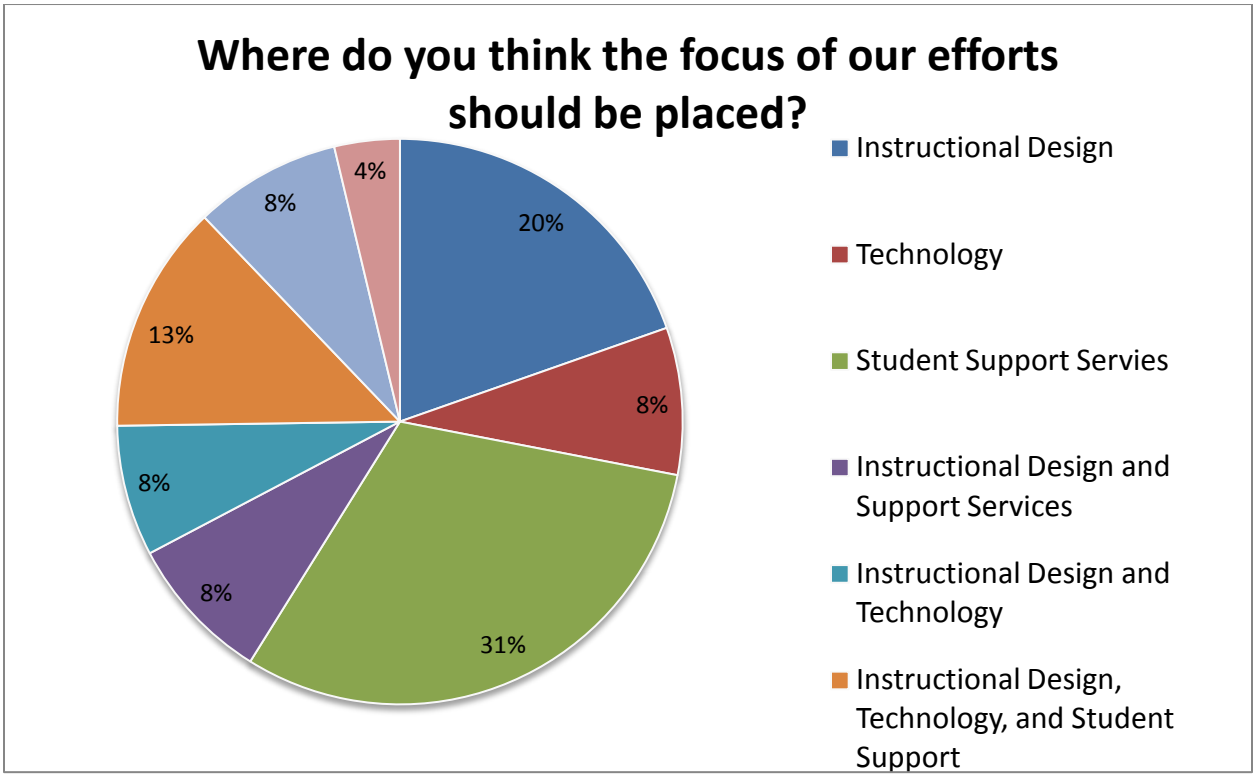
12. What could GCC do to help you succeed in your math class?

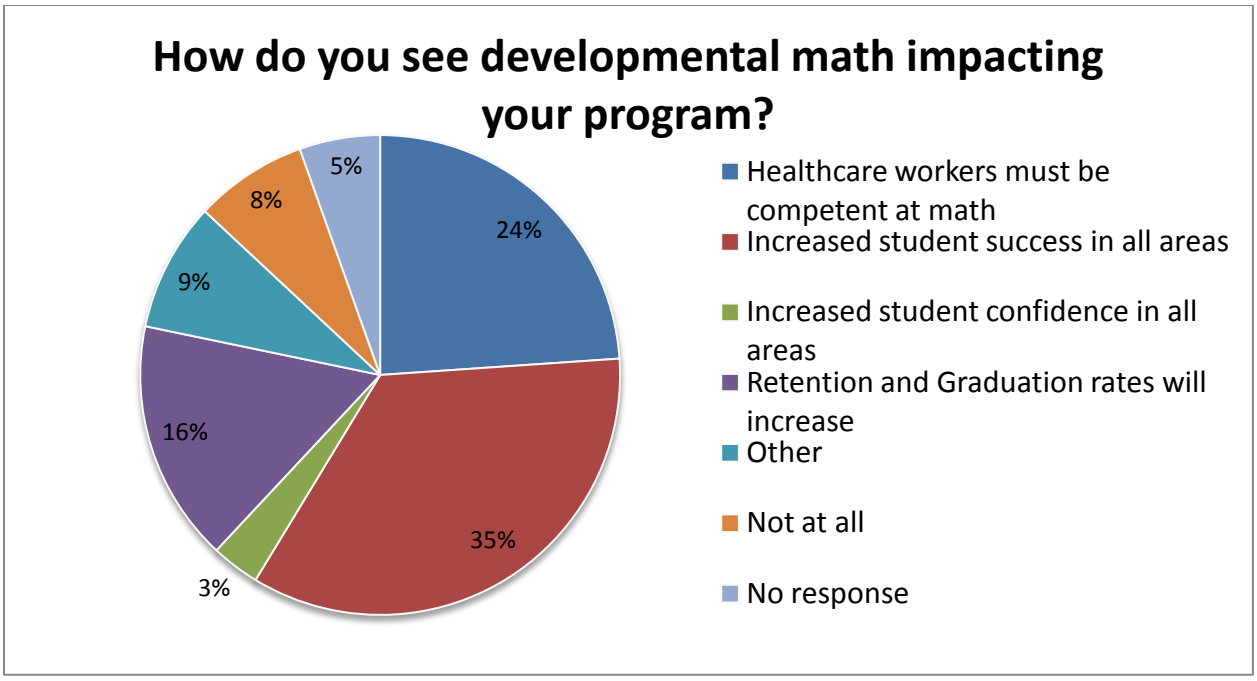
Keep doing what you are doing: 29%
Be patient, provide more support, go slower: 10%
Keep my teacher: 9%
More classes, more time in class: 2%
Get rid of math labs: 2%
No response: 29%
Walk in tutoring: 9%
Get better teachers: 3%
Nothing, it's up to me: 2%


How do you think the QEP will impact student learning?
45%
16%
23%
5%
5%
6%
Impact overall learning and critical thinking
Improve student confidence
Improve math skills
Improve GCC overall
No response


How do you think our QEP topic will affect you as an instructor?
55%
18%
13%
8%
6%
Improved Student Body
Improve My Teaching
Not At All or Not Sure
Other
No Response


What effect will our QEP have on the college community?
21%
9%
5%
6%
10%
27%
8%
1%
5%
5%
3%
Better Students Overall
Increase Student Confidence
Demonstrate GCC's Concern for Students
Improve GCC's Image
Improve Sense of Community at GCC
Improve Retention and Graduation Rates
Don't Know
Little Impact
Better Citizenry

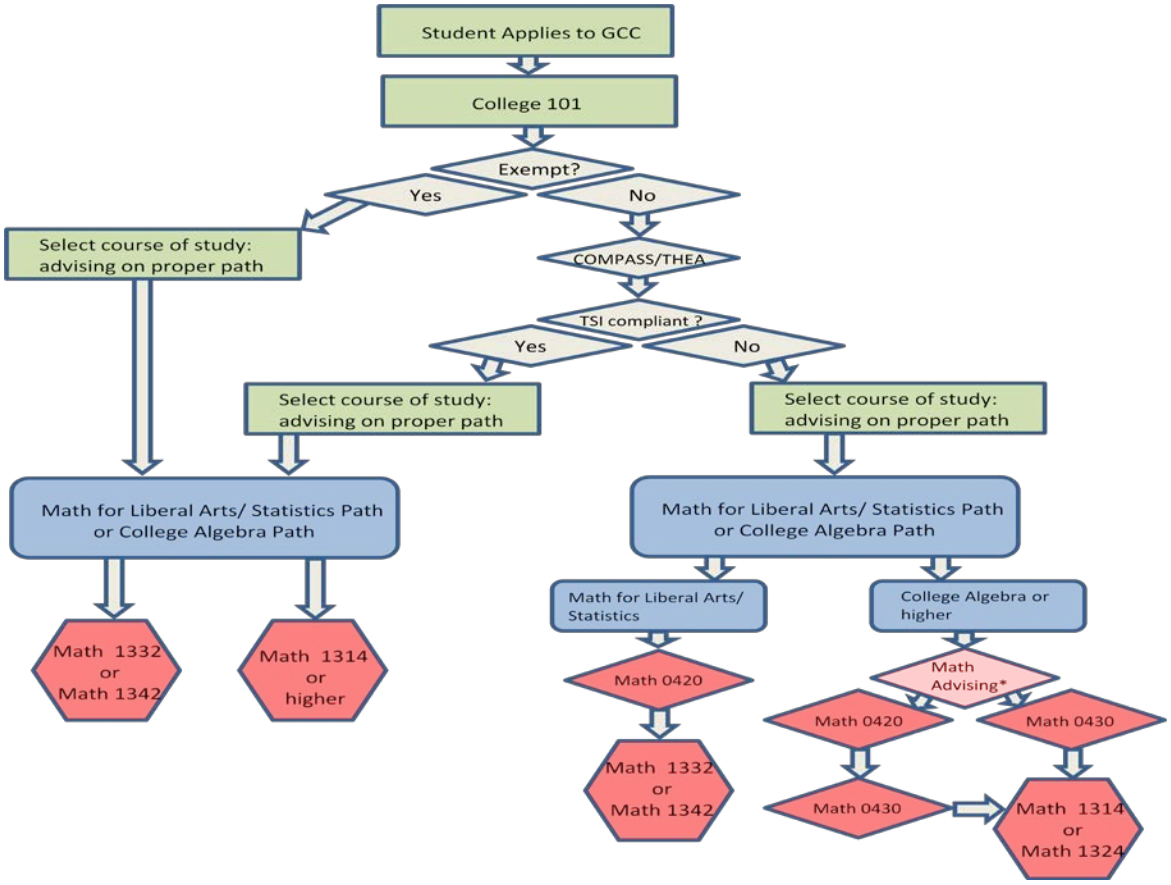

Where do you think the focus of our efforts should be placed?
20%
8%
31%
8%
8%
13%
8%
4%
Instructional Design
Technology
Student Support Servies
Instructional Design and Support Services
Instructional Design and Technology
Instructional Design, Technology, and Student Support


How do you see developmental math impacting your program?
24%
35%
3%
16%
9%
8%
5%
Healthcare workers must be competent at math
Increased student success in all areas
Increased student confidence in all areas
Retention and Graduation rates will increase
Other
Not at all
No response

Appendix J. Discipline Specific Mathematics Requirements

Discipline	Mathematical Prerequisites
Developmental Reading and Writing	Averaging
Allied Health	Long division, Ratio/Proportion, Percentages, Metric System, Linear equations
Nursing	Fractions, Metric Conversion, Dosage calculations, Word problems, Decimals, Ratio and Proportion, Dimensional Analysis
Heating, Air Conditioning and Refrigeration Technology	Basic math operations, Linear equations, Conversion, Measurement
Autobody	Fractions, Metric conversion, Basic geometry
Computer Science	Mathematical operations and terms, Comparison symbols, Logical processing
Drug and Alcohol Abuse Counseling	Basic statistics
Accounting	Logic, Fractions, Percents and decimals, Linear equations, Rounding
Computer Maintenance and Networking	Basic operations, Number systems Metric conversion, Percentages
Economics	Problem solving, Critical thinking, Interpreting graphs
Art	Fractions, Measurement, Geometry, Finance
Geology	Order of operations, Exponents and roots, Fractions, Decimals, Word problems
Physics	Word problems, Order of operations, Exponents and roots, Scientific notation Ratios, Percents, Fractions, Decimals, Metric, Terminology
Psychology	Logic, Basic Statistics, Linear equations, Graphs
Biology	Interpreting graphs, Averaging, Percentages and fractions

Appendix K. Course Re-design Flow Chart



Math 1332 is Math for Liberal Arts Majors.
Math 1342 is Elementary Statistics.
Math 1314 is College Algebra.
Math 0420 is the first developmental course in the sequence.
Math 0430 is the second course in the developmental sequence.

Appendix L. Math Hub Coordinator Job Description

GRAYSON COUNTY COLLEGE

Sherman/Denison, Texas

POSITION ANNOUNCEMENT

MATH HUB COORDINATOR

General Description:
To create, coordinate, and operate a Mathematics lab to provide assistance to students taking math at all levels and to promote ongoing success in these courses.

Responsibilities:
Coordinate all operations of the Math Hub and math tutoring; plan and implement workshops on topics related to Quality Enhancement Program (QEP), implementation in conjunction with Grayson County College mathematics faculty; supervise administration of QEP surveys related to lab usage and satisfaction; track student usage of the hub and create reports on usage as directed by QEP Director and Assistant Dean in charge of the Success Center; tutor all levels of mathematics taught by Grayson County College; supervise adjunct and peer tutors; oversee budget and supplies.

Qualifications:

Expected – A bachelor's degree in mathematics. Ability to work well with students and create a positive, welcoming work environment. Ability to work well with and to bring out the best in adjunct and peer tutors. Ability to adapt and accept challenges. Must be student centered/oriented and be able to promote the community college philosophy. Must be a self starter and demonstrate a cooperative attitude. Possess excellent communication and organizational skills, and work well as part of a team. Computer and technology skills are required, including database manipulation.

Preferred –Master's degree in mathematics; experience working in a mathematics lab; tutoring experience. Experience working in a community college valued.

Application Closing: until filled **Employment Date** August 2011

Salary: Commensurate with qualifications and/or experience. (Lab salary scale).

Benefits: Group Health and Life Ins. (90+ day waiting period for Health), Educational Retirement, Disability/Dental Ins. (opt.), Social Security.

Application Procedure/Information: This is a security sensitive position. To be considered for this position a Grayson County College application, letter of application, résumé, official transcripts, and three professional reference letters must be submitted. Please send to: Human Resources Department, Grayson County College, 6101 Grayson Drive, Denison, TX 75020 or e-mail jobs@grayson.edu. For questions, please call (903) 463-8770.

GRAYSON COUNTY COLLEGE IS AN AFFIRMATIVE ACTION EQUAL OPPORTUNITY EMPLOYER, AND COMPLIES WITH THE IMMIGRATION REFORM AND CONTROL ACT OF 1986. MINORITIES AND WOMEN ARE ENCOURAGED TO APPLY. ADA/Section 504 and Title IX Coordinator: Vice President for Student Services, 6101 Grayson Drive, Denison, TX 75020 – (903) 463-8714.

Appendix M. Active Learning Strategies

The following are a starting point for active learning strategies that will be employed as part of the redesigned courses Math 0420 and Math 0430. While these are a good starting point for increasing student engagement and creating a more student-centered approach in our classrooms, in no way should these be taken as a complete listing of the possibilities that exist. This process is a fluid one, and faculty are encouraged to research and implement new ideas as best practices emerge in the literature.

When a particular intervention has been recommended in the literature, a citation will be made to credit the author. Other interventions are commonly recommended across the literature and no particular citation will be given.

Intervention	Description	Citation
Learning Styles Recognition	Students will be informed about the different learning styles and will complete a commercially available inventory to identify their style(s). A summary of the styles and strategies for students based on the different styles will be made available.	*Beyond Crossroads* Chapter 4, page 21.
Incorporation of writing assignments into the math classroom	-ask students to write to an absent student explaining the most important concepts covered - ask students to begin class by writing about what they learned from doing homework -ask students to write about the process of solving a problem and the connected concepts instead of just "showing work" -include writing components in daily assignments and projects -include creation of journal entries about course topics in the homework	*Beyond Crossroads* Chapter 7, page 54.
Interactive Lecturing	-respond to any answer given by asking whether or not the class agrees and why or why not -request that students come up with alternative methods of problem solving and explain why they think one is better -ask questions to guide students instead of merely giving the answer -ask students to write questions that require explanation	*Beyond Crossroads* Chapter 7, page 54.
Inverted Classroom	-ask students to read background material before coming to class or to watch a prepared youtube video explaining the concept -use class time to further explore the topic and to work on questions that deepen understanding	*Teaching Naked* by Jose Bowen
Guided Reciprocal Peer Questioning	-students are paired in groups of three or four -provided with a set of generic questions that they will use to generate their own questions specific to content covered -students create several thought provoking questions -students pose their questions to each other and take turns answering them	"From Sage on the Stage to Guide on the Side" by Alison King

Jigsaw	-course content for the lesson is divided into discrete units (puzzle-pieces) that can be learned individually -students form “home groups” and each student is given a different piece of the puzzle -students re-group according to their piece, with all students who received the same piece in the same group -students work to learn their piece well enough to teach it -students return to their home groups and teach each other the needed pieces of the puzzle	“From Sage on the Stage to Guide on the Side” by Alison King
Co-op	-students form small teams to learn everything they can about an assigned topic -the groups then present their material to the entire class -nine step process outlined in the cited material	“From Sage on the Stage to Guide on the Side” by Alison King
Class-designed rubric for grading participation	-students work with the faculty member to create a mutually agreeable rubric for grading class participation	Stanley Henderson and Sherre Mercer of GCC math department

Appendix N. MAS-R

5-point Likert-type scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) for negative affect items. Scoring is reversed for positive items so that a high score indicates high anxiety.

Item 1: I find math interesting.
Item 2: I get uptight during math tests.
Item 3: I think that I will use math in the future.
Item 4: My mind goes blank, and I am unable to think clearly when doing my math test.
Item 5: Math relates to my life.
Item 6: I worry about my ability to solve math problems.
Item 7: I get a sinking feeling when I try to do math problems.
Item 8: I find math challenging.
Item 9: Mathematics makes me feel nervous.
Item 10: I would like to take more math classes.
Item 11: Mathematics makes me feel uneasy.
Item 12: Math is one of my favorite subjects.
Item 13: I enjoy learning mathematics.
Item 14: Mathematics makes me feel confused.

Appendix O: Email Permission from Dr. Haiyan Bia

From: Kathleen Elberson
To: Debbie Smarr
Subject: Fwd: Permission to use the MAS-R
Date: Tuesday, August 23, 2011 6:54:27 PM
Attachments: MAR-S_published_online first.pdf
ATT00004.htm

Here it is...

Sent from my iPad

Begin forwarded message:

From: "Haiyan Bai" <hbai@mail.ucf.edu>
Date: November 9, 2010 1:37:29 PM CST
To: <Kathleen Elberson <elbersonk@gmail.com>
Subject: Fwd: Re: Permission to use the MAS-R

Dear Kathleen,

Thank for your interest in using the MAS-R. I am happy to give you the permission to use the instrument, and I would appreciate if you could share your study results with me later. Here attached an electronic version of the final version of MAS-R. If you like, you may can also cite the later study as follows on this instrument which is clearer for the final items.

Bai, H. (2010). Cross-validating a bidimensional mathematics anxiety scale. *Assessment*. 1, 178-182.

Good luck with your study,
Haiyan

Haiyan Bai, Ph.D.
Assistant Professor
UCF Academy Fellow
Educational Research, 222J
College of Education
University of Central Florida
4000 Central Florida Blvd.
P. O. Box 161250
Orlando, FL 32816-1250

Tel: 407/823-1467
Fax: 407/823-4880
E-mail: hbai@mail.ucf.edu

>>> Kathleen Elberson elbersonk@gmail.com> 11/2/2010 9:24 AM >>

Dr. Bai,
I have read with interest your work on a revised mathematics anxiety

Appendix P: GCC Developmental Math Program Learning Outcomes

The reasons students enroll in developmental mathematics are as many and varied as the students themselves. For some, it has simply been too long since their last exposure to mathematical content. For others, their past educational experiences have left them wondering what possible reason there could be for studying the subject. Far too many feel that they are incapable of success with math at any level.

In recognition of the fact that a developmental mathematics program should strive to address not only the subject matter to be taught, but the affective issues that are so often at the heart of many students' difficulties, Grayson County College sets forth the following Developmental Mathematics Program Learning Outcomes.

A. Students will make strides in reducing their level of mathematics anxiety, as evidenced by a decrease in their mathematics anxiety score on the MAS-R. (target: any measurable decrease)

B. Students will become more active learners as evidenced by:

1. the creation of a developmental mathematics student contract with their professor. The students and instructor will evaluate their success in adhering to their plan at the end of the semester. (target: 75% adherence)

2. the use of supplementary educational materials and services provided through GCC's Math Hub. (target: 75% of students enrolled in 0420 and 0430)

C. Students will become competent in carrying out the various mathematical processes and procedures necessary for success in their developmental math course. (target: 70% will attain 70% of associated course-level SLOs)

D. Students will become competent problem solvers. (target: 70% will attain 70% of associated course-level SLOs)

E. Students will progress onto their first college-level mathematics course within one-year of meeting developmental mathematics requirements. (target: 70%)

Appendix Q: GCC Institutional Learning Outcomes

Life in today's world is often complicated and perplexing. Rapid technological innovations bring almost instant changes and challenges -- many jobs our students will eventually hold do not even currently exist. Decisions must be made, sometimes quickly, involving bafflingly complex issues, often with incomplete information at hand. Yet we are still human beings, and we still crave what men and women have wanted for millennia: safety, beauty, purpose, significance, satisfying relationships, and the freedom and opportunity to pursue our passions and our dreams.

With this in mind, Grayson County College sets forth its Institutional Learning Outcomes. As an educational community, these are our dreams for our students.

Our students will demonstrate these intellectual and practical skills essential for learning:

1. **Critical thinking.** Students will utilize both qualitative and quantitative (mathematical) skills to analytically and creatively evaluate ideas, arguments, and problems. They will use creative problem solving and insightful decision making, at times constructing innovative or alternative solutions. Students will recognize interrelationships between diverse scholarly disciplines and integrate this knowledge to respond with insight to complex issues.

2. **Writing.** Students will produce clean, correct, and coherent prose. They will be skilled in all aspects of the writing process, including the organization and development of ideas for a particular audience.

3. **Speaking**. Students will communicate orally in clear, logical, and persuasive language for a particular purpose, occasion, or audience, with poise and control of language.

4. **Reading**. Our students will analyze and interpret printed material across a wide spectrum of styles and sources. They will find delight, pleasure, and profit in general reading and for specific personal needs.

5. **Information Literacy**. Our students will use computer-based technology in communicating, solving problems, and acquiring and processing information while possessing the tools to learn evolving technologies as they become available. They will show skill in utilizing technology and science to improve our society in multiple ways, mindful of the potential as well as of the limitations and problems associated with technological use and innovation.

6. **Teamwork**. Our students will work cooperatively with their peers and leaders to more effectively solve problems by utilizing insights from multiple perspectives.

Our students will become these kinds of educated adults:

7. **Interculturally literate and socially responsible**. They will function on the basis of broad and multiple perspectives on the individual's relationship to the larger society and world. They will live intelligently and responsibly in an ethical and culturally diverse climate. They will wisely discuss and reflect upon individual, political, economic, and social issues in order to become a responsible member of our society.

8. **Personally optimized.** Our students will develop personal values for ethical behavior. They will recognize and delight in beauty in all its manifestations. They will exhibit healthy life styles to live personally fulfilling lives. They will utilize the traits and skills for gratifying employment. They will thrive in deeply satisfying relationships. They will meet their financial obligations.

Presented to faculty Jan.2010 and approved by President's Executive Council May 26, 2010.