

Executive Summary

Founded in 1969, and now celebrating its fortieth anniversary, The University of Texas at San Antonio (UTSA) is the second-largest component in The University of Texas System and one of the fastest growing public universities in the state. UTSA's vision is to be a premier public research university, providing access to educational excellence and preparing citizen leaders for the global environment.

In this new environment, quantitative reasoning skills are essential for all citizens to help them understand and critically evaluate information to make better-informed decisions. UTSA's **Quality Enhancement Plan (QEP): *Quantitative Scholarship: From Literacy to Mastery*** addresses this critical need by providing students with quantitative skills through an enhanced curriculum focused on contextual learning that will help them succeed in this data-rich environment. The mission and goals of the QEP are aligned with UTSA's Strategic Plan and directly support the University's first strategic initiative to enrich the educational experience of its graduates. The QEP also provides a structured framework within which to implement the recommendations of the UTSA Blue Ribbon Committee on the Undergraduate Experience that was charged with identifying the knowledge and skills that all UTSA undergraduates should have upon graduation.

The student learning goals of the QEP will help undergraduate students (a) acquire basic quantitative literacy and numeracy skills, (b) effectively communicate the results of their quantitative analysis, and (c) acquire discipline-specific advanced quantitative skills. The primary focus of enhancing student learning to develop quantitatively trained graduates is achieved through a well-designed curriculum that seamlessly integrates these skills in courses across the undergraduate curriculum. The curriculum redesign will adopt existing best practices for teaching and learning quantitative skills.

The first phase of the curriculum redesign plan will focus on courses in the Natural Sciences and Social and Behavioral Sciences domains of the University's core curriculum. All first-time full-time undergraduates at UTSA must complete eight courses from these domains and will, therefore, have the opportunity to see multiple applications of quantitative skills in a variety of different contexts. The second phase of the curriculum redesign will focus on courses at the upper-division level in disciplines where advanced mathematical, statistical, and computational tools are essential. Transfer students will have the opportunity to enroll in these upper-division courses or complete mandatory quantitative literacy workshops. The implementation plan includes an intensive training program for faculty to help with course redesign and assessment.

Faculty members participating in the QEP will receive summer support in the form of course development grants. The QEP also includes a detailed program of assessment and evaluation to ensure progress toward the vision and goals. The results of the assessments will be used to monitor the progress of the plan and make continuous improvements as needed.

The QEP has broad-based support across the University and represents a truly collaborative effort to increase the quality of the undergraduate education at UTSA. The University has committed \$4 million of new funds over the five-year period, with a majority of the budget allocated for instructional support including faculty stipends and funds for Teaching Assistants. The administrative oversight will be provided by the Associate Vice-Provost for the QEP and the Core Curriculum, and the responsibility for the overall implementation will rest with the QEP Project Director. Over the next five years, the QEP will provide the organizational framework and resources for an institutional transformation to graduate a quantitative, informed citizenry consistent with the mission and vision of the University. The QEP envisions the creation of an exemplary program that will transform the environment to one where quantitative reasoning skills are ingrained in not only the curriculum, but also the culture of UTSA.

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Chapter 1: Introduction

Background

The University of Texas at San Antonio (UTSA) was founded by the Texas Legislature on June 5, 1969. The first official class of 671 graduate students was admitted to degree programs at UTSA in the summer of 1973. There were 52 faculty members, and classes were held in the Koger Center, an office park in San Antonio. At that time, UTSA offered only Masters degrees in business administration, education, bicultural-bilingual studies, English as a second language, environmental management, Spanish, biology, mathematics, and systems design.

In 1973, construction of academic buildings began on a 600-acre tract bordering the Texas Hill Country. By the 1980's, enrollment had grown to 12,000 with the addition of numerous undergraduate and graduate programs. As enrollment increased, the Texas Legislature-funded initiative allocated \$71.5 million to UTSA, with \$20 million stipulated for the Downtown Campus. In 1997, UTSA opened the 11-acre Downtown Campus that now houses two of UTSA's seven colleges: Architecture and Public Policy.

Now celebrating its fortieth anniversary, UTSA is the second-largest component in The University of Texas System and one of the fastest growing public universities in the state. UTSA serves San Antonio and the South Texas region through academic programs and services offered at three campuses: the Main Campus, the Downtown Campus, and the Hemisfair Park Campus. Located in the thriving metropolis of San Antonio, UTSA embraces the multicultural traditions of its diverse population and serves as a catalyst for socioeconomic development in the region.

Enrollment at UTSA has steadily increased over the years, especially in the graduate programs. UTSA is home to over 900 international students representing 80 countries around the world. With more than 29,000 students enrolled in 132 undergraduate and graduate programs and over 1,200 faculty members involved in teaching and research, UTSA contributes \$1.2 billion to the San Antonio area economy [1].

Classified as a Hispanic and Minority-Serving Institution, UTSA provides access and opportunity for large numbers of historically underserved students, many of whom are the first in their families to attend a university. More than 57% of UTSA students come from groups underrepresented in higher education, including 43% Hispanics and 9% African Americans. UTSA ranks fourth overall in the total number of undergraduate degrees awarded to Hispanics in the United States, 12th for Master's degrees and 22nd for doctoral degrees [2].

In a short span of only four decades, the University has transformed from a regional commuter-campus to a thriving campus community. UTSA has also become a school of first choice for students in Texas [3]. In addition to the increasing enrollments, research expenditures and sponsored program funding totaled more than \$51 million in 2008. UTSA is poised to become one of the state's next premier public universities and achieve its goal of being the next Tier 1 institution within The University of Texas System.

With the rapid growth in the number of new industries moving to the region, the need for a skilled workforce ready to compete in today's data-rich environment will continue to increase [1]. The University will play a critical role by providing the knowledge base, developing innovative programs, and training graduates to meet the demands of the global economy [4].

In this new global environment, quantitative reasoning skills are essential for all citizens to help them understand and critically evaluate information to make better-informed decisions [5], [6], and [7]. Unfortunately, a large percentage of college graduates struggle to solve real-world problems that require basic quantitative literacy skills [8]. Data collected from incoming freshmen and graduating seniors at UTSA indicate a similar pattern (see section on UTSA Pilot Data in this chapter). Colleges and universities across the United States have started to recognize the importance of developing programs that provide students with the quantitative reasoning skills to help them succeed in the global economy. The University of Texas at San Antonio has chosen a **Quality Enhancement Plan (QEP)** to address this critical need. ***Quantitative Scholarship: From Literacy to Mastery*** provides the organizational framework and resources to fundamentally transform the institutional environment to one where quantitative reasoning skills are ingrained in the curriculum and the culture of UTSA.

UTSA's QEP seeks to increase and enhance the quantitative reasoning skills of its undergraduates. Two critical elements are addressed in this plan. First, the plan focuses on *contextual learning*, the ability to use simple mathematical, statistical, and computational tools to solve real-world problems. It requires a new paradigm for instruction: a break from *compartmentalized instruction* to one that seamlessly integrates numbers, graphs, and simple probabilistic concepts in courses in Biology, Chemistry, Geology, Economics, Social Science, and Political Science. To help all undergraduates develop these skills, the Quantitative Scholarship QEP will provide the framework for integrating quantitative reasoning and communication skills in different courses in the University's core curriculum. This integration is not only critical for graduating an informed citizenry, but it is also a necessary step in closing the gap between the institution's aspirations to be a research university and its mission of providing access to an underserved community. The second critical issue addressed by the QEP is that of providing students with advanced training in data analysis and modeling in areas where these techniques

are ubiquitous. The overall vision of the QEP is to create an exemplary program that prepares students to effectively use quantitative reasoning to make decisions in both their personal and professional lives.

Institutional Processes in the Development of the QEP

The Quantitative Scholarship QEP was selected through a process that involved broad participation from constituencies across the University. The process included (a) informing the UTSA community about the purpose and importance of the QEP; (b) inviting pre-proposals; (c) evaluating the pre-proposals and selecting a smaller subset to develop into full proposals; (d) evaluating the subset and selecting the final proposal to develop into a full QEP; and (e) preparing the final QEP.

Pre-proposal Development: The pre-proposal stage of the QEP development began with a series of informational meetings held during February and March of 2008 that provided the UTSA community with details (Appendix A) about the purpose of a QEP and its relationship to student learning and the strategic plan. Provost Fellow Dr. Belinda Flores and Dr. Gerry Dizinno, Associate Vice-Provost for Institutional Research, served as consultants during the pre-proposal development period. During this period, the QEP Committee was appointed (Appendix B), with Dr. Flores serving as chair. Committee members were appointed to serve in an advisory and review capacity throughout the QEP development process. The committee consisted of faculty, students, and staff from various offices including Academic Affairs, Student Affairs, the UTSA Library, Business Affairs, Community Services, University Advancement, and Research.

During these meetings, details about the QEP pre-proposal submission process were disseminated to faculty and staff. Guidelines and a template for the submission were made available on the UTSA SACS/COC Reaffirmation of Accreditation web site. Fourteen pre-proposals involving faculty and/or staff from four vice presidential divisions (Academic Affairs, Business Affairs, Community Engagement, and Student Affairs) were submitted.

The pre-proposals were evaluated by the QEP Committee on the basis of their ability to:

- a) Clearly identify the relationship of the plan to UTSA's mission by addressing one or more of the initiatives and goals of UTSA's strategic plan, *A Shared Vision, UTSA 2016*.

- b) Develop a clear, concise focus on student learning (relevant and appropriate goals; crucial importance for improving student learning and/or the environment supporting student learning; benefits to be derived).
- c) Identify an assessment and an evaluation plan which specifies the methods, approaches, and benchmarks for measuring the effects of the tasks/activities in the plan on student learning.
- d) Identify resources needed to implement the plan (financial, personnel, facilities, technology, library).

The QEP committee reviewed the fourteen pre-proposals and selected the following three proposals for further development:

- ***Maximizing the Relevance of Graduate Education for Current and Prospective Students***
- ***Quantitative Scholarship: From Literacy to Mastery***
- ***Service Learning: The Paseo to Lifelong Learning***

QEP Topic Selection: During the summer of 2008, the three teams were provided guidelines (Appendix C) for development of the full proposal. The teams were asked to present their plans to the UTSA community through a series of focus group sessions held at both the Main and Downtown campuses during September, 2008 (Appendix D). There were nine proposal presentation sessions with more than 200 faculty, staff, students, and alumni in attendance. The UTSA community was invited to review these three proposals and provide the QEP finalists with feedback and suggestions for improvement. The three teams worked on developing the proposals into detailed plans and submitted the final documents to the QEP committee on October 1, 2008.

The QEP Committee conducted a detailed evaluation (Appendix E) of the three proposals. Feedback from the community and the committee recommendations (Appendix F) were submitted to the University SACS/COC Reaffirmation Leadership Team. The Quantitative Scholarship proposal received the highest score with 12 of the 15 committee members ranking the proposal number 1 (see Appendix F). The Leadership Team submitted its recommendation (Appendices G and H) to the Campus Management and Operations (CMO), composed of the UTSA President and Vice Presidents for the different administrative units. These recommendations included a discussion of the clear relationship between the proposal and the Strategic Plan. In December 2008, the CMO approved the topic, **Quantitative Scholarship: From Literacy to Mastery**, and the budget for the University of Texas at San Antonio's Quality

Enhancement Plan. The teams were informed of the selection (Appendix I) and it was announced to the Community via the university's web newsletter, UTSA today (Appendix J).

The Executive Committee of the Quantitative Scholarship QEP (see Appendix K) was tasked with the responsibility of developing the proposal into a full plan. The committee included faculty members with extensive experience in teaching quantitative courses, interdisciplinary research, program development, and service on professional committees related to quantitative education. Three members of the Executive Committee currently serve as Principal Investigators for a National Science Foundation Grant that has led to the development of two quantitatively enhanced courses for UTSA Biology students. The committee consulted with a number of Deans, Department Chairs, and faculty members (see Appendix K for the members of this Advisory Committee) when drafting their original proposal. The Chair of the Executive Committee has since met with faculty members in Biology, Chemistry, Computer Science, Economics, Geological Sciences, Mechanical Engineering, Political Science, and Sociology to solicit their input. The Chair has also worked closely with the Directors of the Teaching and Learning Center, Statistical Consulting Center, and the Writing Program in the development of training programs for faculty. In addition, the Chair has met with the Vice Provost and Dean for Undergraduate Studies, Dean of the Library, and the Vice President for Student Affairs. The Quantitative Scholarship QEP has broad-based support across the University and represents a truly collaborative effort to increase the quality of the undergraduate education at UTSA.

The Need for Quantitative Literacy

The first chapter of the book *Mathematics and Democracy* [9], pg. 1, starts with the thought-provoking statement: “*The world of the twenty-first century is a world awash in numbers.*” The advances in technology, particularly the Internet have resulted in an unprecedented explosion in the amount of information and data. According to an article in the *New York Times* [10], the research firm IDC predicts that the amount of digital data will rise fivefold by 2012. Every single day, citizens of this global economy are inundated with information and data: number of H1N1 deaths, unemployment numbers, cost of health care reform, and effectiveness and safety of new drugs. The skills needed to understand, interpret, and evaluate real data to make informed decisions are critical to empowering all citizens and enriching their personal and professional lives.

Robert Orrill, Executive Director, National Council on Education and the Disciplines (NCED), and Senior Advisor at The Woodrow Wilson National Fellowship Foundation, makes this powerful argument for quantitative literacy [11], pg. vi:

“For a democracy, this is no low-stakes concern. If numbers are present everywhere in our public discourse, and many are more confused than enlightened by them, what happens to decision making in our society? If we permit this kind of innumeracy to persist, do we not thereby undermine the very ground and being of government of, by, and for the people?”

The importance of numeracy/quantitative literacy in our society is undeniable; it is vital to the long-term improvement of student learning and the creation of a workforce ready to face the challenges of the global economies. UTSA’s QEP focuses on enhancing the quantitative literacy skills of our undergraduate students to help them understand and evaluate data, assess risks and benefits, and make informed decisions in all aspects of their lives. The plan will be implemented through significant curricular reform (described in Chapter 4) that will help all undergraduates at UTSA improve their quantitative literacy skills.

Quantitative literacy involves understanding the role of numbers, using simple mathematical and statistical tools to solve real world problems, and knowing how to reason and think using numbers. The International Life Skills Survey [12] defines quantitative literacy as:

An aggregate of skills, knowledge, beliefs, dispositions, habits of mind, communication capabilities, and problem solving skills that people need in order to engage effectively in quantitative situations arising in life and work.

Building on this foundation of quantitative literacy, the QEP is also expected to help a significant number of UTSA students reach a level of quantitative mastery in disciplines where quantitative methods are essential. These students will be equipped with a portfolio of data analytic, modeling, and simulation tools that will help them compete successfully for admission into top professional and graduate schools or directly enter the workforce.

Quantitative Literacy and Student Learning

National Data: In 2006, the American Institutes for Research (AIR) published a report [8] based on the *National Survey of America’s College Students* (NSACS). The survey of 1,827 graduating students from 80 randomly selected two-year and four-year public and private colleges and universities provided a comprehensive assessment of fundamental college literacy. The instrument used in the NSACS was the same as that used in the National Assessment of Adult Literacy (NAAL) study. The NAAL instrument was developed and administered by the U.S. Department of Education's National Center for Education Statistics (NCES), and it is the most comprehensive measure of adult literacy in the United States.

The NSACS measured literacy along three dimensions: prose literacy, document literacy, and quantitative literacy. The following definitions were used:

Prose Literacy: The knowledge and skills needed to perform prose tasks, that is, to search, comprehend, and use information from continuous texts. Prose examples include editorials, news stories, brochures, and instructional materials.

Document Literacy: The knowledge and skills needed to perform document tasks, that is, to search, comprehend, and use information from noncontinuous texts in various formats. Document examples include job applications, payroll forms, transportation schedules, maps, tables, and drug or food labels.

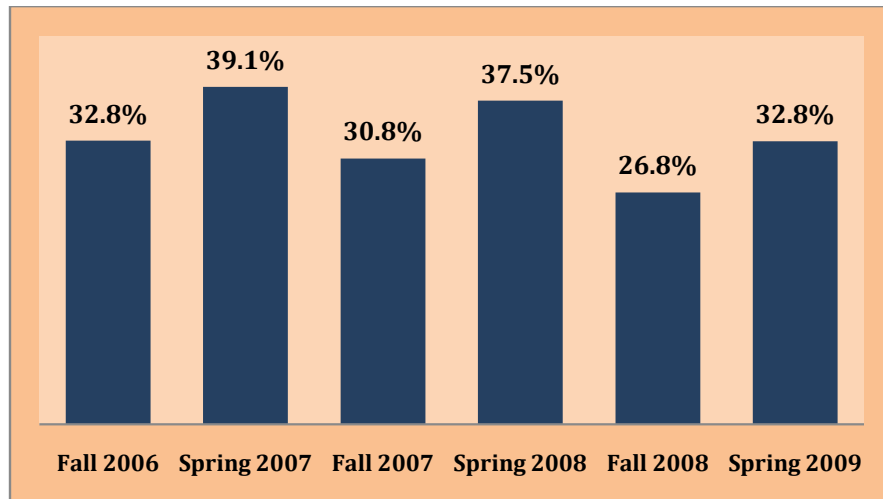
Quantitative Literacy: The knowledge and skills required to perform quantitative literacy tasks, i.e., to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials. Quantitative examples include balancing a checkbook, figuring out a tip, completing an order form, or determining the amount of interest on a loan from an advertisement. [8]

Key findings from the AIR study revealed that college students struggled most with quantitative literacy. The study found that 20% of U.S. college students completing four-year degrees, and 30% of students earning two-year degrees possessed only basic quantitative literacy skills. They were unable to estimate if their car had enough gasoline to get to the next gas station or calculate the total cost of ordering office supplies. The study also found that 82% of students at two-year colleges and 66% of students at four-year colleges did not score at the proficient level of quantitative literacy. They lacked the skills to perform complex tasks, such as interpreting a table about blood pressure, age, and physical activity; comparing credit card offers with different interest rates; or comparing viewpoints in newspaper editorials.

The data also showed persistence of disparities in the average literacy of White students compared with the literacy of students from other racial/ethnic backgrounds. The study found that the average prose and quantitative literacy of White students in four-year institutions was higher than for any other racial/ethnic group (Black, Hispanic, Asian). However, differences in the average prose, document, and quantitative literacy of males and females were not statistically significant. Students in four-year institutions who took either a remedial English or math class had lower quantitative literacy scores than their peers who were not required to take a remedial course.

UTSA Data: As a Hispanic and Minority-Serving Institution, UTSA's student population includes large numbers of minority and other historically underserved students, many of whom are the first in their families to attend a university. At the institutional level, no historical data is available that directly measures the level of quantitative literacy of the student population. Indirect evidence of the need for quantitative literacy is elicited from the large number of students who need mathematics remediation at the time of admission. Over the past five years, the percentage of students enrolled in remedial mathematics courses has ranged from 36% to 41%. In addition, the performance of students in freshmen level Mathematics and Statistics courses indicates a deficiency in basic mathematical skills. Figure 1.1 provides the percentage of students receiving grades of D, F, and W (withdraw) in College Algebra and Basic Statistics: two courses that satisfy the core requirements in the Mathematics domain.

Figure 1.1: Percentage of Students Receiving Grades of D/F/W in Core Algebra and Statistics Courses



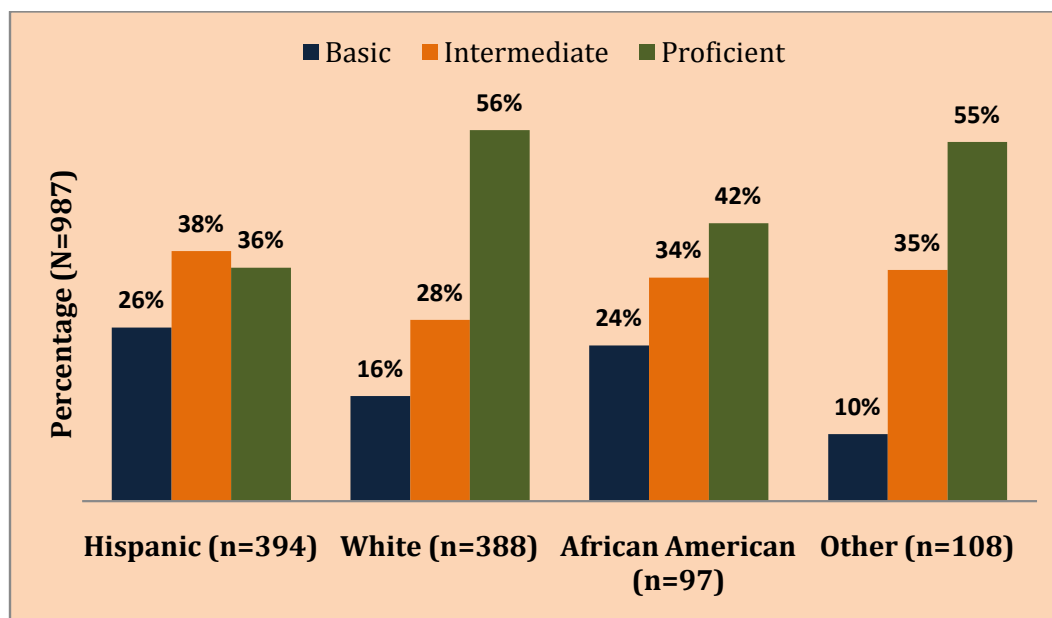
UTSA Pilot Data: To assess the quantitative literacy levels of incoming freshmen at UTSA, a pilot study was conducted in the summer of 2009. A preliminary Quantitative Literacy Assessment Test (QLAT) (See Appendix L) was developed in-house by the QEP Chair and faculty members from the Department of Management Science and Statistics. Questions on the QLAT were intended to test students' abilities in four areas:

- (a) Reading and interpreting basic graphs, charts, and tables
- (b) Simple probability calculations
- (c) Interpreting data and simple data summaries, including the mean, range, and standard deviation
- (d) Understanding sampling and bias

Questions 1-5 required students to interpret percentages, ratios, and make simple numeric comparisons. Questions 8-13 addressed students understanding of basic ideas of probability and counting. Questions 16 and 17 required students to interpret data summaries. Questions 18 and 19 required students to use simple algebraic methods and interpolation from a deterministic mathematical model. Finally, questions 22 and 23 addressed concepts of sampling, reasoning, and bias. In addition, students were asked to indicate their level of familiarity with the content in each of the four areas. The test required students to interpret and evaluate data, and combined algebraic, probabilistic, and statistical concepts: the definition of quantitative literacy. Multiple items were used to test each of the four areas listed above, in increasing order of complexity. The level of mathematical knowledge required was minimal, and students were not allowed to use calculators.

The test was administered to a sample of 987 students (see Appendix M for a description of the sample) from the 2009 freshman class during the summer orientation. Figure 1.2 provides a comparison of the percentage of students who scored at the basic or below basic level (< 59 points), intermediate level (between 60 and 82 points), and proficient level (> 82 points) of quantitative literacy by ethnicity. From the figure, we see that 56% of White students score at the proficient level compared to 36% for Hispanic students. Approximately 26% of Hispanic and 24% of African American students score at or below a basic level of quantitative literacy. These results are consistent with the findings of the AIR report [8].

Figure 1.2: Quantitative Literacy Levels of UTSA Freshmen by Ethnicity



Analysis of the data from the pilot study revealed some disconcerting (but not surprising) results:

- A majority of students had difficulty extracting relevant information from word problems.
- Over 90% of students could not identify potential sources of bias or define the appropriate population for a research study.
- Approximately 40% of students were unable to compare two datasets and determine which of the two datasets was more variable.
- Students scored well on items that were specific, requiring direct calculations or simple manipulations.
- The average score for females was significantly lower than the average score for males.

Given the results from the pilot study, the implementation of the Quantitative Scholarship QEP is timely. The QEP will help students improve their quantitative literacy skills through a curriculum that focuses on contextual learning, helping students use simple mathematical, statistical, and computational tools to solve problems that they encounter in their everyday lives. Too often, students view Mathematics and Statistics courses as hurdles to graduation and a large percentage of students wait until their junior/senior years to complete their core mathematics requirements. Institutional data indicates that over 40% of students in the Basic Statistics course are Juniors and Seniors. The QEP will help students overcome these hurdles by showing them the relevance of quantitative skills across the disciplines. By enhancing the quantitative literacy skills of our students, we believe the program will have a positive impact on retention, persistence, and graduation.

The Office of Institutional Research also analyzed data from the Fall 2008 Faculty Information Forms completed as part of the student survey of teaching (IDEA survey). Of the 1,225 undergraduate courses taught that semester, only 65 courses (5.3%) had the features “writing” and “mathematical/quantitative work” marked as “much required”. Of these 65 courses, the only courses in the core curriculum were Mathematics and Statistics courses.

These results, based on national and institutional data, clearly justify the need for providing students with the quantitative reasoning skills that will help them understand and evaluate data to make better-informed decisions.

In the next chapter, we will provide a review of the literature and best practices for teaching quantitative content and developing quantitative literacy programs. Chapter 3 discusses the relationship between the Quantitative Scholarship QEP and the UTSA Strategic Plan, and

outlines the vision, mission, and goals of the QEP. A detailed implementation plan is provided in Chapter 4. Assessment of Student Learning Outcomes and Program Goals is discussed in Chapter 5. The administrative structure and resources for the QEP are provided in Chapter 6.

Chapter 2: Background and Literature Review

“As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.” Albert Einstein

“It is better to be roughly right than precisely wrong.” John Maynard Keynes

The quotes, one from the eminent physicist, Albert Einstein, and the second by the father of modern macroeconomics, John Maynard Keynes, provide an interesting contrast between the two worlds of mathematics and quantitative literacy. In this chapter, we discuss the different definitions of quantitative literacy and its relationship to Mathematics and to Statistics. A brief history of Mathematics and Statistics is provided, followed by a history of quantitative literacy and mathematics education in the United States. We then provide a review of the recent literature in teaching quantitative methods and building quantitative literacy programs, concluding with a summary of best practices.

What is Quantitative Literacy?

To most students, mathematics represents a world of abstraction, formulae, and meaningless symbols. The Algebra, Trigonometry, and Calculus curricula taught in high schools focus on symbolic manipulation with problems that are devoid of real context [9]. As mathematics has evolved, it often feels removed from the real world. Einstein’s famous quote points to the uncertainty that is inherent when we try to model nature via mathematical equations. Peter Ewell [13] reiterates this perception of mathematics “... I suspect that most people’s early exposure to mathematics strongly imprints the idea that it is somehow illegitimate to improvise and approximate in the quantitative realm: things are either ‘right’ or ‘wrong’ and must be ‘precise’ to be of any use” [pg. 38]. In the world of Keynes, approximations are indeed legitimate and often more valuable than precision.

Quantitative literacy is not solely about mathematics or statistics, but rather the individual’s ability to interpret and evaluate data. The National Center for Education Statistics (NCES) identifies literacy on three dimensions: Prose, Document, and Quantitative Literacy (see Chapter 1). Peter Ewell [13] articulates a clear distinction between Mathematics and Quantitative Literacy. For him, the term literacy represents “an integrated ability to function seamlessly within a given community of practice” [pg. 37]. He further argues that even though

there are three dimensions, literacy is a single concept. In most practical situations, quantitative literacy is practiced together with prose and document literacy.

Definitions

Quantitative Literacy may also be referred to as numeracy, mathematical literacy, statistical literacy, or quantitative reasoning. There are subtle nuances in the different terms used to describe this form of literacy.

The term **numerate** first appeared in the Crowther Report [14] as a “word to represent the mirror image of literacy.” The report goes on to clarify the word **numeracy**: “the need in the modern world to think quantitatively, to realise how far our problems are problems of degree even when they appear as problems of kind. Statistical ignorance and statistical fallacies are quite as widespread and quite as dangerous as the logical fallacies which come under the heading of illiteracy.” The Cockcroft report [15], a British government report on mathematics education provided a different definition of the term **numerate**:

We would wish the word 'numerate' to imply the possession of two attributes. The first of these is an 'at-homeness' with numbers and an ability to make use of mathematical skills which enables an individual to cope with the practical mathematical demands of his everyday life. The second is an ability to have some appreciation and understanding of information which is presented in mathematical terms, for instance in graphs, charts or tables or by reference to percentage increase or decrease.

The Program for International Student Assessment (PISA) conducted by the Organization for Economic Cooperation and Development (OECD) is an assessment of reading, mathematics, and science literacy of 15-year olds in 30 countries. The OECD/PISA [16] defines **mathematical literacy** as:

An individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen.

Gal [17] defines **Statistical Literacy** as

People's ability to interpret and critically evaluate statistical information, data-related

arguments, or stochastic phenomena, which they may encounter in diverse contexts, and when relevant, their ability to discuss or communicate their reactions to such statistical information.

The NCES administers the National Assessment of Adult Literacy (NAAL), an assessment of literacy among adults age 16 and older. The NAAL report [18] defines **Quantitative Literacy** as

The knowledge and skills required to perform quantitative tasks (i.e. to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials). Examples include balancing a checkbook, figuring out a tip, completing an order form, or determining the amount of interest on a loan from an advertisement.

The International Adult Literacy and Skills Survey (IALSS) [19], the Canadian component of the Adult Literacy and Life Skills Survey (ALL) uses this definition of **Numeracy**:

The knowledge and skills required to effectively manage the mathematical demands of diverse situations.

In addition to the definitions listed above, the two monographs *Why Numbers Count: Quantitative Literacy for Tomorrow's America* [20] and *Mathematics and Democracy: The Case for Quantitative Literacy* [9] provide several additional definitions of quantitative literacy. Even with all these different definitions, we can clearly identify common threads: using quantitative tools to solve practical problems, understanding and evaluating numbers and information, and using data to make decisions in every aspect of our daily lives. The definition we feel best represents these different skills is from the International Life Skills Survey [12]:

An aggregate of skills, knowledge, beliefs, dispositions, habits of mind, communication capabilities, and problem solving skills that people need in order to engage effectively in quantitative situations arising in life and work.

In the next section, we present a brief history of mathematics, statistics, and numeracy that provides the context for the curricular reform that has occurred in the past fifty years.

The Origins of Mathematics, Probability, and Statistics

The history of mathematics can be traced back to the third millennium BC, with the development of number systems in Egypt and Mesopotamia. These civilizations viewed mathematics as a practical tool: calculating the number of workers and days necessary for

building a canal, developing a tax system, and performing computations for transactions involving goods and services. During this period, evidence of counting systems and early mathematical thought was also found in India and China [21], [22]. In the fifth century BC, the search for general propositions and a basis for logical argument took root in Greece in the so-called “classical period.” The famous treatise on geometry, Euclid’s *The Elements*, was one of the earliest Greek Mathematics texts of this period that survived and continues to be used to this day. The study of Mathematics flourished during the Hellenistic period, the period that saw Alexandria become the most important center of learning [23]. The 5th to the 12th century AD saw significant developments in Mathematics in India, China, and the Islamic world. The birth of algebra and significant advances in trigonometry occurred during this period.

The end of the 16th century and the dawn of the 17th century saw resurgence in mathematical thought. Galileo, (<http://galileo.rice.edu/index.html>) considered by many to be the father of modern science, investigated the motion of falling bodies by performing experiments. Kepler (<http://kepler.nasa.gov/johannes/>) formulated the laws of planetary motion and was the first to derive logarithms based on mathematics. Descartes developed the field of analytic geometry, and the Cartesian coordinate system we use today is named after him. However, one of the singular achievements of the 17th century (and of all time) was the invention of calculus. Building on the work of many earlier mathematicians, Isaac Newton laid the rigorous foundations for differential and integral calculus. By a remarkable coincidence, the German mathematician Gottfried Leibniz independently developed the foundations of calculus during the same period.

The 17th century also saw the foundations being laid for the theory of probability. Fermat and Pascal examined the use of permutations and combinations to enumerate the outcomes for different games of chance. Bernoulli started to investigate the quantification of uncertainty and determination of *a posteriori* probabilities using an empirical approach. Probability theory provided the framework for the development of the early statistical methodology. In 1805, Legendre published the seminal work *Nouvelles méthodes pour la détermination des orbites des comètes* that included the method of least squares. While statistical methods were used in astronomy in the early 19th century, it was not until the late 19th and early 20th century that these methods were applied to the social sciences. The pioneers in this era include Galton, Pearson, Edgeworth, and Fisher. For a comprehensive history of Mathematics, the reader may refer to *A History of Mathematics* by Boyer [21] and Stigler [24] for a detailed account of the history of Statistics from the early 1800’s.

History of Quantitative Literacy

As we see from the previous section, numbers played an important role in ancient civilizations. Thomas [25] addressed the issue of numeracy in England during the period 1500-1700, and discussed the forces behind the need for ordinary citizens to acquire numerical skills. Arithmetic skills, such as simple calculations and keeping accounts, were important for anyone involved in trade. However, very few grammar schools taught arithmetic, and even the average undergraduates at the university did not possess adequate mathematics skills. Cohen [26] stated that by the end of the 17th century, in England, “fewer than four hundred men could be said to be mathematically minded, and that figure includes teachers of navigation as well as Fellows of the Royal Society, with talents varying from the undisciplined mind of William Petty to the genius of Isaac Newton” [pg. 39]. It was not until the 18th century that mathematics was considered an essential part of the curriculum [26].

The history of numeracy in America can be traced to colonial times with proponents including leaders such as Benjamin Franklin and Thomas Jefferson [26]. During the 18th century, the public was presented with data on population growth, reports on births, and patterns of death. The prevailing view was that every individual’s time of death was predestined. During the Boston smallpox epidemic of 1721, a controversy arose between proponents and opponents of inoculation. Quantitative data were presented by two groups arguing different sides of the issue, but both groups failed to sway public opinion. The data presented by both sides were flawed. However, in 1726, a Boston physician Boylston [27] published a report based on detailed records of his own patients who had been inoculated. He computed that 1 in 47 (2.1%) of the inoculated cases had died compared to a 14.7 % mortality for patients who had not been inoculated. This report was instrumental in changing the public perception regarding the safety and efficacy of inoculation and led to a “new attitude toward numbers” [26: 108].

Even with this new attitude, there were few schools that taught basic arithmetic in the 18th century. Those schools that taught arithmetic relied on students memorizing numerous rules to solve different types of problems. The students had to match the problem to the rule and then construct the solution. One of those rules was referred to as the Golden Rule of Business, or the Rule of Three and is described by Cohen [26] as follows:

“Given three parts, to find the fourth,” is the way the rule was often stated. If 7 yards of cloth cost 21 shillings, how much do 19 yards cost? The Rule of Three instructed the student to set down 7:21::19 on paper and then multiply the middle times the last number and divide the product by the first. Writing the numbers in the wrong order was a major source of grief to students. But the real problem with this rule was that the first

step of the solution leads to a meaningless number: 21 shillings by 19 yards equals 299 units of what? It is only with the second step, dividing 399 by 7 yards, that the calculation makes any sense. A more logical way to do the problem is to figure out what one yard costs and go from there.

By the late 18th century, it was clear that a change was needed to help students not only learn but also understand arithmetic. In the early 19th century, the ideas of a young Harvard mathematician, Warren Colburn, brought about a revolution in Mathematics teaching that he referred to as “mental arithmetic.” His first arithmetic book for young children contained no rules and encouraged children to use common sense and inductive reasoning to solve problems. Even though Colburn’s methods were short lived, the new mathematics was instrumental in bringing the basics of quantitative literacy to large numbers of children [28], [29].

Mathematics and Numeracy in the 20th Century

As mathematics became the language of the sciences and engineering, the need for well-trained students became critical. Geometry, Algebra, Trigonometry, and Calculus became part of the high school curriculum. Texas now requires all college-bound students to complete four years of Mathematics. In spite of the advanced training, the curriculum does not provide students with the skills needed to interpret, evaluate and analyze real data and the use of simple tools to solve real world problems.

In the past fifty years, quantitative methods have been used in almost every area to evaluate, analyze, and interpret data for decision-making. In this data-rich global society, it is critical that all citizens achieve a level of quantitative literacy to make informed data-driven decisions in their lives. However, even with numbers and data being ubiquitous, *math anxiety* and *innumeracy* continue to be serious problems in our society. John Allen Paulos [30], [31] addresses the consequences of mathematical illiteracy and the misleading reporting of quantitative information in his two best-selling books. Sheila Tobias’s book [32] provides insight into the attitudes that affect students’ performance in mathematics.

As we have seen in the previous section, the history of mathematics began with numbers being used to solve practical problems: simple forms of numeracy existed in the early civilizations. As mathematics evolved, it became increasingly abstract and devoid of context. Even though mathematics requirements for high school students have increased over the years, a similar increase in quantitative literacy levels has not occurred.

Designing a Quantitative Reasoning Program

In 1989, the National Research Council conducted a study to assess the state of Mathematics education in the United States from kindergarten through graduate study. A group of distinguished educators, administrators, policy experts, and industry leaders produced a report, titled *Everybody Counts* [33], that outlined a national strategy for revitalizing mathematics and science education. The report stated “Mathematical literacy is essential as a foundation for democracy in a technological age” [pg. 8]. In response to these reports, the National Council of Teachers of Mathematics (NCTM) undertook a major revision of its standards calling on students to learn rich and challenging mathematics. In 2000, NCTM published a new update of its standards for school mathematics [34]. The standards not only addressed the traditional areas of mathematics including algebra and geometry but also addressed the essential elements of quantitative literacy:

“... the Standards for school mathematics describe an ambitious and comprehensive set of goals for mathematics instruction. The first five Standards present goals in the mathematical content areas of number and operations, algebra, geometry, measurement, and data analysis and probability. The second five describe goals for the processes of problem solving, reasoning and proof, connections, communication, and representation. Together, the Standards describe the basic skills and understandings that students will need to function effectively in the twenty-first century.”

The American Statistical Association (ASA) and the NCTM Joint Committee on Curriculum in Statistics and Probability addressed quantitative literacy through development of materials and promoting awareness. The National Science Foundation funded *Quantitative Literacy Project*, a collaboration between the ASA and the NCTM, provided curriculum materials and organized workshops to help teachers enhance their statistical skills. The collaborative effort of teachers and statisticians resulted in a series of four books for middle- and high-school students:

1. *Exploring Data*, by Landwehr and Watkins
2. *Exploring Probability*, by Newman, Obremski, and Scheaffer
3. *The Art and Techniques of Simulation*, by Gnanadesikan, Scheaffer, and Swift
4. *Exploring Surveys: Information from Samples*, by Landwehr, Swift, and Watkins

At the college level, the report [35] from the Mathematical Association of America’s Committee on the Undergraduate Program (MAA-CUPM) stated “Colleges and universities should treat quantitative literacy as a thoroughly legitimate and even necessary goal for baccalaureate graduates.” The report published in 1998 provided a set of quantitative literacy requirements

for all undergraduate students. These requirements are listed below in the section on Best Practices.

In the last decade, quantitative literacy has been recognized as critical to the survival of democracy. A national conversation [9], [36] has begun on how schools and colleges can effectively implement programs that help their students succeed in the global economy. With this increasing awareness of the critical need for quantitative literacy, many liberal arts colleges, including Wellesley, St. Olaf, and Carleton College, have developed programs to embed quantitative methods and technology in courses in the arts and the humanities. The websites <http://www.statlit.org> and <http://www.stolaf.edu/people/steen/Papers/glprogs.pdf> provide a list of institutions that have implemented quantitative literacy/quantitative reasoning programs.

The QEP committee reviewed the programs at several of these institutions. Based on this review, we discuss existing best practices for curriculum reform and assessment in the context of quantitative reasoning.

Best Practices

Goals, Objective, and Outcomes

The MAA-CUPM report [35] sets standards for quantitative literacy requirements for all college graduates. The report also provides recommendations for colleges and universities to achieve these standards through establishment of effective quantitative literacy programs. The report states that every college graduate should be able to:

- 1. Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them.*
- 2. Represent mathematical information symbolically, visually, numerically, and verbally.*
- 3. Use arithmetical, algebraic, geometric and statistical methods to solve problems.*
- 4. Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.*
- 5. Recognize that mathematical and statistical methods have limit.*

The student learning goals and associated outcomes of the QEP presented in Chapter 3 will address these skills and competencies.

Teaching and Learning Quantitative Skills

There is a significant body of research in effective teaching of mathematics and statistics both at the K-12 and college levels. The Guidelines for Assessment and Instruction in Statistics Education (GAISE) project [37] funded by the ASA proposes a series of recommendations for the teaching of introductory statistics at the college level, and suggestions for implementing these strategies in the classroom. The recommendations include the use of active learning, a focus on conceptual understanding, and the use of real data.

Hulsizer and Woolf [38] provide a detailed guide to teaching statistics, with an emphasis on psychology. However, the book provides principles and suggestions that are applicable in teaching quantitative skills in a variety of disciplines. Wenner et al. [39] provide five pedagogical ideas to increase the quantitative literacy of students in introductory geosciences courses. Many of these ideas are rooted in best practices from the mathematics education community. Deborah Hughes-Hallett [40], [41] suggests additional strategies for developing quantitative literacy. There are several recurring themes in these different articles: contextual learning, engaging students, collaborative learning, using technology, writing, and repetition. Based on a review of the literature, the following best practices are identified:

A: Teach in Context

The literature in mathematics and statistics education suggests that students benefit greatly when these concepts are placed in the context of the real world. Peter Ewell [13] also makes the argument that students need quantitative literacy to be rich in context regardless of their major. He goes on to add, “QL is not practiced in isolation nor can it be separated from a particular social context” [pg. 48]. Hughes-Hallett [40], [41] also asserts that the ability to apply mathematical knowledge is easily lost when students are asked to use this knowledge in an unfamiliar context.

The quantitative literacy curriculum development program outlined in Chapter 4 focuses on an approach that seamlessly integrates quantitative reasoning and communication skills in courses across the core curriculum. This allows students to see the applications of quantitative skills in a variety of different contexts. It is important to note, that although UTSA already offers

several courses in Mathematics and Statistics that focus on specific majors, the effort at developing quantitative literacy requires that students develop these skills in courses across the curriculum.

B: Emphasize Conceptual Understanding/Develop Insight

Hulsizer and Woolf [38] address the problems associated with rote memorization. Many students in Mathematics and Statistics often resort to memorizing formulae and rules instead of focusing on the underlying concepts. Hansen, McCann, and Myers [42] observe that students who memorize material perform well on formula questions in basic probability but have difficulty with word problems that require insight. The analysis of the baseline quantitative literacy data at UTSA yields similar findings. Hughes-Hallet [40], pg. 96, also addresses this problem, stating,

“The reason that quantitative literacy is hard to learn and hard to teach is that it involves insight as well as algorithms. Some algorithms are of course necessary—it is difficult to do much analysis without knowing arithmetic, for example. But algorithms are not enough; insight is necessary as well. Insight connotes an understanding of quantitative relationships and the ability to identify those relationships in an unfamiliar context.”

Moreover, Hulsizer and Woolf [38] advocate the use of active learning to help students develop a higher and more robust degree of learning. The research by Sedlmeier [43], [44] shows that successful learning of statistical reasoning requires active learning and is affected by the format in which information is represented. Active learning in quantitative classes may be achieved through a variety of forms [37], [38], [45]:

- Group problem solving and discussion
- Laboratory exercises (simulation, data analysis)
- Demonstrations based on class-generated data
- Written and oral presentations
- Group or individual projects

UTSA’s Teaching and Learning Center will organize summer workshops to help faculty design active learning exercises in their courses (see Chapter 4 for details).

C: Use Technology to Develop Conceptual Understanding

One of the overarching themes of the NCTM is technology: “Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning” [34]. The ASA GAISE [37] report also recommends that all teachers “[u]se technology for developing conceptual understanding and analyzing data” [pg. 1]. Software (Excel, graphing calculators) is now readily available and allows students to explore and visualize data and use simulations to test hypotheses and develop abstract ideas such as the Central Limit Theorem. Software tools also allow students to access and work with large datasets and identify patterns through data mining. Vacher [46] effectively incorporated spreadsheets, including Excel, for problem solving in the geosciences.

The learning outcomes for Quantitative Literacy and Mastery (see Chapter 3) address the use of technology in quantitative analysis.

D: Use Writing to Enhance Quantitative Skills

The MAA report suggests the use of writing to teach quantitative literacy. Assignments will require students to explain the results of a problem or critically evaluate a newspaper article or media presentation of data or other quantitative information. Hulsizer and Woolf [38] also suggest that adding writing to a quantitative reasoning class facilitates “students’ deeper understanding of statistical concepts” [pg. 90]. Chance [47] suggests the use of journals that require students to summarize class activities and develop chapter outlines. The students are also required to provide a self-evaluation of their knowledge of the material and their participation in the course. Lutsky [48] has developed a program at Carleton College that effectively integrates writing and quantitative reasoning. Writing is a critical component of the QEP. In fact, it is one of the three student learning goals presented in Chapter 3.

E: Teach Across the Curriculum

To help students achieve quantitative literacy, they must see applications of quantitative methods in a variety of disciplines. Madison [49] uses the term “synergism in education” [pg. 161] to advocate teaching across the curriculum. The MAA-CUPM report [35] suggests developing a plan that parallels “Writing Across the Curriculum” programs that are part of most college campuses. The report argues that

Just as the complexity of the writing task is so great that the English department should not be expected to assume responsibility for the entire job of its development for the student, so also the complexity of the task of a student's becoming quantitatively literate requires the commitment of more than the department of mathematics. Instructors in other fields must show students how to apply quantitative reasoning to gain disciplinary knowledge and understanding.

Hughes-Hallet [40], pg. 97, argues that a “good-natured conspiracy” is precisely what is needed to develop quantitative scholarship:

Quantitative literacy is achieved when students readily use quantitative tools to analyze a wide variety of phenomena. This requires constant practice. It also requires seeing such behavior as commonplace. This will not happen unless teachers model it. Verbal literacy became universal when it was perceived to be essential; quantitative literacy will be the same. No matter what we say or what curriculum we teach, students will remain unconvinced of the need for quantitative literacy if they do not perceive their teachers as being quantitatively literate.

The University of Texas at San Antonio’s QEP focuses on enhancing the quantitative reasoning skills of our undergraduate students to help them understand and evaluate data, assess risks and benefits, and make informed decisions in all aspects of their lives. The Quantitative Scholarship QEP will achieve its vision of being an exemplary program by implementing some of the key recommendations set forth in the publications cited above. The program will also build on the experience of other universities in developing quantitative literacy programs by adopting existing best practices for curricular reform and assessment.

The curriculum development program outlined in Chapter 4 includes a variety of courses in the Core Curriculum. Quantitative tools will be embedded in courses such as Biology, Economics, Political Science, and Sociology. Students will see how quantitative tools are used in these disciplines. The training workshops (discussed in Chapter 4) will help faculty embed quantitative concepts as they redesign the courses and provide training on effective teaching pedagogies.

In the next chapter, we discuss the relationship between the Quantitative Scholarship QEP and the University’s Strategic Plan and outline the vision, mission, and goals of the QEP. Based on the review of best practices, we develop a set of student learning outcomes that will allow us to assess progress toward the specified goals.

Chapter 3: Quantitative Scholarship and UTSA's Strategic Plan

In 2006, the university unveiled its strategic plan **UTSA 2016** [4], presenting a shared vision of the University as ***“a premier public research university, generating world-class research, providing access to educational excellence, and preparing leaders for the global environment in order to enhance our economy and promote the quality of our lives.”*** The strategic plan was developed to achieve UTSA's vision and fulfill the mission of the university:

The University of Texas at San Antonio is dedicated to the advancement of knowledge through research and discovery, teaching and learning, community engagement and public service. As an institution of access and excellence, UTSA embraces multicultural traditions, serving as a center for intellectual and creative resources as well as a catalyst for socioeconomic development for Texas, the nation and the world.

The plan was the culmination of an 18-month process involving faculty, students, staff, alumni, community leaders, and others committed to helping UTSA become a premier public research institution. As the strategic plan was developed, the University identified five strategic initiatives:

- A. Enriching Educational Experiences to Enable Student Success
- B. Serving Society through Creativity, Expanded Research, and Innovations
- C. Promoting Access and Affordability
- D. Serving the Public through Community Engagement
- E. Expanding Resources and Infrastructure

These strategic initiatives provide the milestones for the University as it continues on the path toward its 2016 goals. The first strategic initiative reaffirms the University's commitment to providing outstanding educational opportunities that allow UTSA graduates to “develop the awareness and skill sets needed to compete in a global environment.” The Quantitative Scholarship QEP addresses this strategic initiative through a program that will provide students with skills that will make them competitive and in demand for the new careers of the 21st century. Increasing the quantitative literacy skills of our students will also have a positive impact on retention, persistence, and graduation.

The mission and goals of the Quantitative Scholarship QEP presented in this chapter are directly aligned with those of the first strategic initiative. In addition, implementation of the QEP will address several strategies and tactics outlined in the UTSA 2016 Strategic Implementation Plan

including (a) improving instruction of courses at UTSA and (b) developing an innovative curriculum [4].

The QEP and the Blue Ribbon Committee on the Undergraduate Experience

In 2007, UTSA President Ricardo Romo appointed a **Blue Ribbon Committee on the Undergraduate Experience** to study issues related to the current undergraduate educational environment. The committee was composed of twenty-five faculty and staff members drawn from academic disciplines and administrative units as well as three undergraduate student representatives. The creation of the Blue Ribbon Committee was an outgrowth of UTSA's Strategic Plan, and it was given the following charge:

The charge of the Blue Ribbon Committee on the Undergraduate Experience includes identifying the knowledge and skills that a UTSA undergraduate should have upon graduation in order to be competitive and successful in a global society made even smaller by technological advances, making recommendations for changes to the undergraduate curriculum that will help our students achieve the identified knowledge and skills and obtain an improved quality of education, and formulating proposals for transformations to enhance the quality of the overall educational experience of UTSA undergraduates.

After careful analysis of the undergraduate educational environment, the Blue Ribbon Committee identified six key areas of knowledge and skills that every undergraduate should have upon graduation. The first three areas listed below are directly related to the goals of the QEP. The Blue Ribbon Committee Report [50] states that "In order to be successful in tomorrow's world, the graduating senior must be able to:

1. Effectively use oral, written, presentation, and listening skills to communicate and interact with others

The ability to communicate effectively is key to becoming a leader who promotes progress and a global citizen mindful of diverse perspectives. To function well in a global society and promote diversity, UTSA graduates must be able to interact effectively by understanding and valuing the perspectives of those who hold very different cultural and personal values.

UTSA graduates must be able to read critically, write and speak clearly and correctly and listen reflectively. Effective use of technology skills will also enhance the sharing of ideas with people around the world. Upon graduation, students will have had multiple opportunities to interact effectively with persons different from themselves in order to build consensus, reach out to resolve conflicts, and, when necessary, disagree respectfully.

2. Use quantitative reasoning

Quantitative reasoning skills are necessary in order to solve problems that currently affect the world as well as new issues that arise. Therefore, UTSA graduates will be able to interpret mathematical and statistical models, analyze data and make judgments concerning the validity and accuracy of the data. They need to be able to represent mathematical information symbolically, visually, numerically, and verbally. They must understand the process of using data to make decisions that impact their lives and the lives of others.

3. Evaluate information and apply it to problem-solving and research

UTSA graduates will be able to cope with an ever-changing world around them by researching problems, analyzing relevant information and formulating solutions. This requires an ability to think about the “whole picture” and how the problem exists in the larger context. Our graduates will understand how differing life experiences and values of individuals can impact both the problem and possible solutions. As transformative leaders, they will be able to consider multiple perspectives in approaching complex and ambiguous problems.

Advances in education and technology have helped pave the way for new, efficient ways of accessing information. UTSA graduates will be able to utilize appropriate and up-to-date technologies to provide creative, new ways of addressing issues and solving problems. They will have the ability to effectively identify, select and use appropriate research tools. Further, graduates will be able to evaluate the information they find to determine whether it is accurate, current, credible, and relevant to their needs.”

The Quantitative Scholarship QEP directly supports the University's first strategic initiative to enrich the educational experience to enable student success. It also provides a structured framework in which to implement the first three recommendations of the University's Blue Ribbon Committee on the Undergraduate Experience.

Program Vision, Mission, Goals, and Outcomes

To address the critical need for a quantitatively trained workforce in the new global economy, the Quantitative Scholarship QEP will provide the organizational framework and resources to fundamentally transform the institutional environment to one where quantitative reasoning skills are ingrained in the curriculum and the culture of UTSA. The plan will focus on improving student learning through curriculum enhancement and the implementation of innovative teaching pedagogies. The aspiration of the QEP is reflected in the vision statement.

QEP Vision Statement

Within the next five years we envision an exemplary program that prepares students to effectively use quantitative reasoning to make decisions in their personal and professional lives.

The vision of the Quantitative Scholarship QEP articulates the ambitions and hopes for a sustained program of excellence that brings together faculty from across the University. The vision helps to clearly define our course of action and set milestones for the next five years. This vision of developing an exemplary program will be achieved through a concerted and coordinated effort on the part of faculty, the involvement of different campus constituencies, and a significant institutional transformation.

The centerpiece of the QEP is a curriculum development program that helps graduate quantitatively literate citizens who are capable of fully participating in the twenty-first century global economy. The mission statement of the QEP conveys the program's focus on student learning and success through enhancing educational opportunities and experiences. The mission and vision of the QEP are directly aligned with UTSA's core values and strategic initiatives and provide a structured framework within which to implement the recommendations of the University's Blue Ribbon Committee on the Undergraduate Experience.

QEP Mission Statement

To educate students through an enhanced curriculum focused on contextual learning that will help them succeed in this data-rich environment by seamlessly integrating quantitative reasoning and communication skills in courses across the undergraduate curriculum.

To realize the vision and mission of the QEP, the Executive Committee has developed three comprehensive goals that address student learning, faculty development, and institutional culture. For each goal, well-defined objectives and performance measures have been identified that will be used in evaluation and assessment of these goals.

Program Goal 1: Develop Quantitative Skills in Undergraduate Students

The overarching goal of the QEP is to instill quantitative reasoning skills in undergraduate students at UTSA. All students will have the opportunity to acquire the skills needed to understand, represent, and interpret data to make decisions and the skills to effectively communicate the results of their quantitative analysis. The goal of developing quantitative skills will be addressed through the following well-defined student learning goals:

Student Learning Goal I: The program will help undergraduate students acquire basic quantitative literacy and numeracy skills. (Quantitative Literacy)

Student Learning Goal II: The program will help undergraduate students effectively communicate the results of their quantitative analysis in writing or by other means. (Communication)

Student Learning Goal III: The program will help undergraduate students acquire discipline-specific advanced quantitative skills. (Quantitative Mastery)

The first student learning goal focuses on helping students acquire the basic quantitative literacy skills to help them successfully face the challenges of the new data-rich global economy. The second student learning goal addresses the critical need [48] for students to not only reason quantitatively, but also translate mathematical concepts into words and present a cohesive argument using data. The third student learning goal deals with the mastery of quantitative concepts in disciplines where advanced mathematical, statistical, and computational skills are ubiquitous. All students will have the opportunity to acquire quantitative literacy and communication skills through an enhanced curriculum embedded in courses within the core curriculum. Only students in specific disciplines such as Biology, Psychology, Business, and Engineering will be targeted for the quantitative mastery goal. To assess the progress toward the three student learning goals, eight student learning outcomes have been developed. The eight outcomes are directly aligned with the Mathematical Association of America guidelines [35] presented in Chapter 2 for quantitative literacy and address the different elements of quantitative literacy outlined in the edited volume *Mathematics and Democracy* [9].

Student Learning Outcomes

UTSA undergraduates will be able to **EVALUATE**:

1. Students will demonstrate the ability to **EXPLORE** data to define problems and identify solutions in a variety of real-world contexts.
2. Students will demonstrate the ability to **VISUALIZE** data through converting information into different graphical and tabular forms.
3. Students will demonstrate the ability to **ASSIMILATE** and **ASSESS** information from different sources, multiple representations of data, different methodologies, and different studies.
4. Students will demonstrate the ability to use **LOGIC** in computing and interpreting probabilities, evaluating risks, and understanding the idea of uncertainty.
5. Students will demonstrate the ability to **UNDERSTAND** units of measurement and scale and the limitations of the quantitative analysis of data.
6. Students will demonstrate the ability to **ANALYZE** data using different quantitative methods and draw appropriate conclusions.
7. Students will demonstrate the ability to **TRANSLATE** quantitative language into verbal assumptions and vice versa.
8. Students will demonstrate the ability to **EXPRESS** quantitative evidence effectively in oral or written communication.

Basic quantitative and numeracy skills will be embedded in core curriculum courses (see Chapter 4) that lend themselves naturally to problem-based inquiry through the analysis of data sets representative of the course content. All courses participating in the QEP will be required to include a significant communication (writing, oral presentation, poster presentation) component. Advanced quantitative skills will be embedded in courses at the upper-division level in disciplines where these methods are essential (see Chapter 4 for a complete explanation of the plan). These eight learning outcomes will be assessed using multiple instruments and methodologies (see Chapter 5). Table 3.1 provides a list of the eight outcomes and the associated goals. The outcomes will be Introduced (I) in the core courses and

Emphasized (E) in the upper-division courses. Assessment data will be analyzed to evaluate the success of courses and the program in developing quantitatively trained students (see Chapter 5).

Table 3.1: Student Learning Goals and Associated Outcomes

Student Learning Outcome	Goal I: Quantitative Literacy (Core Curriculum)	Goal II: Communication (Core and Upper Division Courses)	Goal III: Quantitative Mastery (Upper-Division Courses)
EXPLORE	I	I, E	E
VISUALIZE	I		E
ASSIMILATE	I	I, E	E
LOGIC	I		E
UNDERSTAND	I		E
ANALYZE	I		E
TRANSLATE		I, E	
EXPRESS		I, E	

I: Information pertaining to outcome INTRODUCED

E: Information pertaining to outcome EMPHASIZED

The primary goal of enhancing student learning to develop quantitatively trained graduates is achieved through a well-designed curriculum that seamlessly integrates these skills into courses at the undergraduate level (see Chapter 4 for details). This leads to the second goal of the QEP: developing an effective training program for faculty and teaching assistants that will implement best practices for teaching quantitative content, course redesign, and assessment.

Program Goal 2: Implement effective teaching pedagogies and assessments to support the development of an exemplary quantitative scholarship program at the undergraduate level.

To accomplish this goal, several qualitative and quantitative outcomes are defined. The outcomes include measuring the effectiveness of workshops designed to train faculty and teaching assistants, increase in student learning due to curriculum redesign and enhancement, improvement in faculty teaching, and the level of satisfaction of stakeholders with the program. These outcomes will be assessed using a variety of internal and external measures (Chapter 5).

Outcomes

- 1) Training workshops will be successful in providing faculty with the tools to successfully integrate quantitative content in their courses and develop appropriate assessment mechanisms. Workshops will be successful in training teaching assistants to deliver and grade quantitative content.
- 2) A cadre of core faculty will be trained in the implementation of best practices for effective teaching and assessment of quantitative content.
- 3) QEP Courses will be successful in developing quantitatively trained students. Students completing QEP courses will perform at a higher level on learning outcomes related to quantitative reasoning than students who have not completed QEP courses.
- 4) Department/Program chairs and other stakeholders will express satisfaction with the quality of the courses, teaching effectiveness, and the progress toward learning goals. Satisfaction indicates the stakeholders' confidence in the program and is important for the program's sustainability.
- 5) Students will indicate a high-level of satisfaction with the teaching pedagogies introduced in the courses.

The goal of implementing effective teaching pedagogies to facilitate the development of an exemplary program requires a clear-cut organizational structure and an institutional commitment to providing the necessary support including personnel, infrastructure, and financial and physical resources. The final goal of the QEP addresses the role of the institution in achieving the overall vision.

Program Goal 3: Provide the organizational framework and resources for an institutional transformation to graduate a quantitative, informed citizenry consistent with the mission and vision of the University.

The outcomes and benchmarks listed below will allow the QEP Program Committee and the administration to assess the overall success of the plan. See Chapter 5 for a detailed discussion of the assessment and evaluation of these outcomes.

Outcomes:

- 1) The number of courses with quantitative content that implement effective teaching pedagogies will increase significantly every year over the five-year program period.
- 2) The number of faculty teaching courses with quantitative content will increase significantly every year over the five-year program period.
- 3) The program will transform the environment to one where quantitative reasoning skills are ingrained in not only the curriculum, but also the culture of UTSA.
- 4) Students, faculty, administrators, employers and other stakeholders will indicate a high-level of satisfaction with the program. Stakeholder satisfaction is necessary to the continued viability of the program.
- 5) Graduates of UTSA will have a portfolio of quantitative skills that will help them succeed in the global economy and become empowered citizens of the twenty-first century.
- 6) The Quantitative Scholarship QEP will be recognized nationally as an exemplary program.

In the next chapter, we present a detailed plan for implementation of the QEP. The program focuses on the mission and goals outlined above, and adopts the best practices discussed in Chapter 2.

Chapter 4: Implementation of the QEP

The vision of the QEP is to create an exemplary program within the next five years that prepares students to effectively use quantitative reasoning to make decisions in their personal and professional lives. This vision will be achieved through three specific program goals centered on improving student learning, training faculty, and providing the organizational framework and resources to ensure success. By adopting existing best practices for curricular reform, teaching pedagogies, and assessment, this QEP builds on the experience of other universities in developing quantitative literacy programs.

The primary goal of developing quantitative skills will be achieved by providing students with an enhanced curriculum that integrates quantitative reasoning and communication skills in courses at the undergraduate level. The steps involved in implementing the QEP include

- I. Curriculum mapping and identification of potential courses
- II. Selection of courses for redesign
- III. Curriculum redesign/Faculty Development
- IV. Assessment (see Chapter 5)

Curriculum Mapping

Quantitative Literacy and the Core Curriculum

To address the first learning goal: **help undergraduate students acquire basic quantitative literacy and numeracy skills**, courses in the core curriculum will be targeted for redesign. No changes will be made to the existing mathematics and statistics requirements in the curriculum. Currently, all undergraduate students at UTSA must complete 42 semester credit hours (SCH) of coursework in the Core Curriculum. The 42 hours are distributed across six domains (see Table 4.1), with specific goals and objectives consistent with the Texas Higher Education Coordinating Board (THECB) requirements.

Table 4.1: UTSA Core Curriculum Requirements

Communications (6 SCH)	Mathematics (3 SCH)
Natural Sciences (6 SCH)	Humanities & Visual and Performing Arts (6)
Social and Behavioral Sciences (18)	World Society and Issues (3)

All students can satisfy the Mathematics Domain requirement by completing one course (3 SCH) in College Algebra or an Introductory Statistics course. These courses provide students

with a foundation of basic mathematical and/or statistical skills. However, many students view these courses as hurdles to graduation, and a large percentage of students wait until their final semester to complete their core mathematics requirement (see Chapter 1). To most students, mathematics represents a world of abstraction, formulae, and meaningless symbols with problems that are devoid of real context [9].

Quantitative literacy by definition is rooted in context and allows students to see how simple mathematical and statistical tools may be used to solve challenging data-based problems. The focus of the QEP is on contextual learning, where quantitative tools are applied to real world situations. Madison [51] addresses the need for linking learning in the classroom to “contextual situations in the contemporary world” [pg. 5]. Steen [52] makes the argument for quantitative literacy to be taught across the curriculum. He states “Perhaps contextual teaching--the essence of QL--really belongs where the context is the primary subject being taught” [pg. 16].

Following Steen’s suggestion, the QEP will embed appropriate quantitative content in selected courses across the undergraduate curriculum. To ensure that all first-time full-time students have the opportunity to benefit from the QEP, courses selected for redesign and enhancement will be initially restricted to courses in the University’s core curriculum. The program will target courses where the content is naturally data-intensive. For example, the core course in Geology includes a discussion on population growth and its impact on natural resources. The Microeconomics course examines earnings and income distribution. The introductory Sociology course includes a discussion of the impact of race and ethnicity. All three core courses naturally lend themselves to the embedding of appropriate quantitative content and the assessment of the student learning outcomes. Instructors could require students to analyze real datasets from the Census, EPA, or other sources to reinforce concepts and theories addressed in the classroom. The QEP Committee has already met with department chairs and faculty members to discuss potential courses for the Quantitative Literacy Component of the QEP. Many departments have expressed interest in participating in the QEP, and the committee has received verbal commitments from the Economics, Biology, Chemistry, Geological Sciences, Political Science, and Sociology department chairs. The courses targeted include courses in the Natural Sciences and Social and Behavioral Sciences domains and represent four Colleges: Business, Liberal and Fine Arts, Science, and Public Policy (see Table 4.2).

Table 4.2: Courses in the Natural Sciences and Social and Behavioral Sciences Domains

Domain	Disciplines	SCH
Natural Sciences	Anthropology, Astronomy, Biology, Chemistry, Environmental Sciences, Geology, Physics	6
Social and Behavioral Sciences	History	6
	Political Science	6
	Criminal Justice, Geography, Psychology, Sociology	3
	Economics	3

The quantitative literacy portion of the QEP will allow students to see the applications of quantitative skills in a variety of different contexts. For example, a typical academic plan for a student majoring in History (see Table 4.3) could potentially allow the student to see quantitative material in six core courses over the first two years of his/her academic program.

Table 4.3: Academic Plan for UTSA History Major

Fall (Freshman Year)		Spring (Freshman Year)	
Course	Credits	Course	Credits
WRC 1013	3	WRC 1023	3
Mathematics	3	Science Level I	3
HIS 1043, 1053 or 2053	3	HIS 1043, 1053 or 2053	3
POL 1013	3	POL 1133 or 1213	3
Free Elective	3	Free Elective	3
Fall (Sophomore Year)		Spring (Sophomore Year)	
Course	Credits	Course	Credits
HIS 2003	3	Civilization (Double Dip in Core)	3
Social and Behavioral Sciences	3	Science Level II	3
ECO 2003, 2013 or 2023	3	Foreign Language (semester II)	3 or 4
Literature	3	Free Elective	3
Foreign Language (semester I)	3 or 4	Free Elective	3

As we have noted in Chapter 2, contextual teaching, reinforcement of concepts, and constant exposure will help improve the quantitative literacy skills of all undergraduates. Teaching in context and across the curriculum will also help facilitate transfer of knowledge and skills addressing the tendency of students to compartmentalize knowledge and skills.

Advising and Enrollment in QEP courses

The redesigned courses will be flagged as Q-courses. Beginning with the Fall 2011 cohort, all first-time full-time UTSA freshmen will be required to enroll in at least one Q-course in the core curriculum. Starting with the 2012 undergraduate catalog, all undergraduate students will be required to complete at least one Q-course prior to graduation. The QEP Project Director will work with the Advisors to ensure students receive information about the QEP and the potential benefits of enrolling in multiple Q-courses. If a student successfully completes the entire core or a portion of the core curriculum at another public institution of higher education in Texas, the Texas Higher Education Coordinating Board states that block of courses may be transferred to any other public institution of higher education in Texas and must be substituted for the receiving institution's core curriculum. Transfer students who complete core requirements at other universities will be required to enroll in at least one Q-course or complete mandatory Quantitative Literacy Workshops organized by the Statistical Consulting Center. Students will be tracked using the Banner system for QEP participation and for assessment.

Quantitative Mastery

To address the third learning goal: **help undergraduate students acquire discipline-specific advanced quantitative skills**, upper division courses will be targeted for redesign. The Quantitative Mastery phase of the QEP will involve the embedding of quantitative content in upper-division courses in disciplines where advanced mathematical, statistical, and computational tools are essential. The mastery portion of the QEP will allow undergraduate students to see more advanced quantitative topics in junior and senior level classes depending on their major. These courses will help students develop advanced skills that will allow them to successfully compete for admission to top professional and graduate schools, or enter the workforce.

Selection of Courses

Quantitative Literacy Course Development

The first program goal (**Develop Quantitative Skills in Undergraduate Students**) will be achieved through a well-designed curriculum that embeds these skills into courses at the undergraduate level. Since the program targets a number of courses in the core as well as upper-division courses, the QEP will quantitatively enhance the entire undergraduate curriculum by the end of the five-year period. Undergraduate students will be exposed to

numerous applications of quantitative methods in different contextual settings. Curriculum redesign and enhancement will require the development of an effective training program for faculty and teaching assistants that will allow for implementation of best practices for teaching quantitative content, course redesign, and assessment.

The second goal of the QEP (**Implement effective teaching pedagogies and assessments to support the development of an exemplary quantitative scholarship program at the undergraduate level**) focuses on building and sustaining effective teaching pedagogies and assessment programs. In the next section, we discuss a comprehensive plan for selecting courses for redesign and provide a detailed outline of training workshops.

Each fall, the QEP Program Committee will issue an invitation to all UTSA faculty members to submit proposals for the **QL Course Development Program**. Faculty members who are selected for the program will receive summer support in the amount of \$10,000 for an individual proposal, and \$15,000 for team proposals.

The first stage of the QEP will focus primarily on redesigning courses in the core curriculum. The proposals are expected to support the mission and goals of the QEP including

- Helping students acquire basic quantitative literacy and numeracy skills (Student Learning Goal I).
- Helping students effectively communicate the results of their quantitative analysis in writing or by other means (Student Learning Goal II).
- Implementing effective teaching pedagogies and assessments (Program Goal 2).

Once the proposal solicitation has been distributed through various media, the QEP Program Committee will hold a series of informational meetings in the Fall to provide details to faculty about proposal requirements. The Teaching and Learning Center will also organize a half-day workshop on proposal preparation that will help faculty identify goals and outcomes, and develop a preliminary assessment plan. The due date for all proposals will be December 1 of each year.

Eligibility Criteria

In the initial phase of the QEP, funding will be primarily restricted to courses in the core curriculum, but this restriction may change over time. All proposals submitted to the Course Development Program must satisfy the following eligibility criteria:

Courses:

- The course must be part of the University's core curriculum.
- The course must be offered every semester (with multiple sections).
- The course must have the potential to have significant quantitative content.

Faculty:

- Any faculty member (including non-tenure track faculty) teaching courses in the core curriculum is eligible to apply.
- Proposals involving two or more faculty members are eligible, but a single lead faculty must assume overall coordination responsibility.

Limit on Number of Proposals:

- A faculty member may submit one individual proposal and one team proposal. If both proposals are funded, the faculty member can only receive summer support for one proposal.
- A department may submit a maximum of two proposals (for two different courses).
- A department may only submit one proposal for a specific course.

Guidelines for Proposals

The proposal must contain the following:

1. Objectives and Plans.

The proposal must clearly address how the student learning goals for quantitative literacy and communication (Student Learning Goals I and II) will be achieved in the course. It must include a preliminary plan for assessing the eight student learning outcomes listed in Chapter 3.

2. Rationale

The proposal must clearly demonstrate

- Why quantitative methods are appropriate in that course/discipline.
- How quantitative methods could be embedded within the existing course structure.
- Why and how these changes will lead to improved student learning and benefit the course objectives.

3. Current Status of the Course

This section should include a short summary of how the course is coordinated, identify the course coordinators, discuss at what level the course is standardized among sections (at the catalog description level, at the course objective level, at the textbook level, at the exam/assignment level, at the daily lecture level), and how the course content is managed from semester to semester. A current assessment plan must also be included.

4. Sustainability

The proposal must outline a plan that addresses how all sections of the course will eventually integrate QEP learning goals and outcomes. The plan must address how the curriculum redesign and assessment efforts will be sustained beyond the duration of the grant.

5. Resources

The proposal should provide a preliminary estimate of needs for QEP undergraduate and graduate Teaching Assistants (TAs) to support the QEP initiative for the course.

6. Faculty Member(s) Qualifications

The proposal should address the qualifications of the faculty member(s), including teaching experience and course development. It should include a statement of teaching philosophy and a resume for each faculty member.

7. Department/Program Support

A letter from the Department/Program Chair must accompany all proposals. The Chair must address departmental commitment to ensure that all sections of the course supported by the grant integrate QEP learning goals and outcomes and ensure the department will support the involvement of the faculty in this development.

Proposal Review

All proposals will be reviewed by the QEP Program Committee. The committee will evaluate the proposals on their intellectual merit and ability to effectively incorporate significant quantitative content. Each reviewer will evaluate the proposal and award a maximum of 100 points according to the following evaluation criteria:

1. **A clear description of how the QEP Student Learning Goals will be achieved. (10 pts)**
2. **A clear description of the role of quantitative methods in the discipline and a plan for embedding quantitative methods within the existing course structure. (20 pts)**
3. **A discussion of how the plan will improve student learning. (20 pts)**
4. **A plan for formative and summative assessment. (20 pts)**
5. **A plan to include QEP learning goals and outcomes across all sections. (10 pts)**
6. **Appropriate involvement of department faculty, course coordinators. (10 pts)**
7. **Faculty qualifications, resources. (10 pts)**

The evaluation process will be completed by the 15th of February each year. The QEP Project Director (see Chapter 6) will send letters to the faculty awardees and the Department Chairs.

Post-Awards

Faculty awardees will commit to developing and implementing significant quantitative objectives into a core course. This commitment will entail the development of instructional materials needed to sustain continuity of delivery over multiple sections and multiple semesters. Faculty awardees will be required to share information on course content and assessment plans with instructors teaching other sections of the course. They will also commit to incorporating a significant assessment program that focuses on the Student Learning Goals of the QEP. The department chair will provide a letter of commitment to reiterate support for the incorporation and standardization of quantitative objectives into all sections of the course over the period of the QEP.

Funded faculty will be required to participate in the summer QEP Faculty Development Workshop. They will also receive assistance from the Statistical Consulting Center (SCC) in identifying resources, databases, and simulations available for their discipline. The SCC will also assist faculty in developing curricular materials and assessments for their courses. The details of the workshop are provided later in this chapter.

Curriculum Redesign: Faculty Training Workshop

The centerpiece of the Quantitative Scholarship QEP is the course redesign program that facilitates the seamless integration of quantitative methods and communication in courses across the undergraduate curriculum. A QEP Faculty Development Workshop will be conducted

every summer to help faculty with their course redesign, development of assessment rubrics, and integration of best practices for delivering quantitative content.

Faculty members will have a preliminary meeting with the QEP Project Director, QEP Program Coordinator, and the Directors of the Teaching and Learning Center, Statistical Consulting Center, and Writing Center soon after the announcement of the awards. See Chapter 6 for a description of the roles and responsibilities of these personnel. Each faculty member will be required to provide a detailed list of course topics, copies of handouts, exams, assignments, and projects. The Statistical Consulting Center Staff will review these materials and work one-on-one with the faculty member(s) to determine a preliminary list of quantitative topics that would be appropriate for their course. Based on these preliminary meetings, the QEP Program Coordinator and the Directors of the three centers will finalize the topics for the QEP summer workshops. These workshops are designed primarily for the Q-course instructors. However, other interested faculty may attend.

The QEP Summer Workshop will be held in 3 phases:

1. Phase I will be held at the beginning of the summer session. It involves an intense five-day workshop that provides hands-on training in course redesign. The workshop will specifically address the embedding of quantitative content. By the end of the first phase, faculty members will have the tools necessary to create a course outline and syllabus, and to develop an “enhanced” curriculum. Faculty will be given two weeks after the workshop to create a preliminary outline for review and feedback.
2. At the end of two weeks, Phase II will begin with a two-day workshop. Faculty will share their course outlines and content with their peers, and will also receive one-on-one feedback from the workshop staff and facilitators. A panel discussion will also be held for faculty members with prior experience teaching quantitative content to share their expertise with the group. The panel will also include the instructors of the Fall 2010 pilot courses. At the end of the two-day workshop, faculty members will have six weeks to prepare their new course for implementation.
3. In Phase III, which will occur near the end of the summer session, faculty members will return to present their “new course” to their peers. The facilitators will provide final suggestions for improvement.

A detailed plan for the three phases of the summer workshop is provided below.

QEP SUMMER WORKSHOP: PHASE I

Day 1

Introduction (1 hour)

- Exploring the meaning of quantitative literacy-Definitions, examples
- Teaching quantitative skills – The challenge for teachers and students
- Teaching mathematics as a language

Goals and Outcomes (3 hours)

- Setting goals and outcomes: The Taxonomy
- Formulating goals that go beyond “knowing and understanding” to create significant learning experiences

Activity: Faculty work on defining goals for the course.

Activity: Group Discussion/Feedback

- The broad QEP goals and student learning outcomes
- Learning to evaluate the 8 QEP student learning outcomes
- Aligning and Integrating course/discipline -specific goals with broader QEP goals and student learning outcomes

Activity: Faculty work on aligning course goals with QEP goals and learning outcomes.

Activity: Group Discussion/Feedback

- Looking at examples from other courses focused on quantitative literacy

Assignment for Day 2: Create examples based on existing course content that address the QEP outcomes

Day 2

Presentation (1/2 hour)

- Faculty presentation of goals, outcomes, examples
- Discussion

Facilitator Feedback (1/2 hour)

- One-on-one discussions with facilitators

Content (3 hours)

- Choosing content in the context of goals

Activity: Faculty work on developing content topics that will help them achieve their goals

Activity: Group Discussion/Feedback

- Develop a preliminary course plan

Assignment for Day 3: Create a preliminary course plan based on the content selected and the goals identified.

QEP SUMMER WORKSHOP: PHASE I

Day 3

Presentation (1/2 hour)

- Faculty presentation of refined goals and preliminary course plans
- Discussion

Facilitator Feedback (1/2 hour)

- One-on-one discussions with facilitators

Best Practices in Teaching Quantitative Literacy (3 hours)

- Embedding quantitative content
- Teaching in Context and across the Curriculum

Activity: Faculty are given examples of different quantitative concepts and asked to rewrite the examples in the context of the discipline.

Activity: Group Discussion/Feedback

Day 4

Technology as a Tool (2 hours)

- Thinking of technology as a way to multiply communication outlets, including faculty-student interactions and student-student interactions: Blackboard, wikis, blogs, etc.
- Using software tools effectively: Spreadsheets, Applets, Packages
- Using simulations to develop abstract ideas.

Activity: A demonstration of some popular software tools and hands-on training for faculty.

Writing (2 hours)

- Translating data into words and vice versa
- The importance of effective writing in communicating results
- Quantitative Vocabulary
- Teaching specific quantitative writing skills: writing concise/valid/meaningful statements, assertions, and conclusions about data.
- Integrating effective writing components
- Looking at examples of writing assignments

Activity: Faculty will work on developing a writing assignment for their course.

Activity: Group Discussion/Feedback

QEP SUMMER WORKSHOP: PHASE I

Day 5

Assessment (3 hours)

- Looking broadly at assessment: An overview
- Defining assessment: Formative and Summative
- Using formative assessment such as Classroom Assessment Techniques (CATS) to continually monitor—and help students monitor—learning progress, including prior knowledge, background levels, and misconceptions
- Using summative assessment as benchmarks and milestones measuring student learning progress
- Looking at specific examples of assessment assignments in various disciplines that promote and measure quantitative literacy

Activity: Faculty will work individually and in groups on developing assessment strategies for their goals and outcomes.

Activity: Group Discussion/Feedback

- Exploring assessment further by determining what is assessable and how it can be assessed.
- Creating rubrics for assignments and learning activities: An in-depth look

Activity: Faculty will work individually and in groups on developing rubrics.

Activity: Group Discussion/Feedback

Wrap-up (1 hour)

- **What have we learned?**
- **Putting it all together**
- **Next step: Syllabus Redesign**

Assignment: Faculty will have two weeks to develop a course outline, detailed syllabus, and a sample lesson plan for Phase II.

QEP SUMMER WORKSHOP: PHASE II

Day 1

Presentation and Review (2 hours)

- Presentation of Course Outlines/Syllabi, Plans
- Group Discussion/ Feedback from facilitators

Using Active Learning (2 hours)

- Using Group activities/Presentations in the classroom
- Using Laboratory Exercises to illustrate different quantitative concepts

Day 2

Faculty Resources (2 hours)

- Teaching Assistants
- UTSA Library and the QEP
- Websites/Data Resources
- Tutoring, Supplemental Instruction, Learning Communities
- Using Blackboard/WebCT

Panel Discussion: Effective Strategies in Teaching and Learning Quantitative Content
What works and what does not work: Learning from Experience

Assignment: Faculty will continue to develop the syllabus, outline, and curriculum for the new redesigned course. Faculty will include assignments for assessing quantitative literacy outcomes and appropriate rubrics. Staff from the TLC, Writing Program, and the SCC will be available for consultations during this period.

QEP SUMMER WORKSHOP: PHASE III

Presentation and Review (3 hours)

- Presentation of Course Outlines/Plans
- Presentation of Syllabus: before and after
- Discussion of assessments, innovation
- Peer Review/Feedback from facilitators

One-on-One Meetings

- Faculty will meet with the QEP Program Coordinator and staff from the three centers and receive an evaluation of their course design.

Periodic meetings of instructors and the QEP Program Coordinator will be held during the fall and spring semesters to monitor faculty progress and ensure that appropriate assessments are being conducted. Faculty and TAs will provide the Program Coordinator with results of course-embedded assessments (see Chapter 5 for details).

Faculty will also be required to submit proposals for development grants for Quantitative Mastery (see section on Course Development Grants). These proposals must address how the student learning goals for Communication and Quantitative Mastery (Student Learning Goals II and III) will be achieved in the course. A plan for assessment of the eight student learning outcomes must also be provided. These proposals will also be reviewed by the QEP Program Committee. Faculty members will be required to attend parts of the Summer Workshop. However, they will receive additional support from the SCC staff on specific aspects of their course.

Role of Teaching Assistants

A large number of courses targeted for redesign and enhancement by the Quantitative Scholarship QEP are taught in lecture halls with enrollments that exceed 200. Few of these courses have associated lab or recitation sections, thus, limiting the opportunity for faculty-student interaction. Classroom logistics and lack of computer labs for large lecture classes are significant barriers for instruction. Faculty members teaching large introductory sections are rarely able to assign regular homework and in-class exercises, resulting in limited formative assessment.

Support for TAs and graders is also fairly limited in many departments. To assist faculty members with course delivery and grading, the plan calls for the hiring of new TAs and graders. TAs will assist faculty teaching large lecture courses by demonstrating the quantitative concepts through different modes, including online learning modules. The TAs will also assist with assignments, projects, and case studies that require students to analyze data and communicate their findings. The utilization of the TAs in the learning process incorporates best practices of active learning and the use of technology to enhance learning. TAs would also deliver scheduled clinics on the use of Excel or other statistical software to analyze data using the computer classrooms in the library. These clinics would alleviate the need to spend class time demonstrating the use of software.

Selection of TAs for QEP courses will be the responsibility of individual departments. However, all QEP TAs must attend the QEP training workshops. They will also be responsible for recording assessment data and providing the QEP Program Coordinator with a summary report.

Workshop for Teaching Assistants

Teaching Assistants will play a major role in the implementation of the QEP. The TAs and graders will receive training to ensure their understanding of the quantitative methods included in each course. The workshop will address grading homework and assignments for both quantitative content as well as effective communication of the content. In addition, the workshop will provide TAs with training on teaching, tutoring, classroom management, and the use of technology to assist faculty with the Q-courses.

Departments offering Q-courses will assign TAs prior to the scheduled workshop and require them to attend. A two-day workshop for TAs will be held prior to the beginning of the Fall and Spring semesters. Prior to the workshop, the SCC will conduct a clinic for all TAs that covers introductory research methods, graphing and visualization using software, and simple modeling tools (see Appendix N for clinic outline). All TAs will meet with the course Instructor and the facilitators prior to the two-day workshop. At this meeting, they will be provided with the textbook, syllabus and course outline, and a sample of assignments. The TAs will be asked to prepare a solution to an assigned problem prior to the workshop. The TAs will also be required to attend university-wide workshops organized by the TLC.

After the workshop, TAs will be evaluated periodically by the Program Coordinator. Faculty members will attend TA sessions to assess performance and address any potential problems.

QEP TA WORKSHOP: DAY I

Introduction (1 hour)

- Exploring the meaning of quantitative literacy-Definitions, examples
- Teaching quantitative skills – The challenge for teachers and students
- Teaching mathematics as a language/Dealing with Math Anxiety

Presentation and Discussion (1 hour)

- TAs will present homework solutions (sessions will be videotaped)
- Faculty and facilitators will evaluate the TAs

Activity: TAs will meet one-on-one with instructors/facilitators to go over evaluations.

Technology as a Tool (2 hours)

- Using software tools and simulations effectively: Spreadsheets, Applets, Packages

Conducting Lab/Recitation/Review Sessions (2 hours)

- Classroom management, using Blackboard, effective communication
- Dealing with problems in the classroom, increasing student participation

Activity: TAs will be asked to work in small groups to address situations that may occur in the classroom. TAs will be asked to grade a sample assignment using a rubric.

QEP TA WORKSHOP: DAY 2

Presentation and Discussion (1 hour)

- TAs will present their graded assignments to their peers/faculty/facilitators
- Group Discussion and feedback

Writing (2 hours)

- Translating data into words and vice versa/Quantitative Vocabulary
- The importance of effective writing in communicating results
- Helping students with specific quantitative writing skills
- Grading using rubrics

Activity: TAs will grade the same assignment again incorporating these new tools.

Teaching Assistant Resources (1 hour)

- UTSA Library: Websites/Data Resources
- Tutoring, Supplemental Instruction, Learning Communities
- Teaching and Learning Center/Statistical Consulting Center/Writing Program

Presenting Quantitative Content (2 hours)

- Best Practices: Teaching in context
- Using groups effectively, activities
- TAs from the Mathematics and Statistics programs will share their experiences

Instructional Support

Teaching and Learning Center (TLC): The TLC at UTSA provides resources and support to enhance innovative teaching by faculty and graduate students. The center organizes regular workshops that bring in national experts in curriculum redesign and assessment to UTSA. The TLC will work with the QEP Program Coordinator to develop and coordinate the Faculty and Teaching Assistant Training Workshops each summer. They will organize and deliver some of the training elements of the Quantitative QEP. Staff of the center will provide the expertise in assessment as well as curriculum development. The TLC will work closely with the Statistical Consulting Center and the Writing Program in this effort. Staff from the TLC will be available throughout the year for one-on-one consultations with QEP faculty and TAs.

Statistical Consulting Center (SCC): The SCC provides statistical expertise for faculty and students at UTSA and researchers in the community. The SCC personnel have extensive experience in developing, delivering and assessing quantitative curriculum. They have broad knowledge of available data sets and simulations in many areas. The SCC will provide training

on effective teaching of quantitative content, assessment and the use of technology as part of the Training Workshops. The center will also assist in the collection, analysis, and archival storage of the assessment data obtained as part of the QEP initiative. SCC staff will be available throughout the year for one-on-one consultations with faculty and TAs. Graduate Research Assistants working at the SCC will serve as mentors for QEP TAs.

Online Data Analysis Suite (ODAS): The SCC staff will also assist in the development of a set of online tutorials and assessments developed for Blackboard to teach basic data analysis and interpretation skills. These will include a test bank of examples and exercises from everyday life as well as examples and exercises from specific disciplines. Faculty teaching QEP courses will be encouraged to contribute examples to the test bank. This repository of tools, applets, and datasets will be available to all faculty and students. The Online Data Analysis Suite (ODAS) can be effectively used by Instructors and TAs in several ways. Instructors can assign modules in the ODAS that cover the mechanics of particular quantitative analyses without having to spend class time on it. Students will complete these modules as part of their course grade. Because the ODAS modules and assessments are administered online, they can be graded and the results incorporated easily. As the number of Q-courses increase, the ODAS will have an extensive collection of teaching tools for the use of all UTSA faculty.

Writing Program: The Writing Center/Program will provide support for the Summer Faculty and TA workshops. Staff of the Writing Program will also be available throughout the year for one-on-one consultations. Writing Program Staff will assist TAs with the grading of the written portion of the assignment. The Director of the Program will work with the TLC and SCC in developing a writing module for the Summer Training Workshops.

Dissemination

Faculty awarded QEP Development Grants will be required to share their experiences with curriculum redesign and teaching during the summer workshops the following year. Faculty awardees will also be provided funds to travel to conferences on teaching pedagogies. The QEP Project Director and other key personnel will present papers at national conferences on the results of the program.

Implementation Timeline

The official start-date for the QEP is Fall 2011. Assuming the plan is accepted, the QEP Program Committee will institute a pilot program in the Fall of 2010 with two to three courses. A pilot Faculty Development Workshop will be held in the Summer of 2010. The courses selected for the Pilot Program will represent the Natural Sciences and Social and Behavioral Sciences Domains of the Core Curriculum. Results of the Pilot Program will be used in refining the workshops. In the first year of the QEP, eight courses will be selected for redesign. Redesigned courses will be offered in both the Fall and Spring semesters. Eight new courses will be added annually for the next four years. In the first two years of the program, courses will primarily be selected from the Core Curriculum and focus on quantitative literacy. Mastery courses will be added in Years 3-5. Faculty selected for the QEP may receive funding for up to two years. A timeline for the QEP is provided in Table 4.4.

Assessment

The final step in the implementation of the QEP is Assessment. All faculty members teaching the Q-courses will be required to conduct both formative and summative assessments. Results from the course-embedded assessments will be provided to the QEP Project Director. In the next chapter, we provide a detailed plan for assessment and evaluation of the QEP based on the goals and outcomes discussed in Chapter 3.

Table 4.4: QEP Timeline

Year	Term	Pilot Study	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5
2010	Spring	Recruit Faculty for Pilot Study					
	Summer	Training Workshops					
	Fall	Offer Pilot Q-courses	Solicit Proposals				
2011	Spring	Assess Pilot Program	Select Courses				
	Summer		Training Workshops				
	Fall		Implement redesigned courses	Solicit Proposals			
2012	Spring			Select Courses			
	Summer		Assess and Revise	Training Workshops			
	Fall		Implement redesigned courses	Implement redesigned courses	Solicit Proposals		
2013	Spring				Select Courses		
	Summer			Assess and Revise	Training Workshops		
	Fall			Implement redesigned courses	Implement redesigned courses	Solicit Proposals	
2014	Spring					Select Courses	
	Summer				Assess and Revise	Training Workshops	
	Fall				Implement redesigned courses	Implement redesigned courses	Solicit Proposals
2015	Spring						Select Courses
	Summer					Assess and Revise	Training Workshops
	Fall					Implement redesigned courses	Implement redesigned courses
2016	Spring						Implement redesigned courses

Chapter 5: QEP Assessment and Evaluation Plan

In this chapter, a comprehensive assessment and evaluation plan will be described to measure progress toward achievement of QEP Program goals. The plan for assessment consists of three parts: (a) Assessment of Student Learning Goals, (b) Overall Program Assessment, and (c) Assessment of the Process.

The QEP Project Director and the Associate Vice-Provost (AVP) for the Quality Enhancement Plan and the Core Curriculum (QEP/CC) will have overall responsibility for on-going assessment and evaluation of the QEP results. They will work closely with the office of the Vice Provost (VP) for Accountability and Institutional Effectiveness (AIE) to ensure that the evaluation process is consistent with university requirements for assessment and accountability and to disseminate information for use in strategic planning.

The overall success of the QEP will be measured by:

1. the degree to which UTSA undergraduate students have achieved the stated quantitative literacy and communication outcomes.
2. the degree to which students in specific majors have achieved the stated quantitative mastery outcomes.
3. the increase in the number of courses with quantitative content.
4. the degree to which best practices for teaching quantitative content are implemented across the curriculum.
5. the degree of satisfaction of students, faculty, and employers.
6. the fundamental transformation of the institutional environment to one where quantitative reasoning skills are ingrained in the curriculum and the culture of UTSA.

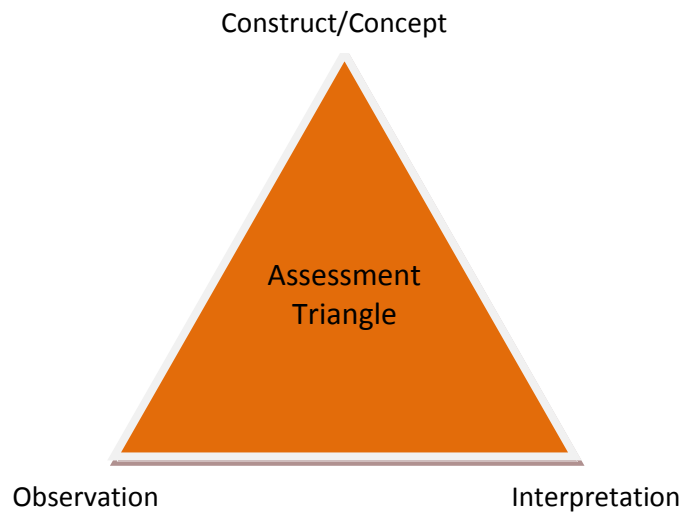
Assessment of Program Goal 1: Student Learning Goals

To measure the degree to which UTSA undergraduate students have achieved the stated student learning goals of quantitative literacy, communication and quantitative mastery, a variety of direct and indirect measures of assessment will be used. An integrated approach to developing assessments is based on the Assessment Triangle developed in a report authored by the National Research Council Committee on the Foundations of Assessment [53]. Shavelson [54] suggests the use of this model in assessing quantitative reasoning (QR). The work of

Wilson and Sloane [55] and Kennedy [56] will also be incorporated in building an effective assessment program based on the QEP Student Learning Goals.

Figure 5.1 illustrates the assessment triangle. The construct vertex represents the knowledge, skills, concepts, or abilities to be measured (quantitative literacy, communication, quantitative mastery). The observation vertex represents activities/tasks designed to elicit evidence of specific understanding along a construct. The interpretation vertex focuses on the “inferences” instructors can draw about student knowledge and understanding. Shavelson [55] states “By interpretation is meant the basis for scoring performance and the chain of reasoning--logical, cognitive, and statistical--that links the scores on the assessment to the construct of interest, QR” [pg. 29].

Figure 5.1: The Assessment Triangle



Student Learning: Methodologies and Instruments

To measure student learning, a combination of existing and new instruments will be used for assessment. These include:

1. **Baseline Evaluation:** In order to assess the effectiveness of the program in increasing the level of quantitative literacy of students, the QLAT (see Chapter 1, Appendix L) will be administered to all incoming freshmen. Preliminary results from the pilot study and test reliability are provided in Appendix M. During the Spring 2010 semester, the data from the pilot study will be used to validate the test, assess its reliability, and make modifications, if required. Standard techniques including confirmatory factor analysis,

item response analysis, analysis of the multitrait-multimethod matrix (MTMT), and exploratory factor analysis will be used for the validation [57]. An item-by-item score as well as a composite (weighted) score will be recorded for every student to provide a baseline for comparison along the different dimensions. The modified and validated instrument will be administered each summer during orientation to all UTSA first-time full-time and transfer students starting in the Summer of 2010. Scores from the QLAT will be used to establish baseline quantitative literacy levels from which improvement may be measured.

2. **Course Embedded Assessment:** Faculty members teaching courses selected for redesign through the competitive grant process will be required to implement a rigorous plan for assessment. Questions embedded in assignments and exams will address different student learning outcomes. For courses in the core curriculum, some of the quantitative questions will be similar to items on the QLAT. Assignments, projects, and exams in upper division courses will be designed to evaluate students' mastery of quantitative methods using the student learning outcomes listed in Chapter 3.
3. **Exit Test:** To evaluate the effectiveness of the program, the QEP Program Committee will work with faculty to develop a test that will measure the degree to which students have acquired quantitative skills. In addition, portions of the Collegiate Learning Assessment (CLA) and the Measure of Academic Proficiency and Progress (MAPP) instruments that address analytic thinking and problem solving will be used to evaluate student progress. Existing capstone courses will also be used as appropriate to assess student progress toward mastery.
4. **Graduate/Professional School Exams:** Scores of students on GRE/GMAT/MCAT exams will allow for comparisons of students in Q-courses to students who had limited or no exposure to the QEP.
5. **Focus Groups/Surveys:** The Teaching and Learning Center (TLC) will conduct focus groups of faculty, teaching assistants, and students to identify expectations, perceptions, attitudes, and problems with individual courses as well as the overall program. Surveys of faculty and students will also be conducted annually. Both qualitative and quantitative data will be collected.

The QEP Program Committee will work with the office of the VP-AIE and the University Testing Services to coordinate the sampling and administrative process. A summary of the different instruments used to assess student learning is provided in Table 5.1.

Table 5.1: Assessment Methods/Instruments

Instrument	Target Population	Method/Forum	Outcome
QLAT	All first time, full-time freshmen (FTFT)	Orientation testing sessions	Establish baseline for use in longitudinal data analysis
Course Embedded Assessment	All FTFT who were initially given QLAT and currently registered in a QEP course	Assignments/ Exams will embed questions similar to items on the QLAT	Data will be collected to measure improvement in levels of literacy or mastery over time
Exit Test CLA/ MAPP	Cohort of freshman and graduating seniors on a yearly basis	Stratified random samples of qualifying students	Cross-sectional data collected on performance and analytical tasks
GRE/ GMAT/MCAT	Students applying to graduate/professional schools	Random Sample of graduating seniors	Measure difference in performance for the two cohorts
QEP surveys	Students, faculty, TAs	Focus groups	Continuous improvement of QEP programs

Course Embedded Assessments

Common test items, homework problems, and writing assignments will be required in courses selected for redesign in the core curriculum. The items will be similar in terms of the quantitative content but will be placed within the context of the respective disciplines. In addition, discipline specific outcomes also will be assessed through assignments, cases, exams, and projects. The data collected from all the assessments will be provided to the Program Coordinator and QEP Project Director for evaluation.

Table 5.2 provides guidelines for course embedded assessments for Student Learning Goals I and II (Quantitative Literacy and Communication, respectively) using the eight learning outcomes outlined in Chapter 3. Faculty members must address all eight student learning outcomes in their course. However, they may choose assessment methods including assignments and exams that are most appropriate for their particular course.

Table 5.2: Guidelines for Assessment of Student Learning Goals (Quantitative Literacy and Communication)

Student Learning Outcome	Course Embedded Assessment Method
Students will demonstrate the ability to EXPLORE data to define problems and identify solutions in a variety of real-world contexts.	Assignments and exams in Q-courses will require students to: <ul style="list-style-type: none"> • Define a problem, identify measurements, and develop an appropriate plan to provide a solution using quantitative methods.
Students will demonstrate the ability to VISUALIZE data through converting information into different graphical and tabular forms.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: <ol style="list-style-type: none"> a) Interpret data presented in graphical and tabular forms in a variety of contexts. b) Construct pie charts, bar graphs, histograms or time plots for different datasets using software tools. c) Construct a frequency or contingency table based on quantitative or categorical data. d) Determine which graphical procedure provides the best representation of different types of datasets. e) Compare and contrast two datasets using graphical and tabular displays.
Students will demonstrate the ability to ASSIMILATE and ASSESS information from different sources, multiple representations of data, different methodologies, and different studies.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: <ol style="list-style-type: none"> a) Compare and contrast two different representations of the same dataset. b) Compare two different methods of data analysis.
Students will demonstrate the ability to use LOGIC in computing and interpreting probabilities, evaluating risks, and understanding the idea of uncertainty.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: <ol style="list-style-type: none"> a) Compute probabilities of events from a tabular display or using simple counting rules. b) Interpret probabilities to determine whether occurrences are rare or common, and evaluate risks of making decisions. c) Determine whether an experiment is deterministic or random.

Student Learning Outcome	Course Embedded Assessment Method
Students will demonstrate the ability to UNDERSTAND units of measurement and scale, and the limitations of the quantitative analysis of data.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: a) Identify different scales of measurement and perform conversions and simple dimensional analysis. b) Understand the difference between frequencies and percentages. c) Understand the idea of sampling and the basic principles of experimentation. d) Understand the ideas of sampling bias, validity, reliability, and margin of error.
Students will demonstrate the ability to ANALYZE data using different quantitative methods and draw appropriate conclusions.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: a) Compute and interpret basic numerical summaries such as means, medians and standard deviations in a variety of contexts. b) Use appropriate quantitative methods that may include regression, simulation, hypothesis tests, and design.
Students will demonstrate the ability to TRANSLATE quantitative language into verbal assumptions and vice versa.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: a) Make correct and meaningful verbal assertions about data. b) Translate verbal assertions about data into quantitative expressions. c) Identify and explain the risks and cost-benefits involved in making decisions.
Students will demonstrate the ability to EXPRESS quantitative evidence effectively in oral or written communication.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: a) Read an article/report and write a short summary about the data presented in the report. b) Effectively communicate the results of data analysis, including presentation of conclusions in the context of the underlying problems. c) Describe how particular data support foundational principles in a discipline and the assumptions made in performing the analysis. d) Write a coherent and correct technical report that summarizes a complete quantitative analysis.

An example of a course embedded assessment that addresses several student learning outcomes for quantitative literacy is given below for illustration. This example may be used in an introductory Sociology course.

Educational Attainment and Earnings in the United States: The Current Population Survey (CPS) conducted by the Census Bureau and the Bureau of Labor Statistics provides information on the mean earnings and educational attainment of the population 18 years and over by Age, Gender, Race and Hispanic Origin. The dataset provided represents CPS data from 1975 to 2007.

(a) Examine the data to determine any trends in the percentage of Hispanics receiving college degrees over this period. **[Explore, Visualize]**

(b) Compare the average earnings of Males and Females by ethnicity and educational attainment. Discuss your findings. **[Analyze, Translate, Express]**

(c) Compare the surveys used by the American Community Survey and the CPS. Discuss the quality of information produced by the two surveys. **[Understand]**

(d) Using state-level information, compare Texas with national data. Is there evidence to suggest that the average earnings for Texas students receiving college degrees are higher than the national average? **[Assimilate, Analyze]**

Assessing Quantitative Mastery

Table 5.3 provides guidelines for course embedded assessments for Student Learning Goals II and III (Communication and Quantitative Mastery, respectively) using the eight learning outcomes outlined in Chapter 3. Once again, faculty members may choose assessment methods including assignments and exams that are most appropriate for their particular course. The writing assignments in the mastery courses will require students to analyze and interpret more complex datasets and provide a comprehensive technical report. Students will also be expected to deliver high quality posters, reports, and presentations.

Table 5.3: Guidelines for Assessment of Student Learning Goals (Quantitative Mastery and Communication)

Student Learning Outcome	Course Embedded Assessment Method
Students will demonstrate the ability to EXPLORE data to define problems and identify solutions in a variety of real-world contexts.	Assignments and exams in Q-courses will require students to <ul style="list-style-type: none"> • Identify a Research Question, define appropriate measurements, and develop a research plan.
Students will demonstrate the ability to VISUALIZE data through converting information into different graphical and tabular forms.	Assignments and exams in Q-courses will require students to <ul style="list-style-type: none"> • Use appropriate software to organize, summarize, and display data effectively.
Students will demonstrate the ability to ASSIMILATE and ASSESS information from different sources, multiple representations of data, different methodologies, and different studies.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: <ol style="list-style-type: none"> a) Develop design plans for collecting data through surveys or experiments and discuss potential confounding factors. b) Compare two different methods of data analysis. c) Identify flaws and misleading arguments in data analysis.
Students will demonstrate the ability to use LOGIC in computing and interpreting probabilities, evaluating risks, and understanding the idea of uncertainty.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: <ol style="list-style-type: none"> a) Interpret probabilities to determine whether occurrences are rare or common, and evaluate risks of making decisions. b) Determine whether an experiment is deterministic or random. c) Identify sources of error in measurement.
Students will demonstrate the ability to UNDERSTAND units of measurement and scale, and the limitations of the quantitative analysis of data.	Assignments and exams in Q-courses will require students to perform at least one of the following tasks: <ol style="list-style-type: none"> a) Understand the ideas of sampling bias, validity, reliability, and margin of error. b) Understand the assumptions underlying different quantitative methods.

Student Learning Outcome	Course Embedded Assessment Method
Students will demonstrate the ability to ANALYZE data using different quantitative methods and draw appropriate conclusions.	<p>Assignments and exams in Q-courses will require students to perform at least one of the following tasks:</p> <ul style="list-style-type: none"> a) Use concepts of modeling & simulation to support hypothesis generation, summarization, and comparison of alternate theories. b) Use appropriate software to implement standard quantitative methods and perform a complete data analysis that may include regression, simulation, hypothesis tests, and design. c) Understand basic concepts of hypothesis testing. d) Make predictions and draw conclusions about populations based on sample data.
Students will demonstrate the ability to TRANSLATE quantitative language into verbal assumptions and vice versa.	<p>Assignments and exams in Q-courses will require students to perform at least one of the following tasks:</p> <ul style="list-style-type: none"> a) Make correct and meaningful verbal assertions about data. b) Translate verbal assertions about data into quantitative expressions. c) Identify and explain the risk and cost-benefits involved in making decisions.
Students will demonstrate the ability to EXPRESS quantitative evidence effectively in oral or written communication.	<p>Assignments and exams in Q-courses will require students to perform at least one of the following tasks:</p> <ul style="list-style-type: none"> a) Read an article/report and write a short summary about the data presented in the report. b) Effectively communicate the results of data analysis, including presentation of conclusions in the context of the underlying problems. c) Describe how particular data support foundational principles in a discipline and the assumptions made in performing the analysis. d) Write a coherent and correct technical report that summarizes a complete quantitative analysis.

Effectiveness of Curriculum Redesign on Student Learning Outcomes

In order to assess student learning outcomes and measure the success of the QEP, we will use standard experimental design layouts controlling for as many factors as possible. To assess the effectiveness of an individual course, two sections of a core curriculum course targeted for curriculum redesign will be selected. To reduce any potential bias due to teaching style, the same instructor will be selected. One section of the course will be taught using the traditional curriculum and the second section using the redesigned curriculum. Both sections will be given identical pre-tests and post-tests. A one-way Analysis of Covariance (ANCOVA) will be conducted to determine if the curriculum redesign had a significant effect on student learning adjusting for class size, student demographics and other factors. In addition, other designs will be constructed to allow for comparison of any redesigned course in the core to baseline data.

Individual students will be tracked using the Banner system. For each student, the score on the QLAT will be recorded as well as course-embedded data from every Q-course they complete. This will allow for a longitudinal analysis of the data to determine the impact of curriculum redesign. As noted in Chapter 4, students will have the opportunity to see quantitative methods in a number of core courses across multiple disciplines. The results from the individual analyses can be combined using Meta Analysis to determine the overall impact of the core curriculum redesign on student learning. Students in quantitative mastery courses will also be tracked using Banner. Faculty members will provide course-embedded assessment data from the mastery courses to the Project Coordinator. The QEP Program Committee will also develop an exit test to assess the level of quantitative mastery. This instrument will be administered to students in the upper-division Q-courses as well as to students in existing capstone courses.

Assessment and Evaluation of Program Goal 2

In Chapter 3, several qualitative and quantitative outcomes were defined to assess the goal of developing effective teaching pedagogies and assessments. The outcomes included measurement of the effectiveness of workshops for faculty/teaching assistants, increase in student learning due to curriculum redesign and enhancement, improvement in faculty teaching effectiveness, and level of satisfaction of stakeholders with the program.

The effectiveness of the teaching pedagogies will be evaluated through a comprehensive **Curriculum Assessment**. The QEP Program Committee plans to review the course materials,

including lecture notes, exams, assignments, and projects to assess the quantitative content and ensure alignment with QEP student learning outcomes. Faculty members teaching QEP courses will be provided with a self-assessment questionnaire for each course to identify the outcomes that were assessed, identify quantitative content, and discuss potential problems encountered during the semester. In addition, the QEP Project Director and the AVP CC/QEP will conduct an annual review of the core curriculum to assess the level of quantitative content in the different domains and identify courses for possible redesign. The QEP committee will also track the number of courses/sections that embed quantitative content each year to monitor the trend. This information will be compared with existing data from the Office of Institutional Research.

UTSA will conduct surveys of students and alumni to measure satisfaction with the program and student perception of their attainment of quantitative skills. The surveys will allow comparisons between students who completed one or more QEP courses and those who did not complete a QEP course. Survey instruments will also be developed to allow chairs, employers, and other stakeholders the opportunity to provide feedback on the program. An external consultant (a content expert) will be brought in each year to review the program and provide feedback to the QEP Program Committee. Table 5.4 provides a summary of the assessment methods and relevant measures for the outcomes associated with Program Goal 2 (Effective Teaching).

Table 5.4: Assessment of Outcomes Associated with Program Goal 2 (Effective Teaching)

Outcome	Assessment Method/Measures	Use of Results
Training workshops will be successful in providing faculty with the tools to successfully integrate quantitative content in their courses and develop appropriate assessment mechanisms.	Survey of Faculty/Focus Groups before and after summer workshop for evaluation of workshops Curriculum Assessment by QEP Program Committee	Feedback to Center Directors Feedback to Instructors and Chairs
Workshops will be successful in training teaching assistants to deliver and grade quantitative content.	Test abilities of TAs prior to attending workshop, and assess performance over the semester	Feedback to TAs
A cadre of core faculty will be trained in the implementation of best practices for effective teaching and assessment of quantitative content.	Number of faculty participating in the QEP Curriculum Assessment by QEP Program Committee	Project Director's (PD's) annual report to Provost and other stakeholders

Outcome	Assessment Method/Measures	Use of Results
QEP Courses will be successful in developing quantitatively trained students. Students completing QEP courses will perform at a higher level on learning outcomes related to quantitative reasoning.	Assessment and evaluation of curriculum effectiveness through student learning outcomes (see previous section) CLA /MAPP/Exit Tests and survey of students	Feedback to Instructors and Chairs Annual report to the Provost and stakeholders
Department/Program chairs and other stakeholders will express satisfaction with the quality of the courses, teaching effectiveness, and the progress toward learning goals.	Survey of Chairs and Deans will provide feedback on impact of curricular changes, faculty development, and an overall assessment of the impact of the program	PD's annual report to Provost and other stakeholders
Students will indicate a high-level of satisfaction with the teaching pedagogies introduced in the courses.	Course evaluations	PD's annual report to Provost and other stakeholders

Assessment of Program Goal 3

The final goal of the QEP addresses the role of the institution in achieving the overall vision: providing the organizational framework and resources for an institutional transformation to graduate a quantitative, informed citizenry. Table 5.5 provides a summary of the instruments/methods that will be used to assess the outcomes associated with this goal (see Chapter 3).

Table 5.5: Assessment of Outcomes Associated with Program Goal 3 (Institutional Transformation)

Outcome	Assessment Method/Measures
The number of courses with quantitative content that implement effective teaching pedagogies will increase significantly.	Actual counts and trend over time
The number of faculty teaching courses with quantitative content will increase significantly.	
The program will transform the environment to one where quantitative reasoning skills are ingrained in the curriculum and the culture of UTSA.	Survey of faculty and students, baseline data collected through a survey administered in the Fall of 2010

Outcome	Assessment Method/Measures
Students, faculty, administrators, employers and other stakeholders will indicate a high-level of satisfaction with the program.	Survey of stakeholders to determine satisfaction
Graduates of UTSA will have a portfolio of skills that will help them succeed in the global economy and become empowered citizens of the twenty-first century.	Survey of alumni and employers; survey of local employers to determine the level of satisfaction with the knowledge of quantitative skills possessed by UTSA students
The Quantitative Scholarship QEP will be recognized nationally as an exemplary program.	An outside expert on quantitative literacy and assessment will review the program and provide feedback to the Program Committee Presentations at national conferences

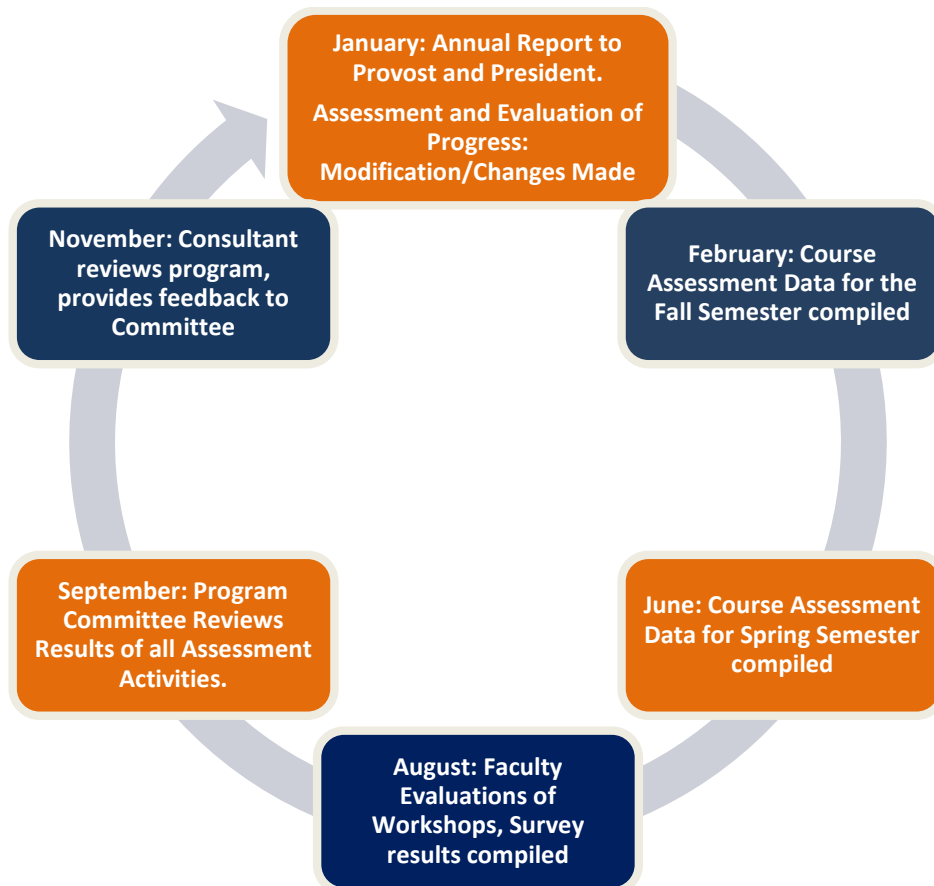
Dissemination and Use

The results of the program and process evaluation and assessment will be presented to several groups:

- The Center Directors will receive the results of faculty surveys and focus groups on the content presented in the workshops and overall satisfaction with the program. The Center Directors will use these results to modify the content.
- Faculty teaching the QEP courses will receive results of student surveys and curriculum assessments. Faculty will work with TLC/SCC to improve the existing courses.
- Department/Program Chairs will receive results of curriculum assessment and results of student satisfaction with the courses in their programs. Department chairs and faculty will use these results to assess course content and determine appropriate changes to the curriculum. They will also use these results in the design of new QEP courses.
- The QEP Project Director and the AVP-QEP/CC will receive results of all the assessment activities, including an overall review of the program by the external consultant. The QEP Program Committee will work with the Project Director to determine if any modifications/improvements need to be made.
- The QEP Project Director with the help of the Program Committee will provide an annual report to the Provost and President summarizing the overall progress of the plan. The Committee will determine if appropriate milestones are met and make required improvements.

Figure 5.2 provides an annual feedback loop for continuous assessment, evaluation, monitoring, and dissemination of information regarding the progress of the QEP.

Figure 5.2: Annual Feedback Loop



In the next chapter, we provide the administrative structure for the QEP and address the resources allocated for the implementation of the plan.

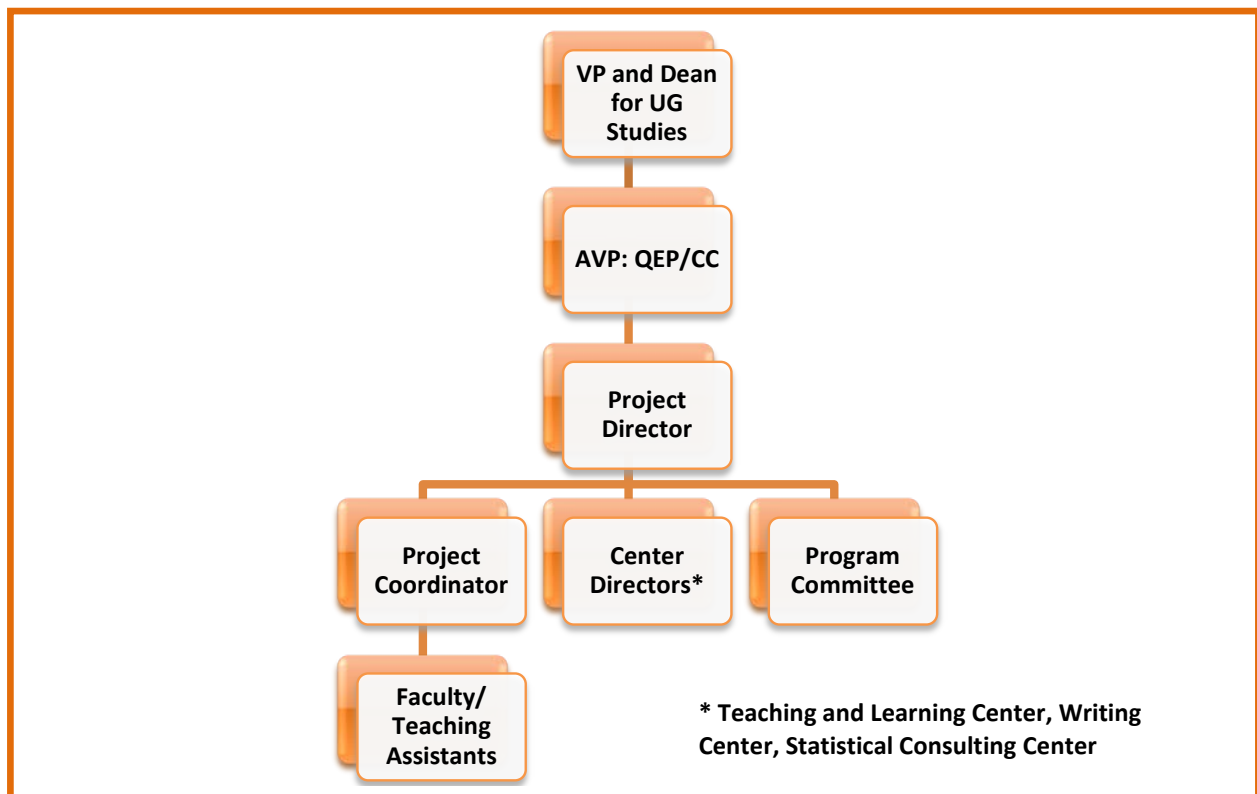
Chapter 6: Management, Organization, and Resources

In this chapter, we discuss the organizational structure and the resources needed to achieve the goals of the QEP.

Administration and Oversight

Key Personnel and Committees: The organizational chart for the QEP is provided in Figure 6.1.

Figure 6.1: Organizational Chart for the QEP



The Office of the Vice Provost and Dean of Undergraduate Studies will assume administrative oversight of the Quantitative Scholarship QEP. A new **Associate Vice Provost (AVP)** has been appointed within this office to oversee the Core Curriculum and the QEP. (See Appendix O for the job description and Appendix P for a short bio-sketch.) The responsibilities of the AVP that directly address the QEP include:

- Providing administrative oversight and support for the implementation of the QEP and the QEP Project Director.
- Managing the QEP budget and identifying the resources needed for the full implementation of the QEP.
- Ensuring, with the assistance of the QEP Project Director, that the QEP curriculum and its impact on student learning outcomes are fully assessed.

The responsibility for the overall implementation of the QEP rests with the **QEP Project Director**, a tenured faculty member at UTSA, with content expertise in Quantitative Reasoning and significant experience with program development. The Project Director will receive course-release time (50%) and summer support to oversee the implementation plan. The Project Director will serve ex-officio (without vote) on the University Core Curriculum committee. The position has been filled. Responsibilities of the Project Director include:

- Implementing the overall QEP.
- Developing guidelines for proposal submissions and evaluating proposals.
- Providing oversight and evaluation of faculty workshops, training, and support.
- Providing guidance to the QEP Program Coordinator.
- Evaluating and assessing progress toward all goals and objectives of the QEP.
- Providing assessment reports to AVP.

The **QEP Program Coordinator** will oversee the day-to-day operations of the QEP and report directly to the Project Director. The Program Coordinator will be a content specialist with experience in assessment and teaching quantitative courses. The Program Coordinator will be a UTSA non-tenure track faculty member who will receive 50-75% release time. This position will be filled by the Summer of 2010. Responsibilities of the Program Coordinator include:

- Handling requests for data and producing reports for program assessment.
- Meeting with faculty and TAs regularly to ensure program goals are met.
- Serving as a liaison to the Project Director.
- Overseeing the faculty workshops, faculty, and TA participation.
- Coordinating with IT/Banner to ensure QEP courses are included for tracking.
- Coordinating collection of baseline data from freshman orientation.
- Ensuring assessment data is uploaded for statistical analysis.

In addition to the key personnel identified above, a committee will be formed to assist with the implementation and assessment of the QEP. The **QEP Program Committee** will consist of a faculty

representative from each College at UTSA and members of the team responsible for developing the plan. The Program Committee will be chaired by the QEP Project Director, with the AVP-QEP/CC serving *ex-officio*. The Committee will be responsible for evaluating the development grant proposals and for the final selection of the awardees. The committee will meet monthly and provide oversight of the implementation and on-going assessment of courses and curriculum development. The Project Director and the AVP-QEP/CC, with the help of the Program Committee, will provide the Provost with a yearly progress report (see Assessment Plan for more details).

QEP Budget

The goal of implementing effective teaching pedagogies to facilitate the development of an exemplary program requires a significant institutional investment and a strong commitment to providing the necessary support including personnel, infrastructure, and financial and physical resources. The QEP budget approved by the Provost includes \$4,000,000 in new funding over the five-year project period (see Table 6.1). Eighty-six percent of the total budget is allocated toward Instructional Support, including faculty summer stipends and support for Teaching Assistants and graders. Administrative costs include funds for hiring a Program Coordinator and providing course releases for the Project Director. Administrative support for the QEP is provided through the office of the AVP-QEP/CC. A modest operational budget is included.

Table 6.1: QEP Budget

	FY 11-12 Total	FY 12-13 Total	FY 13-14 Total	FY 14-15 Total	FY 15-16 Total	5-Year Total
Instructional Support						
Faculty Summer Support	\$110,000	\$220,000	\$220,000	\$220,000	\$110,000	\$880,000
Faculty Travel	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$75,000
Teaching Assistants	\$32,000	\$80,000	\$240,000	\$400,000	\$560,000	\$1,312,000
Writing Program/Center	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$220,000
Statistical Consulting Center	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$500,000
Teaching & Learning Center	\$90,000	\$90,000	\$90,000	\$90,000	\$90,000	\$450,000
Instructional Subtotal	\$391,000	\$549,000	\$709,000	\$869,000	\$919,000	\$3,437,000
Administrative Support						
Administrative Associate	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$75,000
Project Director	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$100,000
Program Coordinator	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$250,000
Administrative Subtotal	\$85,000	\$85,000	\$85,000	\$85,000	\$85,000	\$425,000
Operating Support						
Office Equipment/M&O	\$15,000	\$5,000	\$5,000	\$5,000	\$8,000	\$38,000
Web and Promotional Costs	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$100,000
Operating Subtotal	\$35,000	\$25,000	\$25,000	\$25,000	\$28,000	\$138,000
Total	\$511,000	\$659,000	\$819,000	\$979,000	\$1,032,000	\$4,000,000

Figures 6.2 and 6.3 provide a breakdown of the total budget by categories, and the instructional budget by sub-categories, respectively.

Figure 6.2: Allocation of QEP Budget

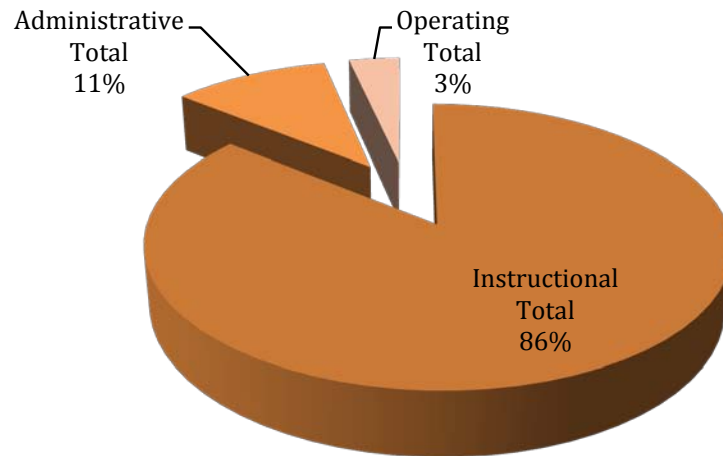
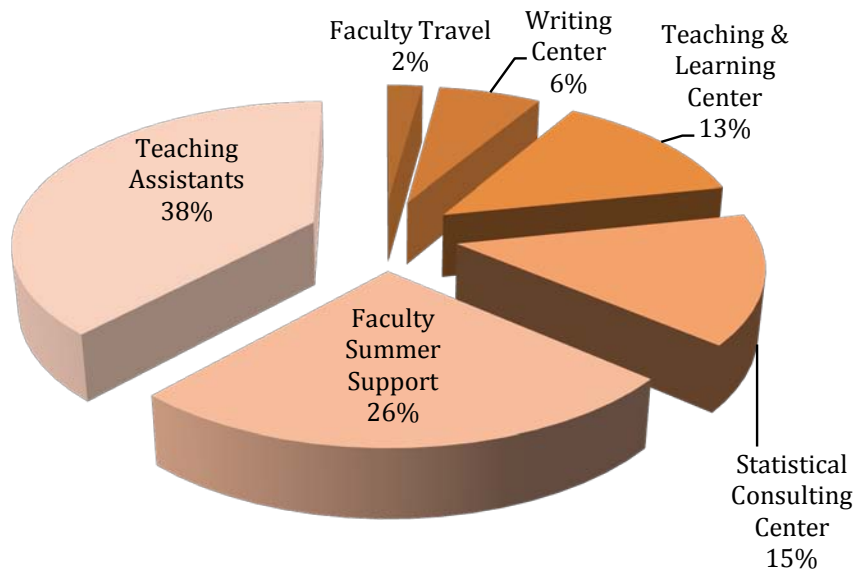


Figure 6.3: Allocation of QEP Instructional Budget



Instructional Support Breakdown

Faculty Summer Support: The QEP Program Committee will select eight core courses for funding the first year. Since a significant number of these classes are taught in large lecture formats with multiple sections, the committee expects teams of 2-3 faculty members teaching different sections of the same course to submit a single proposal. Some proposals for course redesign will be submitted by individual faculty members. In the first year, we expect to fund six team and two individual proposals. Individual proposals will receive a summer stipend of \$10,000, and team proposals will receive a summer stipend of \$15,000. The summer support may be renewed for a second year. New courses will be added every year of the program: in Years 2-4, the number of proposals funded will be 16 (12 team and 4 individual). In the fifth year of the program, only eight proposals will be funded.

Teaching Assistants: A significant portion of the QEP instructional budget (38%) is new funding for TAs to support the Q-courses. The budget includes support at the rate of one TA for approximately every 150 students. Based on current stipends for graduate and undergraduate teaching assistants and graders, an average salary of \$8,000 for 9 months has been estimated (assuming approximately equal numbers of undergraduate and graduate students). In Year 1, the budget includes funds for two graduate and two undergraduate students at a median salary of \$8,000. These teaching assistants will assist with the Q-courses and augment the support provided by existing course TAs. In Year 2, the program will provide funds for 10 TAs. The number of TAs is based on estimates of enrollment in the core classes. TA support will continue to increase to ensure continuous assessment and tracking. TA support for Q-courses will continue beyond the two-year grant cycle. The number of TAs funded increases every year to maintain the quality of the program. In Year 5, the QEP will support 70 TAs. The total budget for TAs over the five-year period is \$1,312,000.

Writing Program/Center: The QEP budget includes support for Writing Center Staff to assist with summer workshops and walk-in hours for faculty and students.

Statistical Consulting Center: The budget includes funds for a full-time Master's level professional with expertise in assessment, as well as support for Ph.D. level statisticians who will serve as senior research associates.

Teaching and Learning Center: The budget includes funds for delivering summer workshops, faculty and TA support, and external consultants for program review.

Administrative Resources

In-Kind Funding: The new funding outlined in the budget amounts to \$4,000,000 over the five-year period. In addition, in-kind funding will be available through several existing UTSA offices. Table 6.2 provides an in-kind budget for existing University services that have been committed for the implementation of the QEP.

Table 6.2: In-Kind Funding for the QEP

In-kind Funding	FY 11-12 Total	FY 12-13 Total	FY 13-14 Total	FY 14-15 Total	FY 15-16 Total	5-Year Total
University Testing Services	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000
Library: Reference Librarian (20% FTE)	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000
OIT: Systems Analyst (20% FTE)	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000
Benefits for Administrative Staff	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$150,000
TOTAL	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$300,000

The following University offices will provide support:

Office of the Vice Provost for Accountability and Institutional Effectiveness

The office of the Vice Provost for Accountability and Institutional Effectiveness (AIE) provides logistical support and relevant, reliable information for institutional planning, accreditation, assessment, and accountability. The office serves as the coordinator of activities for the reaffirmation of reaccreditation with SACS/COC including Compliance Report preparation and coordination of the development of the QEP. The office facilitates the development of an institution-wide assessment program by monitoring the process through the University; supporting faculty and staff involved in assessment through training and consultation; conducting survey research; and assisting in the development of assessment tools.

The Office of Institutional Research (OIR) will provide the QEP Program Committee and the Project Director with institutional data on remedial course enrollment, graduation and retention rates, and other information needed to assess the QEP. In addition, the OIR will provide access to the University's data through its data warehouse project and other data

sources. In addition, information on national assessment instruments (NSSE and CLA) currently used by UTSA will be provided as supplemental information. The QEP Project Director will provide the AIE staff with baseline data based on the QLAT and course assessment.

University Testing Services

University Testing Services (UTS) will play a critical role in the implementation of the QEP. The Director of the University Testing Services is one of the members of the team responsible for the QEP proposal. UTS will assist with the administration of the QLAT to all students entering the University, including transfer students. The UTS will also administer the CLA, NSSE, and other assessment instruments.

Office of Information Technology

The Office of Information Technology (OIT) oversees Blackboard, the web-based course management system at UTSA. All QEP courses selected for redesign will be required to use Blackboard for posting course material and maintaining assessment data. The OIT will provide programming support for the QEP to help create an integrated database to help the QEP Project Director track student performance over time. The database will contain baseline scores from the QLAT as well as data from all course-embedded assessments. This data is critical for assessment of individual courses and the overall program. The database will also contain demographic information and admission records. OIT staff will also provide support for linking the QEP database to the existing BANNER system.

Resources for Faculty and Teaching Assistants

Teaching and Learning Center (TLC). The TLC will organize workshops every summer to help faculty develop curricular materials and assessment plans. Details of the summer workshops are provided in Chapter 4. The TLC will also organize a half-day workshop on proposal preparation that will help faculty to identify goals and outcomes, and develop a preliminary assessment plan. The TLC staff will coordinate these workshops with staff of the Writing Program and the Statistical Consulting Center. The budget includes funds for the TLC to bring in consultants and specialists in curriculum design to work with faculty. Staff of the TLC will be available to provide advice and support throughout the year to faculty and teaching assistants. The Director of the TLC will work closely with the QEP Project Director and Program Coordinator.

Statistical Consulting Center (SCC). The SCC will be tasked with development of the various templates and assessment tools under the supervision and direction of the QEP Project Director and Program Coordinator. In addition, the SCC will also assist in the collection, analysis and archival storage of the assessment data obtained as part of this QEP initiative. SCC staff will provide one-on-one consulting for individual faculty in developing quantitative curriculum. They will also assist in the development of a set of online tutorials and assessments to teach basic data analysis and interpretation skills. These will include a test bank of examples and exercises from everyday life as well as examples and exercises from specific disciplines. Faculty will be encouraged to contribute examples to the test bank. The SCC staff and faculty from the Department of Management Science and Statistics will also be responsible for validating the QLAT and developing the final instrument for baseline data collection. The budget includes funds for a full time Master's level professional with expertise in assessment as well as support for PhD level statisticians who will serve as senior research associates. The SCC will play a major role in providing support for faculty and teaching assistants in the development of quantitative tools and assessment rubrics during the Summer Faculty Development Workshops.

Writing Program/Center. The QEP budget includes funds to support the Writing Center. The Center will provide walk-in hours for one-on-one support for students in QEP classes. The Center will also provide training on designing effective writing assignments and rubrics for the summer workshops. The Director of the Writing Program will work closely with the QEP Project Director and Program Coordinator.

University Library. The Dean of the UTSA Library recently met with the AVP-QEP/CC and the Chair of the QEP Executive Committee. The Committee also met with the Library's Head of Electronic Information and Reference Services to determine how best to leverage the Library's expertise in on-line data retrieval. The library has identified a reference librarian who will provide faculty and teaching assistants with reference material for their courses. As noted in Chapter 4, library representatives will also participate in the workshops for faculty and teaching assistants organized by the TLC.

Facilities and Physical Services

The Quantitative Scholarship QEP does not require significant resources in terms of space. Office space has been allocated for the QEP Program Coordinator and a work-study or administrative assistant.

As we have seen in this chapter, in addition to financial resources, successful implementation of the QEP and its sustainability will require the support of several offices across the University.

Chapter 7: Conclusions

The University of Texas at San Antonio's QEP seeks to increase and enhance the quantitative reasoning skills of its undergraduates. These skills are essential for all citizens to help them understand and critically evaluate information to make better-informed decisions. The mission of the QEP is to provide students with an enhanced curriculum focused on contextual learning that will help them succeed in this data-rich environment through seamlessly integrating quantitative reasoning and communication skills in courses across the undergraduate curriculum.

UTSA's QEP was selected through a process that involved broad participation from constituencies across the University. The first phase of the implementation plan will focus on courses in the University's core curriculum. This will ensure that all undergraduates have the opportunity to benefit from this enhanced curriculum. The implementation plan includes an intensive training program to help faculty with course redesign. The plan also includes a detailed program of assessment and evaluation to ensure progress toward the vision and goals.

The Quantitative Scholarship QEP has broad-based support across the University and represents a truly collaborative effort to increase the quality of the undergraduate education at UTSA. The University has committed \$4 million of new funds over the five-year period. A majority of the budget will be allocated for instructional support including faculty stipends and funds for Teaching Assistants.

Over the next five years, the QEP will provide the organizational framework and resources for an institutional transformation to graduate a quantitative, informed citizenry consistent with the mission and vision of the University. The QEP envisions the creation of an exemplary program that will transform the environment to one where quantitative reasoning skills are ingrained in not only the curriculum, but also the culture of UTSA.

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Appendix A

QEP Meeting Invitation and Schedule

February 7, 2008

The UTSA Community

UTSA is preparing for the SACS Commission on Colleges reaffirmation of accreditation. A critical component of reaccreditation is the Quality Enhancement Plan (QEP). The development of the QEP reflects and affirms our commitment to enhancing the quality of higher education and to the principle that student learning is at the heart of our mission. The plan describes a carefully designed and focused course of action to significantly improve or even to transform student learning. The development of the plan should involve broad-based institutional participation in identification of the topic. To provide everyone the opportunity to learn about and contribute to this process, we have scheduled several meetings, held on Friday afternoons, to disseminate information about the QEP.

Please review the schedule below. If you are not able to attend your unit's meeting, please feel free to attend one of the other scheduled meetings.

We look forward to visiting with you about this important effort. If you have any questions, please contact this office at -4706, and ask to speak to either me or Belinda Flores.

Sandy Welch

QEP Informational Meeting Schedule

Unit	Time	Date	Location
Library	10-11:00	February 14, 2008	JPL Old Regent's Room
College of Architecture	1:30-2:30	February 14, 2008	Monterey Gallery
College of Public Policy	1:30-2:30	February 15, 2008	Southwest Room, DT
College of Business	1:30-2:30	February 22, 2008	BB 2.06.04.
College of Sciences	3:00-4:00	February 22, 2008	BB 2.06.04.
Business Affairs	3:00-4:00	February 29, 2008	BB 2.06.04.
College of Liberal and Arts	1:30-2:30	February 29, 2008	BB 2.06.04
University Advancement	TBD	March TBD	TBD
College of Engineering	1:30-2:30	March 7, 2008	BB 2.06.04.
Honors College	3:00-4:00	March 7, 2008	BB 2.06.04
Student Affairs	8:30-9:30	March 13, 2008	Denman Room, UC 2.01.28
Community Services	10:15-10:45	March 13, 2008	BV 4.306.
College of Education & Human Development	1:30-2:30	March 14, 2008	BB 2.06.04
Research	3:00-4:00	March 14, 2008	BB 2.06.04
Open	4:00-5:00	March 14, 2008	BB 2.06.04

Appendix B
QEP Committee Membership and Charge Memorandum

February 21, 2008

M E M O R A N D U M

TO: Mark Blizard, COA
Richard Gambitta, Honors
Juan Gonzalez, COB
Susan Bruenger, COLFA
Marlon Anderson, Student Affairs
John Flores, Business Affairs
Karen Kimbell, University Advancement
Diana Garcia, Undergraduate Student

Ellen R. Clark, COEHD
Andrew Johnson, COE
Kay Robbins, COS
Chris Reddick, COPP, Downtown
Henry Cantu, Student Affairs
Nilka Aviles, Community Service
Jim Massaro, Research
Samira Ahmadi, Graduate Student

FROM: Ricardo Romo, President

SUBJECT: UTSA's Quality Enhancement Plan Committee

As UTSA prepares for our SACS Commission on Colleges reaffirmation of accreditation, I am pleased to appoint you to UTSA's Quality Enhancement Plan (QEP) Committee. Your appointment will continue for two years, beginning in the Spring 2008 semester and ending in the Spring 2010 semester.

The charge of the UTSA's Quality Enhancement Plan Committee is as follows:

- Review QEP pre-proposals and recommend promising pre-proposals for full development
- Solicit feedback for full proposals from UTSA community, leaders, and stakeholders
- Make a recommendation to Leadership Team regarding merits of final proposal
- Assist as needed with revisions and final development of the QEP

The QEP is a critical element of the reaccreditation process and requires the broad-based involvement of the university community. As a representative of your college or unit, your role in this committee is essential in assuring that UTSA presents a viable QEP plan focusing on improvement of student learning and/or the student learning environment. Given UTSA's commitment to the advancement of knowledge, this committee's work is instrumental in assuring we fulfill our mission.

Belinda Flores, QEP Coordinator, will be in contact with you regarding background materials and meeting agendas. If you have any questions or comments, do not hesitate to contact her either via email or at 210-458-4739.

Thank you for your service on this important committee. I appreciate your time and effort toward the success of the committee's work.

Appendix C

Guidelines for QEP Finalist Teams

UTSA

QEP Full Proposal Outline for QEP Proposals and Evaluation Criteria¹

Each QEP Proposal should contain, and will be evaluated based upon, the following essential components:

- I. Focus
 - a. A clear and concise description of the critical issues to be addressed; need to connect to literature, best practices, institutional data and strategic planning
 - b. A clear description of the relationship of the plan to student learning; student learning defined and related to activities of the plan.
 - c. Relevant, appropriate and measurable goals and objectives to improve student learning
 - d. Identification of which students will be affected by the activities in the plan; i.e., the degree to which the plan will affect student learning across the campus

- II. Appropriate involvement of the academic, student affairs, and other components of the community in planning and implementing the QEP

- III. Identification of Resources Needed to Implement and Continue the Plan
 - a. Time line for implementation and completion of the plan
 - b. Personnel to administer/oversee administration
 - c. Academic, financial and physical resources needed to implement, sustain, and complete the activities in the plan
 - d. Administrative processes for maintaining the progress of the quality improvements produced by the plan

- IV. Assessment
 - a. Assessment methodology for implementation/progress; relevant internal and external measures to evaluate the plan and its progress during implementation
 - b. Student Learning; assessment methodologies and instruments clearly related to the student learning to be improved; appropriate evaluation methodology designed to use results of assessment to further improve student learning

¹ This outline is based and adapted from information contained in the SACS COC publication “*Handbook for Review Committees, 2nd Edition*,” pp. 35 – 36.

Appendix D

Example of Invitation to September QEP Proposal Focus Groups

August 7, 2008

TO: Mauli Agrawal, Dean, College of Engineering
 Robert Baron, Interim Dean, College of Architecture
 Lynda De La Vina, Dean, College of Business
 Richard Diem, Dean, Honors College
 Dorothy Flannagan, Dean, Graduate School
 Daniel Gelo, Dean, College of Liberal and Fine Arts
 David Johnson, Vice Provost, Academic and Faculty Support, Interim Dean, Library
 Betty Merchant, Dean, College of Education and Human Development
 George Perry, Dean, College of Sciences
 Larry Williams, Vice Provost and Dean, Undergraduate Studies
 Jesse Zapata, Vice Provost for the Downtown Campus, Dean, College of Public Policy

FROM: Sandra Welch, Vice-Provost for Accountability and Institutional Effectiveness

SUBJECT: SACS QEP Update

The purpose of this memo is to provide you a Quality Enhancement Plan (QEP) update. The QEP pre-proposal finalist teams have been working diligently to develop their respective full proposals. To facilitate broad UTSA community engagement in developing the QEP, throughout the summer the community has had an opportunity to provide direct feedback to the finalists at the following website: <http://www.utsa.edu/sacs/qep/qepPreProposalFinalist.html>

We would appreciate your support in assuring that **the teams** receive critical feedback on their pre-proposals as they continue to develop their full proposals. Please encourage your personnel to take some time to review each pre-proposal. They can provide suggestions for improvement by clicking on the black rectangle after the last **author listed on each pre-proposal** (titled "Please Participate in the QEP Process – Click Here") to navigate to a three-question survey. Deadline for submitting feedback is August 15, 2008.

During the weeks of September 8-18, we have scheduled a number of focus group sessions. Each of the finalists will present an overview of the full proposal. Time and locations will be announced shortly. At that time, we will also request your support in assuring that your personnel attend these group sessions and provide feedback. This process will provide QEP developers an opportunity to incorporate substantive feedback into their full proposal and will provide us an opportunity to further engage the university community.

Full proposals are due October 1st and we plan to post the full proposals on our website by October 8, 2008. The QEP committee will make its final recommendations on November 24, 2008 to the SACS Leadership Committee. A final topic will be selected by end of December.

During the spring 2009 semester, the authors of the selected proposal will develop a full plan. We also plan to engage the UTSA community in a marketing campaign. We hope to students will participate through service learning projects in designing a QEP logo, slogan, etc. Details will be sent early in the fall semester.

If you have any questions, please feel free to contact me (sandra.welch@utsa.edu), Belinda Flores (belinda.flores@utsa.edu), Elaine Sanders (elaine.sanders@utsa.edu), or Janice Kramer (janice.kramer@utsa.edu).

Appendix F
QEP Committee Evaluation

QEP Proposals — Respondents' Score Comparison			
Reviewer Number	Graduate Excellence	Quantitative Scholarship	Service Learning
1	68.5	70.0	72.50
2	88.5	94.5	84.50
3	72.0	92.5	88.00
4	77.5	64.5	73.00
5	64.5	75.0	60.50
6	59.0	79.5	75.00
7	78.0	79.0	73.50
8	77.0	77.5	78.00
9	66.0	69.0	66.50
10	90.5	98.0	95.00
11	90.0	100.0	85.50
12	55.0	93.0	75.50
13	46.5	69.5	33.50
14	78.0	84.0	68.00
15	76.5	98.0	90.00
Average	72.5	82.9	73.50
Median	76.5	79.5	75.00
5-Year Budget	\$1.8 M	\$3.9 - \$5.0 M	\$2.5 M
Students Served	200 UG/ 175 Grad	All native U/G	All native U/G

Appendix G

CMO DISCUSSION: Other QEP Information

1. *Program for Graduate Excellence (PGE): Maximizing the Relevance of Graduate Education for Current and Prospective Students*
 - a. Elements:
 - i. Graduate School Preparatory class for undergraduate students
 1. Expand number of UTSA undergraduate students who apply to, and succeed in, graduate programs
 2. Graduate students serve as mentors
 - ii. “Great Projects” seminars
 1. Each focuses on one of UTSA’s five areas of collaborative excellence
 2. Strengthen graduate programs
 - b. Strengths
 - i. Link to UTSA 2016 Initiatives I, II, III
 - ii. Serve as a confidence builder and allay concerns about the GRE and GMAT
 - iii. Focus funding to support recruitment and preparation for graduate programs
 - iv. Student learning outcomes clear
 - c. Challenges
 - i. Specific student learning outcome measures vague
 - ii. Timeline confusing
 - iii. Lacks specifics about roles and responsibilities
 - iv. Too few students involved
 - v. Budget low, unclear given goals
2. *Service Learning: The Paseo to Life-Long Learning*
 - a. Required activity for all undergraduate students
 - b. Enhance student learning — active participation in a Service Learning (SL) experience
 - i. Partnerships – UTSA and internal/external service groups
 - ii. Participate, reflect, evaluate, celebrate
 - iii. Assessors: students, UTSA community partners, UTSA supervisors
3. Strengths
 - a. Link to UTSA 2016 – Initiatives I, IV
 - b. Link to Blue Ribbon Committee Report
 - c. Strong case for requiring students to participate in an SL activity, and the benefits that the SL requirement will have
4. Challenges
 - a. Lack of clear definition of service learning experience
 - b. Uneven experience opportunities
 - c. Need authorization for curriculum change
 - d. Magnitude of task understated
 - e. Budget heavy on staff, understated given magnitude
 - f. Student learning outcomes not clearly measured

- g. Use of student learning outcomes unclear

Appendix H

UTSA Quality Enhancement Plan Information

CMO Meeting November 25, 2008

1. Three QEP Proposals Selected as Finalists
 - a. *Program for Graduate Excellence (PGE): Maximizing the Relevance of Graduate Education for Current and Prospective Students*
 - b. *Quantitative Scholarship: From Literacy to Mastery*
 - c. *Service Learning: The Paseo to Life-Long Learning*
2. Committee Assessment – Average Ratings:
 - a. *Graduate Excellence: 72.5*
 - b. *Quantitative Literacy: 82.9 (12 of 15 members rated this number 1)*
 - c. *Service Learning: 73.5*
 - d. Committee insisted on sending recommendation for *Quantitative Literacy*
3. Summary – *Quantitative Scholarship: From Literacy to Mastery*
 - a. All undergraduate students develop quantitative literacy
 - b. Quantitative literacy — NOT just more math problems and courses
 - c. Quantitative material embedded in core courses
 - d. Writing about quantitative problems embedded in core courses
 - e. Large number of students develop higher level of quantitative mastery
 - f. Critical analysis material embedded in upper level courses (quantitative and writing)
4. Benefits: *Quantitative Scholarship: From Literacy to Mastery*
 - a. Clear link to UTSA 2016 I, III, V
 - b. Link to Blue Ribbon Committee Report
 - c. Broad, interdisciplinary participation
 - d. Clear student learning outcomes and measurements
 - e. Support for graduate student teaching assistants
 - f. Appropriate support for participants
 - g. Will benefit students after graduation
5. QEP Discussion
 - a. This project has the best potential for
 - i. Feasibility
 - ii. Benefitting the most UTSA students through synthesization of skills and ultimate success
 - iii. The QEP Committee’s dedication and work is affirmed
 - b. Budget
 - i. is appropriate for goals and objectives of the proposal
 - ii. The amount is mid-range for a QEP for a large university
6. Next Steps
 - a. CMO must formally approve and be prepared to indicate support during SACS on-site visit
 - b. QEP author develop proposal into full plan (January through December 2009)
 - c. Communication and Marketing Plan and Implementation (June 2009 through January 2010)

Appendix I
Letter Announcing Selection of Quantitative Scholarship QEP

UTSA The University of Texas at San Antonio
 Office of the President


COPY

December 10, 2008

M E M O R A N D U M

TO: Dr. Nandini Kannan
 Dr. Nancy Martin
 Ms. Joleen Reynolds
 Dr. Kay Robbins
 Dr. David Senseman

COPY: Dr. Lynda de la Viña
 Dr. John Frederick
 Dr. Betty Merchant
 Dr. George Perry

FROM: Dr. Ricardo Romo 

SUBJECT: Congratulations for Selection of Your QEP Proposal

I would like to offer my congratulations on behalf of the University of Texas at San Antonio and the Quality Enhancement Plan Committee. Your proposal, *Quantitative Excellence: From Literacy to Mastery*, has been selected for UTSA's Quality Enhancement Plan (QEP). The Quality Enhancement Plan Committee carefully reviewed each of the final proposals and concluded that your proposal would most benefit the University and our students, and would contribute to accomplishing goals of our strategic plan.

We are fortunate to have such dedicated University citizens as yourselves, and we owe you a debt of gratitude for the time and effort that you have put into this process. Your hard work and dedication are much appreciated. I look forward to working with you as further develop your proposal into our formal QEP as a part of our efforts to obtain SACS Commission on College reaffirmation of accreditation.

Appendix J
Public Announcement of QEP Topic by University President

ANNOUNCEMENT OF SELECTION OF UTSA'S QUALITY ENHANCEMENT PLAN TOPIC

Dr. Ricardo Romo is pleased to announce that the topic, *Quantitative Scholarship: From Literacy to Mastery*, has been selected for UTSA's Quality Enhancement Plan (QEP), a critical element of SACS Commission on Colleges reaccreditation. He extends his congratulations to the authors. Dr. Romo also wishes to thank the authors of all the QEP topic proposals for their hard work and dedication to improving UTSA, the many university community participants who attended focus group meetings to help the authors develop their proposals, and the QEP Selection Committee, who devoted many hours to reviewing and assessing the final QEP proposals.

Dr. Nandini Kannan is currently developing the QEP proposal into a full plan. Feel free to provide your suggestions for the plan to her through Janice Kramer (janice.kramer@utsa.edu) in the office of the vice provost for accountability and institutional effectiveness. She will make sure Dr. Kannan receives your input.

To view the proposal for *Quantitative Scholarship: From Literacy to Mastery*, please go to:

<http://www.utsa.edu/sacs/docs/QEP%20Complete%20Final%20Draft%20-%20QuantitativeScholarship.pdf>

Appendix K

QEP Team

Executive Committee of the Quantitative QEP

Dr. Nandini Kannan, Professor of Statistics (Chair)
Dr. Nancy Martin, Education
Ms. Joleen Reynolds, UTSA Testing Service
Dr. Kay Robbins, Professor of Computer Science
Dr. David Senseman, Associate Professor of Biology

The Quantitative QEP Advisory Team

Mr. Mike Anderson, Management Science and Statistics
Dr. Stuart Birnbaum, Geology
Dr. Stephanie Cano, Director, Statistical Consulting Center
Dr. Dmitry Gokhman, Mathematics
Dr. Kollen Guy, History
Dr. Amy Jaspersen, Political Science
Dr. Craig Jordan, Biology
Dr. Jerome P. Keating, Management Science and Statistics
Dr. Laura Levi, Chair, Anthropology
Dr. Martha Lundell, Biology
Dr. Barbara Millis, Director, Teaching and Learning Center
Dr. Marguerite Newcomb (Writing Center)
Dr. Gail Pizzola (Writing Program)
Dr. Jack Reynolds, History
Dr. Harriet Romo, Sociology
Dr. Ray Sadeghi, Chemistry
Dr. Raydel Tullous, Chair, Department of Management Science and Statistics
Dr. Bill VanAuken, Professor of Biology
Dr. Ken Weiher, Chair, Department of Economics

Appendix L

QLAT: Quantitative Literacy Assessment Test

Dear UTSA Student:

Thank you for volunteering to participate in the QEP. The information gathered here will NOT affect your grades, placement or enrollment. This information will help us identify your understanding about data analysis and in curriculum redesign.

Attached are a series of multiple choice questions about data analysis and interpretation. No special mathematical knowledge is required and calculators will not be needed. Please answer all questions to the best of your ability. The two questions at the bottom of each page allow you to provide feedback on the level of difficulty and familiarity with the topics. Thank you once again for your participation. Prizes will be awarded to the top performers as well as to randomly selected participants.

The UTSA QEP Committee

The Instrument has been removed from the Web version of the document.

Please contact the authors if you would like to see a copy.

Appendix M
Results of the Summer 2009 Pilot Study

Ethnicity	Gender		
	Female	Male	Total
Hispanic	208 (21%)	186 (19%)	394 (40%)
White Non-Hispanic	158 (16%)	230 (23%)	388 (39%)
Black Non-Hispanic	65 (7%)	32 (3%)	97 (10%)
Other	45 (5%)	63 (6%)	108 (11%)
Total	476 (49%)	511 (51%)	987

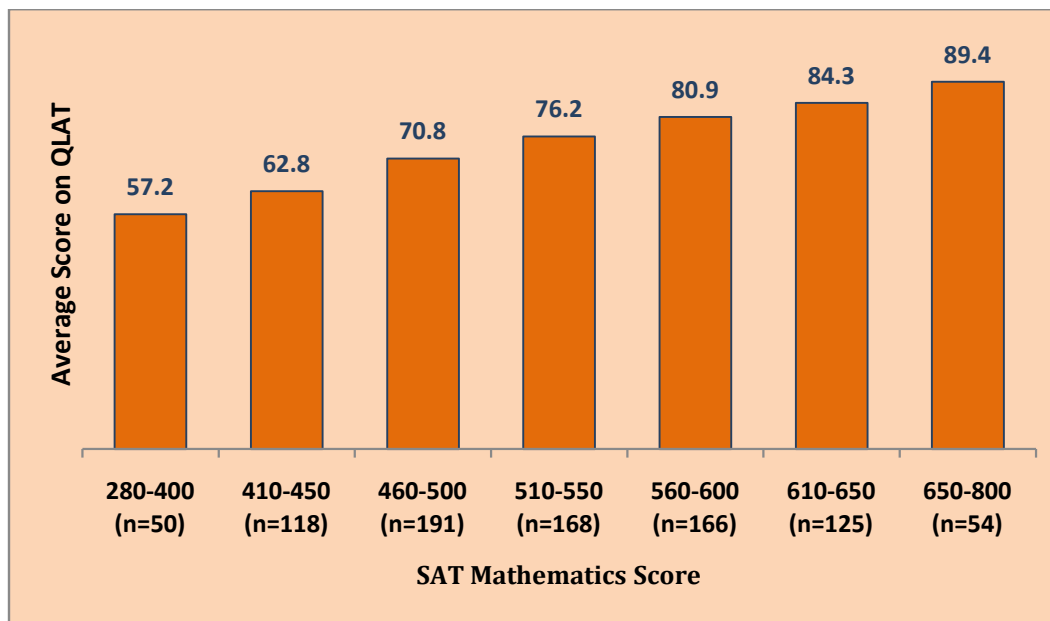
Question/ Area	Percent of Correct responses	Question/ Area	Percent of correct responses
Q 1: Interpreting Graphs/ Charts	0.91955	Q12: Probability	0.70876
Q 2: Interpreting Graphs/ Charts	0.79430	Q13: Probability	0.84114
Q 3: Interpreting Graphs/ Charts	0.84521	Q16: Interpreting Data Summaries	0.75356
Q 4: Interpreting Graphs/ Charts	0.71079	Q17: Interpreting Data Summaries	0.61813
Q 5: Interpreting Graphs/ Charts	0.85031	Q18: Algebraic Methods/ Reading Graphs	0.93788
Q8: Probability	0.85132	Q19: Algebraic Methods/ Reading Graphs	0.80550
Q9: Probability	0.70978	Q22: Sampling and Bias	0.10081
Q10: Probability	0.88697	Q23: Sampling and Bias	0.59674
Q11: Probability	0.76578		

A confirmatory factor analysis was performed on the pilot data. The results showed the presence of three factors: Questions 8, 10, 11, 12, and 13 all loaded on Factor 1 (probability); Questions 16, 17, 18, and 19 (interpreting data summaries) all loaded on Factor 2; Questions 3, 4, and 5 (interpreting data tables) all loaded on Factor 3. The Statistical Consulting Center will conduct a more detailed validation study in the Spring of 2010 including an item response analysis.

Figure M1 examines the association between SAT Mathematics scores and the scores on the QLAT. There is an association between the two sets of scores. However, the QLAT provides item level information that may be tracked over time. The percentage of correct responses for the QLAT was

lowest for items that required students to interpret data and reason critically. Students performed well on items that required direct calculations. This clearly shows a lack of quantitative literacy skills.

Figure M1: Quantitative Literacy Scores vs. SAT



Appendix N

Statistical Consulting Center Workshop Outline

The UTSA Statistical Consulting Center Summer Clinic in Applied Statistics June 8-11, 2009

REGISTRATION

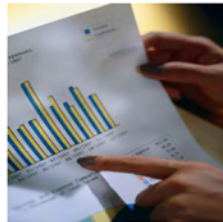
Seats are limited. Registration information can be found at www.business.utsa.edu/scc

SCHOLARSHIPS

A limited number of scholarships are available for students enrolled in the Fall semester.

CONTACT

For additional information, or to provide us with feedback about our class offerings, please email scc@utsa.edu.



The SCC Summer Clinic is designed to provide students with a basic toolkit for working with and analyzing data using sound statistical principles. Research applications are emphasized using statistical software packages such as SPSS and SAS. The clinic is intended for UTSA students who require statistical methods in their research or job.

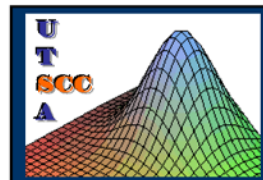
Participants are provided with guest access to software during class and receive a CD with handouts, sample data and code, references and more. Course rates, limited to UTSA students, are as follows:

Student Status	Per Session	Full Week
Undergraduate	\$20	\$50
Graduate	\$25	\$75

The summer clinic will consist of four 3-hour sessions, from 12:30pm to 3:30pm daily. Each session will include presentation of material followed by hands-on applications using statistical software.

SCHEDULE

- Monday (June 8, 2009)
Research Basics
Topics will include defining your research question, identifying your population, sampling, measurement, scales and data collection issues.
- Tuesday (June 9, 2009)
Data Quality
Topics will include data pre-processing, checking and cleaning, and managing invalid and missing data.
- Wednesday (June 10, 2009)
Summarizing Data
Topics will include graphical and numeric summaries of data, and simple discrete and continuous probability models.
- Thursday (June 11, 2009)
Statistical Models
Topics will include scatterplots, simple linear regression, boxplots and ANOVA.



Appendix O

AVP for the QEP and the Core Curriculum: Position Description

The Associate Vice-Provost (AVP) for the Quality Enhancement Plan and the Core Curriculum (QEPC) will coordinate the on-going development, implementation, and evaluation of UTSA's undergraduate general and integrated education programs.

The general duties of the AVP QEPC will be to work with the academic departments, the colleges, the Faculty Senate, and the Dean of Undergraduate Studies to facilitate the implementation, review, and revisions of both the QEP and the Core Curriculum. In particular, the AVP QEPC will chair the University Standing Committee on the Core Curriculum, which is charged with general oversight of the CC, and serve *ex officio* on the QEP implementation committee, chaired by the QEP project director. The Associate Vice-Provost QEPC shall be a tenured faculty member at UTSA and shall report to the Vice Provost and Dean for Undergraduate Studies. The specific duties of the AVP QEPC include:

QEP—

- Provide administrative oversight and support for the implementation of the QEP and the QEP project director.
- Manage the QEP budget and identify the resources needed for the full implementation of the QEP.
- Ensure that the QEP curriculum and its impact on student learning outcomes is fully assessed, with the assistance of the QEP project director.

Core Curriculum—

- Monitor the Core Curriculum as a whole and monitor its impact on the various university degree programs.
- Promote and monitor delivery of the Core Curriculum at the Downtown Campus.
- Develop and implement a comprehensive and regularized plan and means for assessing the general education program and its component courses with respect to meeting the delineated objectives of the Core Curriculum.
- Review, clarify, and make recommendations on the alignment of the UTSA Core Curriculum objectives and course specific objectives, with the "Core Curriculum: Assumptions and Defining Characteristics" adopted by the Texas Higher Education Coordinating Board.
- Coordinate the implementation of the report of the Blue Ribbon Committee on the Undergraduate Experience in regard to promoting the inclusion of the six "knowledge and skills" identified in the report in Core courses so that each undergraduate is exposed to all six "knowledge and skills" upon completion of the UTSA Core Curriculum.
- Encourage, promote, and recognize high quality teaching of courses that contribute to the Core Curriculum.
- Pursue grants and other sources of funding for enhancing the general education program and for faculty development projects in connecting with the Core Curriculum. Such activities may include working with the Teaching and Learning Center to sponsor faculty seminars and workshops on the teaching of Core Curriculum courses.
- Maintain continuous communication with local community colleges and other local institutions of higher education with respect to articulating the general education curriculum.

The Associate Vice-Provost QEPC will also carry out other duties as assigned.

Appendix P

Nancy K. Martin: Bio Sketch

Office of Undergraduate Studies
The University of Texas at San Antonio
One UTSA Circle, San Antonio, TX 78249

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Fax: (210) 458-7412
E-mail: nancy.martin@utsa.edu

Academic Training

Ed.D., 1988
Texas Tech University
Educational Psychology Foundations
Minor: Speech Communication

M.Ed., 1980
Sam Houston State University
School Counseling

B.A.T., 1977
Sam Houston State University
Major: Speech Communication Education, Minor: English

Relevant Academic Experience

1993-Present	The University of Texas at San Antonio
2009-Present	Associate Vice Provost-Core Curriculum and Quality Enhancement Plan
Spring, 2009	Department of Educational Psychology, Interim Chair
2006-2009	Associate Dean for Undergraduate Student Success
2000-2006	Associate Dean for Undergraduate Studies
1997-Present	Associate Professor, Department of Educational Psychology
1993-1997	Assistant Professor, Department of Educational Psychology

Relevant Professional Service

Ex-Officio	Core Curriculum Committee, Chair
2008-2009	Core Curriculum Assessment Committee, Chair
2009	<u>Quality Enhancement Plan (QEP) Pre-Proposal</u> Accepted for further development & review: <i>Quantitative Scholarship: From Literacy to Mastery</i> (David Senseman, Kay Robbins, Nandini Kannan, Nancy Martin)
2009	<u>Quality Enhancement Plan (QEP) Pre-Proposal Finalist:</u> <i>Service-Learning: The Paseo to Life-Long Learning</i> (Lisa Blazer, Nancy Martin, Rosalie A, Jennifer Lilly, Alycia Mauer, Gabriel Mendiola, Barry McKinney, Elizabeth Stanczak)
2007-2008	Blue Ribbon Committee on the Undergraduate Experience, Chair

