

**Connect the Dots: Quantitative Literacy
Texas A&M University-San Antonio
On-Site Review March 4-7, 2019**

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From the University President

Texas A&M University-San Antonio (A&M-SA) is committed to building a national model for student and academic success that combines exceptional academic instruction and individualized experiential-learning opportunities to help students attain a degree and set them on the pathway to prosperity. We recognize that quantitative literacy is critical to students' personal growth, focused learning, and career preparedness. In the twenty-first century, students cannot afford to graduate from a university without achieving quantitative literacy. At A&M-SA, we are building a campus climate that is intentional in supporting and encouraging students to attain quantitative literacy through dedicated courses, co-curricular programming, and other academic support such as tutoring and academic coaching. This 2019 Quality Enhancement Plan (QEP), which is focused on quantitative literacy, is designed to be a central component of A&M-SA students' educational experience to ensure that they are agile, innovative, and entrepreneurial. Students will be equipped to engage meaningfully in creating a better future and transforming San Antonio and the world.

This year, A&M-SA is celebrating its tenth anniversary, and our core values are central to everything we do across the campus. In the last ten years, the institution has transformed itself into a comprehensive four-year university, welcoming its first freshman class in 2016, and has also been designated a Hispanic Serving Institution. The university is student focused and employs innovative and applied learning methods in the 27 undergraduate and 11 graduate degree programs that we offer our diverse student body. A majority of the programs incorporate experiential learning, community service, and global experiences.

A&M-SA's QEP efforts will draw from the assets provided by our faculty, staff, and community partners to enable our students to succeed in their academic endeavors and our graduates to leave the university well equipped with knowledge that prepares them for the working world and to be responsible citizens. This plan reminds us that providing students with a strong foundation for success and lifelong learning requires the focused work of the entire A&M-SA community and involves continual self-evaluation and improvement to meet the educational needs of a dynamic and growing student population.

Cynthia Teniente-Matson
President

Executive Summary

A&M-SA selected quantitative literacy (QL) as its Quality Enhancement Plan (QEP) from a number of proposals from faculty, staff, and students. In August 2018, a committee representing the three colleges at A&M-SA, as well as staff, began the process of developing the QEP. Through review of QEP proposals and university data, QL was a natural choice because it spoke to our mission that “our graduates leave well equipped with knowledge and marketable skills that prepare them for rewarding careers, responsible global citizenship, and lifelong learning.”

The plan, now called “Connect the Dots” is a campus-wide effort to infuse QL into the student experience. The definition of QL that the QEP Committee adopted is the ability to interpret, represent, and apply numerical information and models in personal, academic, and professional contexts. The university committed to the infusion of QL across disciplines and not focusing just on math or science. The committee is also aware that QL can be applied to a student’s life outside of and after college, and the plan makes a point to involve curricular and co-curricular efforts.

The QEP Committee came together and adopted the following two goals:

Goal 1: Establish QL as an essential component of the student experience at A&M-SA.

Tactic 1: Faculty and staff will be able to attend QL workshops throughout the academic year.

Tactic 2: The university will establish the Quantitative Literacy Center along with hiring a QL director.

Tactic 3: A&M-SA students will graduate with at least 2 quantitative literacy courses.

Goal 2: Develop curricular and co-curricular activities to ensure QL competency of A&M-SA graduates.

Tactic 1: Review current A&M-SA courses and co-curricular programs for QL.

Tactic 2: Infuse QL into foundational and upper-level courses so that students will experience it whether they enter as a native A&M-SA or transfer student.

The QEP Committee has developed an implementation plan that spans 5 years and includes a budget, assessment plan, and people identified that will complete the tasks in the plan. Data collection will occur each year (including year 0) and the plan will be assessed and changes will be made to it as needed.

Section 1: Texas A&M University-San Antonio

Background

A&M-SA is a contemporary university reflective of the diverse and heritage-rich community it serves. Founded as the first upper-division institution of higher education in South San Antonio, A&M-SA today is a comprehensive four-year university offering affordable, high-quality education.

From fall 2008, when A&M-SA became a standalone university, to fall 2017, enrollment grew 340 percent. The university currently serves nearly 6,500 students and has graduated more than 8,000 alumni. The student body is 60 percent female and 72 percent Hispanic, and approximately 77 percent of students are the first in their family to attend college.

Through the university's 26 undergraduate degrees and 13 graduate degrees, students can pursue a wide variety of in-demand fields, such as education, business, information technology and cyber security, criminology, and biology. A&M-SA prepares and empowers students with knowledge and marketable skills that prepare them for rewarding careers, responsible global citizenship, and lifelong learning.

Vision

A&M-SA serves as an economic, research, and social catalyst that will become nationally recognized for student and academic success, embracing all students, especially those from underrepresented communities.

Mission

A&M-SA is reflective of the diverse and heritage-rich community it serves. University and community partnerships provide a strong foundation for student and academic success and support interdisciplinary teaching and experiential learning. Faculty and staff collaborate to create comprehensive, industry-responsive academic and co-curricular programs that provide a transformative experience for all students. The university's inclusive environment inspires learning and fosters social development using relevant scholarship, research, and public service. A&M-SA graduates leave well equipped with knowledge and marketable skills that prepare them for rewarding careers, responsible global citizenship, and lifelong learning.

A&M-SA Core Values

The following are A&M-SA's five core values, which are central to everything we do:

- **Excellence**
We strive for excellence above all else. Those who represent the A&M-SA family—faculty, staff, students, and alumni—do so with the highest standards of integrity and characterize the honor and traditions of the campus community.

- **Student Focus**
We use a number of co-curricular activities, including experiential learning, as catalysts to achieve active student learning. We use intentional and innovative teaching and applied learning methods to educate a diverse student body, enhance retention, and encourage timely graduation.
- **Audaciousness**
We think big and work diligently to fulfill our aspirations. We are an innovative and entrepreneurial university that prepares students, faculty, and staff to create a better future and transform the world, starting with our local community, region, and state.
- **Opportunity**
We create opportunities for a diverse student body by embracing the demographics of our region and the military-connected community. We are inclusive of all learners and welcome students where they are socially, economically, and academically. We prepare traditional and nontraditional students with marketable skills and undergraduate research experiences that contribute to a meaningful life and a fulfilling career.
- **Collaboration**
We value interdisciplinary approaches, partnerships, and research opportunities that respond to needs across public and private industries, the military community, school districts, other colleges and universities, and the Texas A&M University System.

A&M-SA Context from Local to Global

Texas A&M-SA is located in South San Antonio, a historically underserved area. According to the U.S. Census Bureau (n.d.), the household income in San Antonio was \$49,711 and 18.6% live below the poverty level. Over 63% of the San Antonio population identifies as Hispanic or Latino, and 43.6% speak a language other than English.

A&M-SA is committed to providing access and opportunities to students in the San Antonio area. A&M-SA students reflect the demographics of the surrounding areas, with approximately 72% of students identifying as Hispanic. Seventy-seven percent of enrolled students report that they are the first generation in their families to attend college. In 2016-2017, A&M-SA also had the lowest 4-year undergraduate tuition in San Antonio and 81% of A&M-SA students qualify for financial aid.

With San Antonio coined as “Military City USA,” nearly one in six students at A&M-SA are military connected. A&M-SA is also one of four Texas universities and the only one in San Antonio to be designated a Purple Heart University.

Section 2: Process Used to Develop the QEP

Table 2.1 provides an overview of A&M-SA's process in developing the QEP. The process is described in the following section.

Table 2.1 A&M-SA's QEP Process

Spring 2017	Associate vice provost is directed to oversee the SACSCOC reaffirmation process
Spring 2017	Administration and faculty conduct brainstorming session for QEP topic
Fall 2017	Institutional Effectiveness Committee conducts qualitative analysis of data for common themes
Fall 2017	Call for proposals was distributed campus-wide for development of more detailed QEP topics
Fall 2017	Proposals reviewed by campus community for selection of final QEP topic
Fall 2018	QEP Committee formed
Fall 2018	QEP lead is appointed
Fall 2018	QEP Committee drafts QEP document

QEP Topic Brainstorming Sessions

The then-associate vice provost, Holly Verhasselt, conducted a series of brainstorming presentations across campus and attended staff, faculty, and student meetings throughout the spring and summer of 2017 to generate a comprehensive list of potential QEP topics. During this process, staff, faculty, and students were provided with a survey to generate ideas for the QEP topic. They could also submit suggestions using an online form, which was available through the university's Quality Enhancement Plan webpage. Each group was asked to rank its top five priorities for potential QEP topics (Appendix D).

Qualitative Analysis of Suggestions Performed by Institutional Effectiveness Committee

Once a comprehensive list of QEP topics was created, the Institutional Effectiveness Committee (Appendix A) conducted a qualitative analysis of the suggestions to identify common themes during the fall of 2017. Once common themes were identified, a call for proposals was distributed campus-wide for the development of a more detailed QEP proposal on the top 3-5 topics. These proposals were made available for review by the A&M-SA campus community for the selection of the final QEP topic. Faculty, staff, and students had the opportunity to vote on the final topic in late 2017.

Development of QEP Committee

After the selection of the QEP topic at the end of 2017, work on A&M-SA's QEP transitioned to a QEP committee, which is led by Kimberley Nanez, director of the Student Success Center. The QEP Committee, formed in the fall of 2018, included faculty from all colleges and staff from across the university (Appendix B). The committee met on a regular basis to review literature outlining best practices in quantitative literacy and outline potential outcomes suited for A&M-SA

students, as well as assessments for outcomes. Members of the QEP committee drafted the report.

Section 3: Identification of Topic

The Institutional Effectiveness Committee took the suggestions from the campus community regarding the QEP topic and narrowed them down to three top choices. This committee reviewed institutional data and the following tables were the ones that helped inform the final decision of QL.

A&M-SA administers the National Survey of Student Engagement (NSSG). The following table summarizes the results of the 2017 NSSE with respect to quantitative literacy.

Table 3.1: NSSE Data

Question	First Year	Seniors
During the current school year, about how often have you done the following?		
a. Reached conclusions based on your own analysis of numerical information	Never – 16%	Never – 14%
b. Used numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.)	Never – 20%	Never – 20%
c. Evaluated what others have concluded from numerical information	Never – 24%	Never – 19%

Among both new students primarily taking “core” general education classes and students approaching graduation taking more specialized classes in their majors, a fifth reported they had gone an entire academic year without applying quantitative literacy.

DFW rates of A&M-SA’s undergraduate students were also reviewed. Data was further broken down to scrutinize all undergraduate students versus those in the fall 2016 and fall 2017 cohorts. Then the data was drilled down to focus on how A&M-SA undergraduates are faring in math courses offered on campus. Table 3.2 is a section of lower division math courses that were analyzed for the DFW rates. Table 3.3 is the DFW rates in college algebra comparing all freshmen, the fall 2016 freshman cohort, the fall 2017 freshman cohort, and transfer students. All DFW rates are hovering at over 50%. Although Connect the Dots is not only concentrating on math classes, the QEP plan used the data from our lower division math classes to help inform decisions about the QEP topic.

Lastly, the Institutional Effectiveness Committee reviewed data on completion rates of freshman level core curriculum writing courses and freshman level core curriculum math courses. Tables 3.4 and 3.5 address the completion rates of A&M-SA’s fall 2016 and fall 2017 freshman cohorts. Whether students are taking their core English and math courses at A&M-SA or elsewhere, they are completing those courses in the first year at an average of 15-36%.

Table 3.2: DFW Rates in a Sample of Lower-Division Math Classes for All Undergraduates

Subject	Course	Title	D		F		W		DFW	
			#	%	#	%	#	%	#	%
MATH	1314	College Algebra	419	15.65%	644	24.06%	413	15.43%	1476	55.14%
MATH	1324	Math for Bus/Soc Sci I	10	6.37%	35	22.29%	41	26.11%	86	54.78%
MATH	1325	Math for Bus/Soc Sci II	93	13.82%	128	19.02%	127	18.87%	348	51.71%
MATH	1332	Contemporary Mathematics I	15	17.44%	19	22.09%	22	25.58%	56	65.12%
MATH	1342	Introductory Statistics	53	10.69%	123	24.80%	49	9.88%	225	45.36%

Table 3.3: Comparison of DFW Rates in College Algebra

Group	Subject	Course	Title	D		F		W		DFW	
				#	%	#	%	#	%	#	%
Transfer	MATH	1314	College Algebra	85	14.26%	129	21.64%	117	19.63%	331	55.54%
Fall 2016	MATH	1314	College Algebra	87	17.94%	127	26.19%	67	13.81%	281	57.94%
Fall 2017	MATH	1314	College Algebra	131	20.40%	168	26.17%	55	8.57%	354	55.14%
All Freshmen	MATH	1314	College Algebra	334	16.05%	515	24.75%	296	14.22%	1145	55.02%

Table 3.4: Students Completing Core English and Math at A&M-SA by Conclusion of 1st Year

Cohort	Yes		No	
	#	%	#	%
Fall 2016	102	20.65%	392	79.35%
Fall 2017 ¹	89	15.78%	475	84.22%
Grand Total	191	18.05%	867	81.95%

¹ As of May 2018

Table 3.5: Students Completing Core English and Math Anywhere by Conclusion of 1st Year

Cohort	Yes		No	
	#	%	#	%
Fall 2016	179	36.23%	315	63.77%
Fall 2017 ²	174	30.85%	390	69.15%
Grand Total	353	33.36%	705	66.64%

After review of the institutional data and suggestions from the campus community the QEP topic of quantitative literacy was selected. The QEP Committee then formed to work on the QEP Plan. The first thing that had to be decided was what definition of QL would the group choose?

Operational Definition of Quantitative Literacy (QL)

Over the last few decades, various definitions of QL have been used in educational literature (e.g., AAC&U, 2009; Boersma & Klyve, 2013; Grawe, 2011; Madison & Steen, 2008; Steen, 2001). In addition, different terms are often used interchangeably to emphasize the importance of QL in education, such as numeracy, quantitative reasoning, statistical literacy, mathematical literacy, and data literacy (e.g., AAC&U, 2009; Steen, 2001). The QEP Committee adopted the terms in defining its own: “quantitative” to highlight non-discipline specific but a campus-wide effort across all disciplines and “literacy” to feature a fundamental level of accomplishment in A&M-SA students’ educational experience. An operational definition of QL was adopted by the QEP Committee based on a subset of the expansive literature (see Section 4) and definitions used by various organizations and institutions as follows:

QL is the ability to interpret, represent, and apply numerical information and models in personal, academic, and professional contexts.

Although there is no standard dictionary definition, many educators and researchers often described QL as “a basic mathematical skill set uniquely combined with reasoning abilities, critical thinking abilities, and the habit of mind to purposefully engage with quantitative material” (Boersma & Klyve, 2013, p. 1). However, the components in such a definition of QL make reasonable assessments for outcomes difficult because of the context-rich or subjective nature.

For an operational definition of QL, the QEP Committee focused on basic competencies for QL that could be measured. For example, the AAC&U Valid Assessment of Learning in Undergraduate Education project identified the six competencies for QL: interpretation, representation, calculation, application/analysis, assumptions, and communication (AAC&U, 2009). Considering potential overlaps among the six competencies, the three core competencies: interpretation, presentation, and application are incorporated in the operational

² As of May 2018

definition of QL. For example, the ability to represent quantitative information in various forms (e.g. graphs, tables, and diagrams) is necessary to effectively communicate findings and evidences in terms of how they are organized, presented, and contextualized to pose argument in the context of a real world problem. Similarly, the ability to interpret quantitative information presented in mathematical forms (e.g. graphs, tables, and diagrams) potentially involves the competencies of analysis and assumptions. The three core competencies of QL are also supported by a perspective based on cognitive psychology: mathematics is about seeing (interpreting and representing) at least as much as it is about doing (application) (Lesh, 2000).

Next the group began work on the goals and desired student learning outcomes. Focusing on our strategic plan goal one to “become a national model for student and academic success embracing all students, particularly first generation and underrepresented communities, while achieving graduation and retention rates above the national average,” the topic of QL helps further the university’s goal (Texas A&M University-San Antonio, 2016). Opportunity, one of the university’s core values states that “we are inclusive of all learners and welcome students where they are socially, economically, and academically. We prepare traditional and nontraditional students with marketable skills and undergraduate research experiences that contribute to a meaningful life and a fulfilling career” (Texas A&M University-San Antonio, 2016). Looking to the definition the QEP committee chose, the core value of opportunity meshes well with taking a holistic approach to student success. Connect the Dots will focus not only on math or numbers but on how QL can be applied to a student’s academic, personal, and professional life. QL is everywhere, and A&M-SA will apply it across the curriculum and co-curriculum.

The student learning outcomes help the university move toward the goal stated in the executive summary:

Goal 2: Develop curricular and co-curricular activities to ensure quantitative literacy competency of Texas A&M University-San Antonio graduates.

An SLO Map (Appendix G) has been created to assist faculty and staff to assess the student learning outcomes in the curriculum and co-curriculum. The map is to be used by department chairs, the QL Advisory Committee, faculty, and staff to assess whether or not QL competency is occurring.

Below is one example that faculty can use to assess their course:

Table 3.6: Example from the SLO Map

Student Learning Outcome	Examples of Outcome Achievement	Experiences Provided for Learning	When Will Assessment Occur?	Assessment Methods	Goal Outcome
Student demonstrates the ability to interpret quantitative information presented in mathematical forms (e.g. graphs, tables, and diagrams) to analyze a real world problem.	<p>Student accurately interprets trend data shown in a graph.</p> <p>Student accurately describes the relationship between data displayed in a graph or table.</p> <p>Student accurately describes the differences in returns on savings and investments.</p>	<p>All QL-designated courses.</p> <p>Academic Learning Center will provide at least one workshop per semester on interpreting graphs, tables, and diagrams.</p> <p>Financial literacy workshops provided by the University Library, Scholarships & Financial Aid, and Division of Student Affairs offered each semester.</p>	<p>At least once per semester in all QL-designated courses.</p> <p>At the conclusion of financial literacy workshops.</p>	<p>All QL-designated courses will submit student assignments that assess students' ability to interpret information presented in mathematical forms to OL Director for evaluation against QL rubric.</p> <p>Questionnaire completed at the conclusion of financial literacy workshops will assess student outcome achievement.</p>	<p>At least 60% of student assignments submitted from QL-designated courses will successfully demonstrate the ability to interpret information presented in mathematical forms as evaluated against QL rubric.</p> <p>At least 60% of students will accurately describe the differences in returns on savings and investments in the financial literacy workshop questionnaire.</p>

Section 4: Literature Review and Best Practices

Introduction

The focus of QL for A&M-SA is based on students' college preparedness issues and impact on the university's Strategic Plan Goal 1 ("become a national model for student and academic success embracing all students, particularly first generation and underrepresented populations, while achieving graduation and retention rates above the national average."). Albeit underlying issues appear to primarily manifest in the disciplines of Mathematics and English, it is recognized that addressing "literacy" may be needed to mitigate college-preparedness issues to support achieving not only a strategic plan goals but moreover, support the university's mission to have "graduates leave well equipped with knowledge and marketable skills that prepare them for rewarding careers, responsible global citizenship, and lifelong learning." A QL initiative directly supports Goal #1 by focusing on the development of the characteristics of successful individuals (habits of mind). Accordingly, this section provides a brief overview of research related to QL as a foundation for developing an approach to the challenges posed with regard to addressing QL at A&M-SA.

Historical Notes

For a society to thrive, its citizens need to have an opportunity to grow in mind, body, and spirit so that they may function co-responsibly in professional, work and everyday personal experiences. A key aspect of such activity is communication in its many forms, especially in regard to responding to the changes imposed by varied forms of technology. In particular, the last 30 years has witnessed the inundation of information, in general, and the availability and use of and exposure to, *quantitative* information in various forms, in particular. Cohen (2001a) authors a historical perspective of the critical increase in the need for numeracy skills over two centuries. Indeed, the significance of QL has been well-recognized:

"The quantitatively literate individual should be able engage in mathematics and solve quantitative problems from a wide array of authentic contexts and everyday life situations. These 'habits of the mind' lead to making well-founded mathematical judgments that are useful in an individual's current and future life as a constructive, concerned, and reflective citizen" (Blair and Getz, 2011).

With regard to professional associations addressing QL needs, although the Mathematical Association of America (MAA) has had various curriculum initiatives related to QL since the 1950s, QL was not a specific focus until the 1980s. Several national calls for change and reform in education and mathematics, in particular, channeled efforts to focus on QL as did various educational organizational efforts, too numerous to include in this brief historical narrative. However, in 1989 the MAA QL committee defined QL for college graduates and the academic community has also responded over the last 20 years by exploring ways of integrating QL in disciplines or establishing designated centers for developing approaches to improve QL as part of their discipline. In the 1990s, the MAA established a Quantitative Literacy Subcommittee of the Committee on the Undergraduate Program in Mathematics, which issued guidelines for QL

programs (Sons, 1999). Researchers also examined the various uses of QL in society identified as *five facets: practical, civic, professional, recreational, and cultural to describe the “tapestry of civilization”* (Steen, 1997).

The National Numeracy Network (NNN) started in 2000 working to advocate the integration of quantitative skills across disciplines and at various levels to foster the development of such skills as habits of mind (<http://www.nnn-us.org/>). This necessitated exploring the relationship and delineation of terms such as numeracy, quantitative reasoning, and quantitative literacy (Cohen, 2001; Dingman and Madison, 2010; Madison, 2003; Rocconi, Lambert, McCormick, and Sarraf, 2013). In 2004 the MAA formed a Special Interest Group focused on QL (SIGMAA QL) with the purpose of providing “a structure within the mathematics community to identify the prerequisite mathematical skills for QL and find innovative ways of developing and implementing QL curricula” (SIGMAA, 2018). The American Mathematical Association of Two-Year Colleges (AMATYC) underscored the importance of QL in its standards document recommending that “faculty integrate QL outcomes into all mathematics courses and collaborate with faculty in other disciplines to integrate QL into coursework across all disciplines” (AMATYC, 2006).

Indeed there have been numerous efforts in promoting and adopting QL. The Dana Center works with the nation’s “education systems to transform structures and teaching practices to improve students’ achievement.” Inherent in the corresponding Mathematics Pathways developed is the significance of QL and in particular, quantitative reasoning explicitly developed as one of the three aligned mathematics pathways to improve student success and learning (DCMP 0218). So a historical groundwork has been laid that provides a rich context for an A&M-SA QL initiative that thrusts.

Perspectives on Quantitative Literacy

With the evolving nature of an emphasis on QL it is essential that an A&M-SA QL initiative apply a definition that captures the essence of QL as viewed in the literature as well as serving as a pragmatic tool in formulating a feasible implementation approach. The (AAC&U) Liberal Education and America's Promise (LEAP) initiative identifies QL as one of six “Intellectual and Practical Skills” (AAC&U, 2007). In “The Case for Quantitative Literacy,” several perspectives regarding QL are explored. In particular, four ways of viewing QL are posed: identification of various components that provide a basis for a comprehensive definition; an array of manifestations that occur in daily life requiring QL thinking; characterizations of the skills that comprise QL academically; and differentiating QL from mathematics (Cohen, 2001b; (NASSEM, 1991). However, there appears to be no formal consensus of a definition of QL. Numerous definitions of QL reflect that QL is the ability to understand and interpret a problem within a given real life context to formulate and communicate a solution that applies underlying concepts and techniques of working with numerical information in conjunction with knowledge and skills from diverse disciplines (Davidson and McKinney, 2001; Madison, 2003; Steen, 2001; MAA, 2004; Elrod, 2014; Hughes-Hallet, 2001; NCES 1993). It has also been referred to as “more like art than science” (Ellis, 2001).

Quantitative Literacy Definition

A key feature of a QL focus is the development of the characteristics of successful individuals. Such features are referred to as *habits of mind* that include sixteen “problem solving, life related skills, necessary to effectively operate in society and promote strategic reasoning, insightfulness, perseverance, creativity and craftsmanship” (Costa and Kallick, 2000).

In light of the underlying issues evident in the state of student math TSI readiness and the resulting DFW rate across lower-division math courses (fall 2016 – spring 2018) and the need to further the university’s strategic goals, it is vital that the overall issue to be addressed by the QEP was not simply a math problem but a more encompassing issue found in various disciplines. As discussed by Elrod (2014), a primary misconception is that QL is already taught in mathematics classes. Although QL applies basic mathematics skills, the focus is not on how to perform the calculation but more about interpreting calculation results. Elrod (2014) underscores the differences between quantitative reasoning and traditional mathematics as shown in table 4.1.

Table 4.1. Differences between TM and QR (Adapted from Elrod 2014)

Aspect	Traditional Math (TM)	Quantitative Reasoning (QR)
Reasoning	Abstract, deductive	Practical, robust habit of mind
Employment	STEM professions	Daily-life
Context	Rises above	Anchored in
Objects of study	Ideals	Data
Purpose	Primarily professional	Graduates’ personal/civic responsibilities

Clarifying how QL is not the same as mathematics is essential for successful implementation across disciplines. Indeed, although QL and mathematics are definitely interrelated, math is recognized as a discipline with its own language as opposed to QL being a skill associated with everyday experiences (Manaster 2001, Grawe 2012). It is noted that the MAA (1994) called for universities to insure that “every college graduate should be able to apply simple mathematical methods to the solution of real-world problems and be able to

1. Interpret mathematical models such as formulas, graphs, tables, 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 limits.”

Consequently, review of the literature on QL leads to recognizing various attributes associated with QL.

Significance: The importance of QL can be expressed in a myriad of ways to include uncertainty in life (Ellis, 2001).

Life Cycle: The development of QL occurs from pre-college preparation throughout the entire college experience.

Level: It is recognized that QL has many facets and in practice, manifests on different levels of competency.

Interdisciplinary Nature: QL crosses domains with complementary skills in key disciplines utilizing QL being science, social sciences and business.

Functional Elements: Although there are a multitude of definitions for QL, it appears that whatever definition is adopted involves the following elements (Beaudrie, 2009):

- Inherent purpose of life skills development and responsible citizenship
- Context (real life situations)
- Problem Solving (various aspects and degrees)
- Synthesis of several skills from most areas of curricula with the underlying principles/perspectives of (*non-advanced*) mathematics and english

Core Competencies: QL Core Competencies have been identified (Boersma, Diefenderfer, Dingman and Madison, 2011):

- Interpretation
- Representation
- Calculation
- Application/Analysis
- Assumptions
- Communication

Application: QL is applied to evaluating and/or forming a sound argument to support decision-making.

Literacy Strand: QL is one thread of “literacy” that can be considered an umbrella concept comprising of various types of literacies that are practiced together (Ewell, 2001).

Cultural Challenge: Introducing and/or addressing QL in college and university cultures requires long-term commitment, coordinated focus and engaging challenges found in traditional academic approaches and systemic processes.

Assessment Challenge: Assessing QL is recognized to be difficult and not common practice across colleges and universities thus requiring credible and practical methods (Gaze, Montgomery, Kilic-Bahi, Leoni, Misener, and Taylor, 2014; Johnson and Kaplan, n.d.; NSSE, 2018).

Founded on recognized A&M-SA student development deficiencies and the above QL attributes, A&M-SA understands QL to be the ability to understand and interpret a problem within a given real life context in order to formulate and communicate a solution that applies underlying concepts and techniques of working with numerical information in conjunction with knowledge and skills from diverse disciplines. Accordingly, to facilitate the introduction and implementation of a QL initiative the following definition was adopted for A&M-SA's QEP:

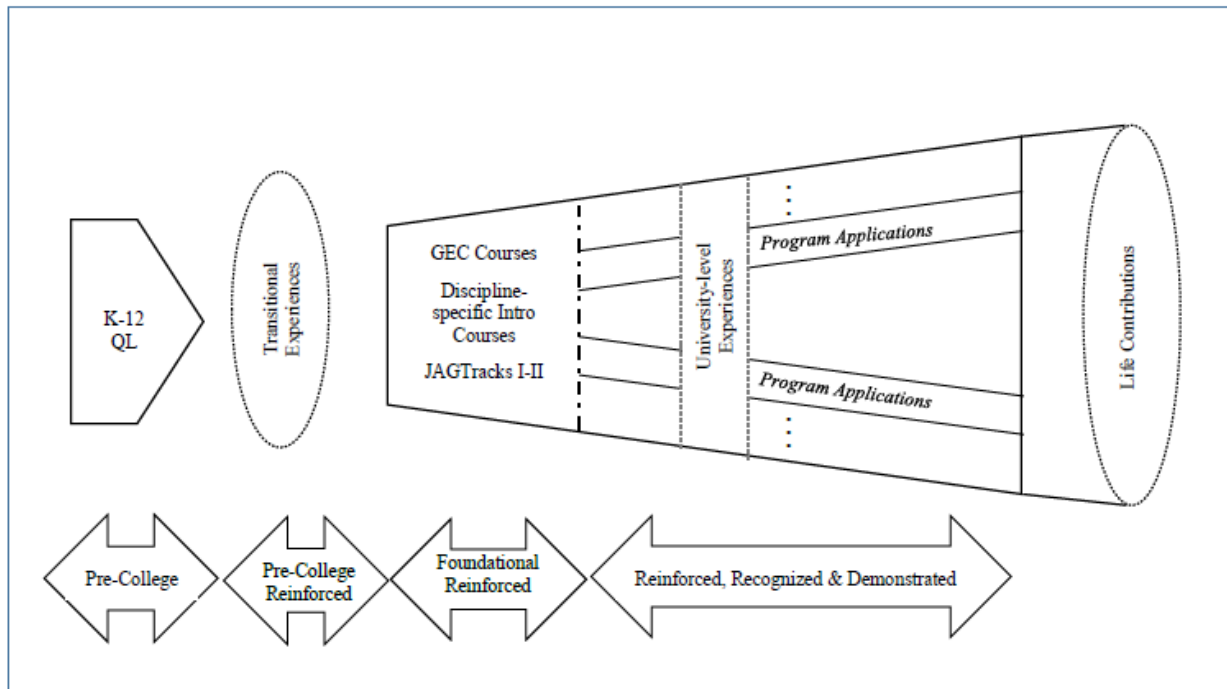
Quantitative Literacy is the ability to interpret, represent, and apply numerical information and models in personal, academic, and professional contexts.

This definition, based on reviewed literature and definitions used by various organizations and institutions in conjunction with A&M-SA QEP committee deliberations, is considered to appropriately capture the essence of QL for the A&M-SA QL initiative and is also sufficiently encompassing, without linking to neither specific disciplines nor category of students.

Quantitative Literacy and Higher Education

National studies (AAC&U, 2007; Rocconi, Lambert, McCormick, and Sarraf, 2013), professional organization recommendations (MAA 2007), and state-mandated accountability initiatives (Davidson, and McKinney, 2001) in conjunction with industry and business expectations and efforts (Rosen, Weil, and Von Zastrow, 2003) compel that colleges and universities address student development of QL skills. Indeed, QL underlies the intellectual and practical skills that have been identified by an AAC&U panel calling “for higher education to help college students become intentional learners” that are to be empowered learners who are able to: effectively communicate; understand and apply both quantitative and qualitative analysis to solve problems; interpret and analyze information from diverse sources; grasp and work within complex and varied systems groups; exhibit intellectual agility and manage change; and transform information and knowledge for sound decision-making (AAC&U 2002).

In this respect, A&M-SA's QEP seeks to focus on QL in a deliberate focused manner considering the different levels of QL based on the student's learning process (i.e., prerequisite, foundational, and applied) as illustrated by Johnson and Kaplan (n.d.). Figure 4.1 adapts their framework for A&M-SA.

Figure 4.1. Levels of Quantitative Literacy (Adapted from Johnson and Kaplan, n.d.)

This is recognized as a first step in approaching the broadened focus of QL across all disciplines. The initial focus of QL relates to bridging students' incoming level of QL (e.g., K-12) with transitional experiences (e.g., JAGX) to reinforce initial QL level and initiate awareness of QL as a significant element in the A&M-SA experience. The next phase addresses transfer of the college readiness QL level to acquire a college foundation level QL (e.g., General Education Core courses, discipline specific introductory courses and JAGTracks I-II). The QL focus then extends to the development of college-level QL through university experiences and discipline-specific/program applications (e.g., major core courses, projects, CAPSTONES, experiential learning activities, UG research, internships, JAG Tracks III –IV, et al.).

Quantitative Literacy Implications on Curriculum

The 1994 MAA report on QR draws four major conclusions:

1. Colleges and universities should treat QL as a thoroughly legitimate and even necessary goal for baccalaureate graduates.
2. Colleges and universities should expect every college graduate to be able to apply simple mathematical methods to the solution of real-world problems.
3. Colleges and universities should devise and establish QL programs each consisting of foundation experience and a continuation experience, and mathematics departments should provide leadership in the development of such programs.
4. Colleges and universities should accept responsibility for overseeing their QL programs through regular assessments (Johnson and Kaplan, n.d.; MAA, 1994).

How such measures, as well as a QL focus, may impact curriculum is a significant consideration in proceeding. As stated by Ewell (2001) "*the notion of embedding QL in general education is*

part of a larger issue of what role this portion of the curriculum ought to play in the first place" (page 47). Undoubtedly, the many faces of QL, numeracy, and QR all highlight the importance of integrating a degree of quantitative material across the curriculum and that higher education must infuse QL appears vital (Davidson and McKinney, 2001; Dingman and Madison, 2010); Ellis, 2001; Elrod, 2014; Ewell, 2001; Cohen, 2001b; Grawe, 2012; MAA, 1994; Madison, 2003; Miller, 2010; Rocconi, Lambert, McCormick, and Sarraf, 2013; Steen, 1997; Steen, 2004).

However, as noted by Elrod "There is no single pedagogy for QR, although problem-based or inquiry-focused learning approaches may be the most appropriate" (2014). According to the Numeracy Infusion Course for Higher Education (NICHE)/Numeracy Infusion for College Educators (NICE) Program website several pedagogical approaches, which are important for teaching QR include: (1) real world applications and active learning; (2) pairing QR instruction with writing and critical reading; (3) using technology; (4) collaborative instruction and group work; (5) pedagogy that is sensitive to differences in students' culture and learning styles; and (6) scaffolding the learning process with feedback and opportunities for revision. (Wilder, 2018) Thus, the challenge of incorporating QL in curriculum not only resides in courses which may be deemed to not have inherent QL elements but also in those that may and which would require different teaching approaches and philosophies (Saxe and Braddy, 2015).

Students and Quantitative Literacy

Research indicates that "Colleges in the United States assess a total of about 60% of their new freshmen as unprepared for college-level work" (Grubb et al., 2011). With regard to QL, the problem is more so dire among students from underrepresented communities (Baer, Cook, and Baldi, 2006; Wilder, 2012). Being an indispensable component in today's information-rich society, QL is not just about preparing scientists but equips students with the skill set used for making sound decisions in their everyday lives to making critical decisions in life-changing situations. In a highly integrated economy, it is exceedingly risky to accept as inevitable the innumeracy of many of our fellow citizens. As discussed in Johnson and Kaplan (n.d.), there are three layers of QL meaningful to students: (1) the prerequisite level that includes a fundamental understanding of the mathematical, statistical and computational concepts; (2) the foundational level that expands the preceding knowledge base to include outcomes typically from introductory coursework; (3) the applied level that involves the completion of a set of courses and/or projects so that students can meaningfully apply quantitative knowledge into an applied context, both general and major-specific. Students with a well-equipped kit of QL skills often gain more self-confidence, show good level of leadership and open communication, demonstrate increased abilities and skills in critical/logical thinking as well as in problem solving techniques related to real-world application contexts. Regarding students identified as needing remediation, Logue, Watanabe-Rose, and Douglas (2016) inferred such students should be channeled to college-level QL courses to increase student success.

In addition, the LEAP National Leadership Council identified QL as one of the essential learning outcomes to be realized through the many varied education programs and in all higher education institutions (ACC&U, 2007). Correspondingly, Beaudrie (2009) states QL will help students with the following:

- Articulate their ideas

- Express themselves with precision
- Ground their observations in evidence
- Test claims and hypotheses
- Participate in civil discourse
- Represent what they are ill-equipped to see
- Recognize and weigh uncertainty
- Construct a context to attract interest and to inform critical thinking

As students enter the job market, they will need to balance responsibilities and make sound decisions, many of which are based on numerical information. In particular, many students will continue to face financial challenges and handle various financial and loan decisions. As examined by the RAND Corp., the state of financial knowledge in college is a growing policy concern (Anderson, Conzelmann and Austin, 2018).

Faculty and Quantitative Literacy

As instructors of QL, faculty should assume more responsibilities in designating and redesigning existing courses and develop new courses meeting the demands of equipping the student with QL skills. “But even if mathematicians wanted to, they cannot teach QL alone. Mathematicians need the help of other disciplines in secondary school and university departments to support the cause of quantitative literacy” (Ellis, 2001). As Grawe (2012) states “Faculty in all disciplines needed professional development support to enhance QL in their courses.” Accordingly, several efforts have been made in the associated pedagogical methods that may facilitate the implementation or enhancement of QL in teaching.

Wenner (2016) observes that when teaching quantitative skills to entry-level students, some valuable ideas include:

- Place concepts in context
- Use multiple representations
- Work in groups
- Use appropriate technology
- Do in-depth problems that last more than one day

Wilder (2012), Lehman College, and CUNY, discussed the following faculty views on the importance of a variety of approaches to teaching QL:

- Active engagement in data analysis
- Wide & multi-disciplinary participation
- Screening test that assesses QR skills
- QR tutoring center
- Regular assessment of student learning
- Standard set of QR learning objectives
- Foundational QR course
- Discipline-specific QR learning. Objectives
- Different tiers of QR across the curriculum
- QR courses with lab components

Regarding concerns of teacher preparation, Murray (Madison, B. L. and Steen, 2008) explores implications for the higher order forms of learning needed for QL as well as the issues of teacher preparation regarding content vs. preparation. Indeed, The MAA's *A common vision for undergraduate mathematical sciences programs in 2025* presented challenges to the mathematical community in the areas of curricula, course structure, workforce preparation, and faculty development, which also underlies teaching QL and related faculty development (Saxe and Braddy, 2015).

Community and Quantitative Literacy

Lynn Steen and his collaborators articulate a clear call for broad reforms to prepare students for the pervasive need for QL in citizenship, education, professional life, personal finance and health, and even culture. Making certain not to understate the case, Robert Orill warns in his preface "If individuals lack the ability to think numerically, they cannot participate fully in civic life, thereby bringing into question the very basis of government of, by, and for the people" (NCED, page xvi, 2011). Project Kaleidoscope, a leading advocate for building and sustaining strong undergraduate programs in the fields of science, technology, engineering, and mathematics, has argued from its inception in 1989 that community is a key ingredient in fostering national reform movements. As Kezar puts it "Scale-up works better when individuals or groups working in local settings are connected to a network of others who are also involved in similar efforts. Through such networks, innovators can support one another and help resolve issues of implementation, motivation, and ownership. Networks can also provide the leadership needed to create and sustain change in particular settings" (Grawe, 2012).

The adult QL skill level (e.g., below basic to proficient) as described by Kutner et. al. (2007) shows a glaring contrast in economic impact as well as type of occupation. Concerning healthcare, physicians, and healthcare staff need to be able to interpret quantitative information to conduct effective clinical practice. The impact of inadequate quantitative skills in the medical arena can be critical as errors can occur in prescribing incorrect dosage of medication or not interpreting medical data properly. This poses great disadvantageous conditions in the community of physicians and thus leads to dangerous consequences. Besides implementing better healthcare information systems, they have applied various training programs addressing issues related to QL (Ancker and Abramson, 2012).

Citing the National Council in Education and the Disciplines (Steen 2008), Bookman, Ganter, and Morgan (2008) noted that baseline level of numeracy would include elements such as

- ability to interpret public data
- application of quantitative information to decision making
- confidence with mathematics
- cultural appreciation of mathematics
- logical thinking in forming opinions
- practical problem solving skills
- prerequisite mathematics for advanced quantitative study
- strong number and symbol sense
- use of mathematics in context (page 912)

Implementation Challenges

The nature of challenges associated with a QL initiative not only include curriculum as noted above but more so systemic as well in terms of assessment (Johnson and Kaplan, n.d.). Challenges have been summarized in terms of the high number of college graduates not having sufficient QL skills, lack of professional development for faculty to infuse QL, lack of policy-maker awareness of the increasing importance of QL need, and lack of QL in assessment processes (Steen, 2001; Dingman and Madison, 2010). In addition, the challenges have been noted to parallel those associated with the “writing across the curriculum” movement and its slow acceptance in universities and colleges (Bookman, Ganter, and Morgan 2008). QL as a thrust entails that it be viewed and implemented as an integrated process with existing processes (e.g., curriculum, university student support programs, policy, et al) as well as newly identified activities or processes (e.g., professional development workshops, QL coaches, et al). Hence, resource constraints may also pose fiscal hurdles.

Amid cultural aspects, faculties’ perspectives may also pose challenge: “Most faculties tend to see both communication and quantitative literacy in ‘prerequisite skills’ as opposed to ‘educated person’ terms” (Ewell, 2001). Attitudes regarding specific pedagogy that may be necessary may also engender discord. Most notably as previously cited the challenge of appropriately assessing QL. One must recognize that answers to important assessment questions that need to be addressed are not well-defined (e.g., what pre-college level QL skills should students be expected to possess on admission or what do the QL skills of a graduate look like?) (Davidson and McKinney, 2001; Hughes-Hallet, 2001; Bookman, Ganter and Morgan 2008; Gaze, Montgomery, Kilic-Bahi, Leoni, Misener, and Taylor, 2014; Logue, Watanabe-Rose, Douglas 2016; NSSE, 2018). In this respect, application of available QL rubrics such as developed by the AAC&U can certainly be adapted to facilitate addressing this latter challenge.

Consequently, successful implementation bears not only on graduating students’ QL proficiency level but on the university’s emphasis of, and the resources dedicated to, QL programs. As Bookman, Gante, and Morgan (2008) state “Central to these efforts must be valid methods of assessing QL proficiency and progress in these students” (page 927).

Section 5: QEP Implementation Timeline

Connect the Dots seeks to infuse QL into all parts of the academic experience of an A&M-SA student. This plan will span five years and requires faculty and staff to work together for implementation. Current A&M-SA courses will be reviewed using a university developed rubric. Faculty and staff will have the ability to attend workshops to develop QL in the course as well as in co-curricular activities. The plan involves the student at Jag-X (week-long freshman program that occurs the week before classes begin), Jag Tracks I and II (academic success courses offered to freshmen and sophomores), in the core curriculum and discipline specific courses. Below is the five year timeline created by the QEP Committee.

Table 5.1 Texas A&M University QEP Implementation Timeline

Year	Action Items	Responsible Party
<p>Year 0 Fall 2018- Summer 2019</p>	<ul style="list-style-type: none"> • Post Quantitative Literacy Director Position in December 2018 and hire by April 2019 • Develop Quantitative Literacy Rubric by December 2019 • Create a student focus group • January-March 2019 advertise/market QEP to campus community • Create Quantitative Literacy Advisory Committee by February 2019 • Initial Assessment/Evaluation current courses for Quantitative Literacy by March 2019 • Campus-wide assessment of co-curricular programs for Quantitative Literacy by March 2019 • Quantitative Literacy is added to Jag Tracks I and II as a component by April 2019 • Develop Quantitative Literacy workshops for faculty and staff by August 2019 	<ul style="list-style-type: none"> • QEP Committee Chair • QEP Committee • QEP Committee Chair • QEP Committee • The Provost • Department Chairs in 3 Colleges • VP of Student Affairs • Director of First Year Experience • Director of Quantitative Literacy/Quantitative Literacy Advisory Committee

	<ul style="list-style-type: none"> Quantitative Literacy infused in Jag-X in August 2019 	<ul style="list-style-type: none"> Executive Director of Student Experience and Engagement
<p>Year 1 Fall 2019- Summer 2020</p>	<ul style="list-style-type: none"> Launch first set of workshops in fall and spring for faculty/staff Collect Student Learning Outcomes from identified Quantitative Literacy courses for fall 2019 and spring 2020 Develop general education Quantitative Literacy rubrics to assess core curriculum Develop examples of Quantitative Literacy assignments/activities for faculty and staff Host at least 2 Quantitative Literacy-focused co-curricular programs in the academic year Review Student Learning Outcomes from identified Quantitative Literacy courses and write a report by August 2020 Conduct ongoing review of courses that go through the workshops for effective Quantitative Literacy implementation 	<ul style="list-style-type: none"> Quantitative Literacy Director Quantitative Literacy Director Director of Quantitative Literacy/Quantitative Literacy Advisory Committee VP for Student Affairs Quantitative Literacy Director Director of Quantitative Literacy/Quantitative Literacy Advisory Committee
<p>Year 2 Fall 2020- Summer 2021</p>	<ul style="list-style-type: none"> Continue offering workshops in fall and spring for faculty/staff Collect Student Learning Outcomes from identified Quantitative Literacy courses for fall 2020 and spring 2021 Utilize the Quantitative Literacy rubric in core curriculum to assess 	<ul style="list-style-type: none"> Quantitative Literacy Director Quantitative Literacy Director The Provost

	<ul style="list-style-type: none"> Review Student Learning Outcomes from identified Quantitative Literacy courses and write a report by August 2021 Conduct ongoing review of courses that go through the workshops for effective Quantitative Literacy implementation Host at least 3 Quantitative Literacy-focused co-curricular programs in the academic year 	<ul style="list-style-type: none"> Quantitative Literacy Director Quantitative Literacy Director/Quantitative Literacy Advisory Committee VP of Student Affairs
<p>Year 3 Fall 2021- Summer 2022</p>	<ul style="list-style-type: none"> Continue offering workshops in fall and spring for faculty/staff Collect Student Learning Outcomes from identified Quantitative Literacy classes for fall 2021 and spring 2022 Utilize the Quantitative Literacy rubric in core curriculum to assess Develop Quantitative Literacy rubrics for discipline specific courses Develop examples of Quantitative Literacy assignments/activities for faculty and staff Review Student Learning Outcomes from identified Quantitative Literacy courses and write a report by August 2022 Conduct ongoing review of courses that go through the workshops for effective Quantitative Literacy implementation 	<ul style="list-style-type: none"> Quantitative Literacy Director Quantitative Literacy Director The Provost The Provost, Deans, Department Chairs Director of Quantitative Literacy/Quantitative Literacy Advisory Committee Quantitative Literacy Director Quantitative Literacy Director/Quantitative Literacy Advisory Committee

	<ul style="list-style-type: none"> • Host at least 5 Quantitative Literacy-focused co-curricular programs in the academic year • Create Quantitative Literacy designation in catalog and schedule 	<ul style="list-style-type: none"> • VP of Student Affairs • The Registrar and the Provost
<p>Year 4 Fall 2022- Summer 2023</p>	<ul style="list-style-type: none"> • Continue offering workshops in fall and spring for faculty/staff • Utilize the discipline specific rubrics to assess upper level identified Quantitative Literacy courses • Collect Student Learning Outcomes from identified Quantitative Literacy courses for fall 2022 and spring 2023 • Review Student Learning Outcomes from Quantitative Literacy courses and write a report by August 2023 • Conduct ongoing review of courses that go through the workshops for effective Quantitative Literacy implementation • Host at least 5 Quantitative Literacy-focused co-curricular programs in the academic year • Assess percentage of students graduating with at least two Quantitative Literacy courses 	<ul style="list-style-type: none"> • Quantitative Literacy Director • The Provost, Deans, Department Chairs • Quantitative Literacy Director • Quantitative Literacy Director • Quantitative Literacy Director/Quantitative Literacy Advisory Committee • VP of Student Affairs • The Provost, Registrar, and Director of Academic Advising

<p>Year 5 Fall 2023- Summer 2024</p>	<ul style="list-style-type: none"> • Continue offering workshops in fall and spring for faculty/staff • Utilize the discipline specific rubrics to assess upper level identified Quantitative Literacy courses • Collect Student Learning Outcomes from identified Quantitative Literacy courses for fall 2023 and spring 2024 • Conduct ongoing review of courses that go through the workshops for effective Quantitative Literacy implementation • Host at least 5 Quantitative Literacy-focused co-curricular programs in the academic year • Review Student Learning Outcomes from identified Quantitative Literacy courses • 5 year report due to SACSCOC in September 2024 	<ul style="list-style-type: none"> • Quantitative Literacy Director • The Provost, Deans, Department Chairs • Quantitative Literacy Director • Quantitative Literacy Director/Quantitative Literacy Advisory Committee • VP of Student Affairs • Quantitative Literacy Director • Quantitative Literacy Director/Quantitative Literacy Advisory Committee and the Provost
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Section 6: QEP Management, Organization, Resources

Connect the Dots, exists under the supervision of Provost Mike O'Brien. Kimberley Nanez acts as the chair of the QEP Committee and leads 7 faculty and 2 staff members (Appendix B).

The QEP committee will collaborate with several departments on and off campus to carry out the plan. Primary collaborators include the following:

- The Mays Center for Experiential Learning - currently hosts financial literacy workshops on campus as well as Career Services workshops that pertain to QL.
- The Academic Learning Center - houses the subject area for tutors on campus. This department will offer QL workshops on a peer-to-peer level.
- Office of Student Experience and Engagement - hosts the weeklong Jaguar immersion program before classes begin. This department offers the QEP committee valuable insight on infusing QL in pre-college activities.
- Mathematics Learning by Inquiry - The mission of the Mathematics Learning by Inquiry group is to “strengthen the mathematical preparation of all students by supporting and expanding the community of teacher-practitioners at the pre-college, undergraduate, and graduate levels engaged in Learning by Inquiry” (Mathematics Learning by Inquiry, n.d.). A&M-SA values the collaboration with MLI and its mission to support all students.

Figure 6.1. Leadership of Texas A&M University-San Antonio’s QEP

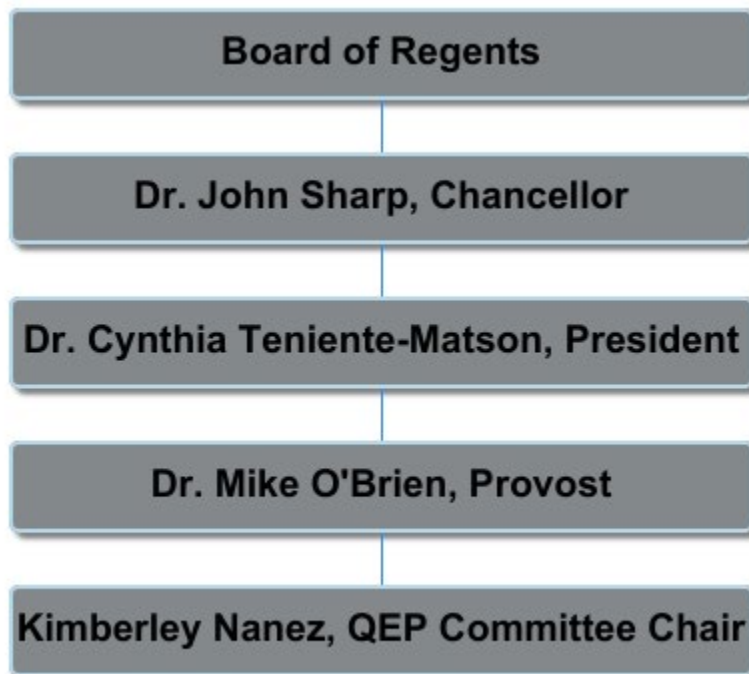


Figure 6.2. Leadership of Texas A&M University-San Antonio’s Collaborators

QEP Collaborators
The Mays Center for Experiential Learning & Community Engagement
The Academic Learning Center
The Office of Student Engagement and Experience
Mathematics Learning by Inquiry

Section 7: Budget for QEP Plan, Connect the Dots

Direct Costs

A&M-SA values the QEP topic of QL and felt that a position to lead this effort is required. The majority of the 5-year direct budget focuses on this position (see Appendix E for job description). The budgeted total amount for this position includes the following:

Item	Amount
QL Director Position	\$72,000.00
Fringe and Benefits	\$22,160.00
Operations & Maintenance	\$5,000.00
TOTAL	\$99,160.00

In the six-year figures shown below, the salary and benefits are shown as not changing, although in reality, they will change as raises become available.

Direct Costs							
Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
QL Director	\$99,160.00	\$99,160.00	\$99,160.00	\$99,160.00	\$99,160.00	\$99,160.00	\$594,960.00
Marketing	\$8,300.00	\$1,000.00	\$500.00	\$500.00	\$500.00	\$0.00	\$10,800.00
Faculty/Staff Development	\$1,000.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$8,500.00
Total Direct Costs	\$108,460.00	\$101,660.00	\$101,160.00	\$101,160.00	\$101,160.00	\$100,660.00	\$614,260.00

The marketing efforts are front loaded in the plan as efforts will be undertaken to get advertisement for Connect the Dots. In year zero, A&M-SA has earmarked \$8,300 for marketing and promotional materials. In subsequent years the amount spent per year goes down or equals off. Since there will be faculty and staff professional workshops, there will be a need every year to market Connect the Dots.

In relation to the faculty and staff professional workshops a specific amount has been associated with each year of the plan to make sure that the QL director has enough funds for supplies and technology required for the workshops. In the operations and maintenance budget, the QL director can use that for professional developmental of faculty and staff (for example: conferences or workshops hosted externally).

Indirect Costs

There are indirect costs associated with Connect the Dots. There are seven faculty members who make up the QL advisory committee that assists the director. The QEP committee in consultation with the provost decided on the following formula:

Faculty support indirect cost = 7 faculty members x 25% workload + 28% benefits x average faculty salary

This calculation increases in weight each year. Years 0 and 1 is weighted at 25%, years 2 and 3 are weighted at 30% and years 4 and 5 are weighted at 35%. This is due to the belief that the amount of QL courses that will need to be reviewed by this committee will continue to grow each year, therefore requiring the committee to exert more time and effort.

The department chairs will also have a large role in helping to identify QL courses in the curriculum and as the process refines itself the role of the chair will also be weighted more in later years. The QEP committee in consultation with the Provost decided on the following formula:

Department chair support = 10 department chairs x 10% workload + 28% benefits x average faculty salary

This calculation increases in weight each year. Year 0 is weighted at 10%, years 1-3 are weighted at 15%, and years 4-5 are weighted at 20%.

Expenses in the administrative support area revolve around the time that the provost, the executive assistant to the provost, and the QEP chair will spend working on Connect the Dots. The difference in year 0 to the rest of the years has to do with the QEP chair no longer being a position used after year 0 is complete. That role will transition to the QL director.

The public relations costs are for the marketing and awareness that is necessary to keep Connect the Dots on the forefront at the university. This indirect cost is associate with updating the QEP website, the social media pages, and other media related items.

Indirect Costs							
Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Faculty Support	\$145,600.00	\$145,600.00	\$174,720.00	\$174,720.00	\$203,840.00	\$203,840.00	\$1,048,320.00
College Chairs Support	\$89,600.00	\$134,400.00	\$134,400.00	\$134,400.00	\$179,200.00	\$179,200.00	\$851,200.00
Administrative Support	\$20,000.00	\$15,000.00	\$15,000.00	\$15,000.00	\$15,000.00	\$15,000.00	\$90,000.00
Public Relations	\$500.00	\$500.00	\$500.00	\$500.00	\$500.00	\$500.00	\$3,000.00
Total Direct Costs	\$255,700.00	\$295,500.00	\$324,620.00	\$324,620.00	\$398,540.00	\$398,540.00	\$1,997,500.00

Section 8: QEP Assessment and Evaluation

Among the core components of assessment of student learning, according to Suskie (2009), are clear, measurable outcomes of student learning, and sufficient opportunities to achieve those outcomes. In developing our student learning outcomes and assessment measures for QL, a conscious decision was made to articulate them for broad applicability across disciplines, as well as to co-curricular programming to ensure sufficient opportunities for students to achieve the learning outcomes.

Attention was also paid to articulating student learning outcomes and assessment measures with minimal reference to mathematics, acknowledging the fact that students, and even some faculty, may “possess deeply held beliefs and ideas regarding how mathematics is taught and learned” (Dingman and Madison, 2010). Such views may prejudice students to avoid taking QL-designated courses or participating in QL-designated co-curricular programs and may prejudice faculty teaching in some disciplines from adopting QL strategies into their pedagogies.

Using our definition for QL as a framework, four scaffolded student learning outcomes for QL have been developed:

- Student demonstrates the ability to interpret quantitative information presented in mathematical forms (e.g. graphs, tables, and diagrams) to analyze a real world problem
- Student demonstrates the ability to represent quantitative information in various forms (e.g. graphs, tables, and diagrams) to pose argument in the context of a real world problem
- Student demonstrates the ability to apply a model based on quantitative information to formulate a solution of a real world problem
- Student values quantitative literacy as an essential component of the A&M-SA experience

Dingman and Madison (2010) note that “the major challenge in assessing QL concerns the central goal of transfer of knowledge and cognitive processes to contexts that are unpredictable and of unbounded variation.” Acknowledging this challenge, we anticipate that our assessment methods and goals will evolve beyond those that appear in our Student Learning Outcomes Assessment Map (Appendix F) as QL is rolled out across the curriculum and co-curriculum.

Initially, the primary form of direct assessment of student learning in QL-designated courses will be sample student assignments evaluated against a QL rubric to be developed by the QL director. All QL-designated courses will submit a selection of student assignments representing the breadth of student performance in attaining QL outcomes. The QL director will then evaluate this representative sample against the QL rubric to determine the level of student learning attainment in the first three student learning outcomes for QL at the institutional level. Over time, through campus-wide initiatives led by the QL director, other direct assessment methods may be developed and utilized.

For co-curricular programs with a QL designation, an indirect assessment will be employed in the form of a questionnaire. An indirect assessment has been selected for its broad applicability

to a variety of settings, as we anticipate highly diverse co-curricular programming featuring QL, not limited to film screenings with discussions, financial literacy workshops, and experiential learning activities related to election polling and redistricting. An indirect assessment method has also been selected for the fourth student learning outcome, "Student values quantitative literacy as an essential component of the A&M-SA experience." This is the only student learning outcome that will be assessed once during a student's educational experience at A&M-SA. At the point of graduation when students are asked to complete the graduating student survey, an item will be included that uses a five-point Likert scale response to a statement, such as, "Quantitative literacy was an essential part of my A&M-SA experience."

The assessment of QL undertaken at the institutional level seeks to address the broad QL skills articulated in the four student learning outcomes for QL. Within individual QL-designated courses, it is expected that faculty will develop their context and discipline-specific assessment methods and instruments to assess the attainment of QL outcomes within their courses. These methods and instruments will be developed through the faculty workshop series led by the QL director. Both at the institutional level and at the individual course level, it is expected that assessment results will lead to revisions in the tactics and pedagogies that support students' attainment of QL outcomes; the assessment and revision cycle should be on-going, with the goal of improving QL at A&M-SA.

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Appendix A: Institutional Effectiveness Committee

Dr. William Bush, Co-chair, College of Arts & Sciences

Dr. Holly Verhasselt, Co-chair, Academic Affairs

Lloyd Butler, Business Affairs

Mary Kay Cooper, University Advancement

Dr. Joselyn Del Pilar, College of Arts & Sciences

Dr. Daniel Glaser, College of Business

Dr. Melissa Jozwiak, College of Education and Human Development

Dr. Leonard Love, College of Business

Art Olague, Student Affairs

Dr. Edward Westermann, College of Arts & Science

Appendix B: QEP Committee

Kimberley Nanez, Chair, Director of Student Academic Success

Dr. John Romo, College of Arts and Sciences

Dr. Qi Han, College of Arts and Sciences

Dr. Young Rae Kim, College of Education and Human Development

Antoinette Curl, Director of Academic Advising

Dr. Lizbett Tinoco, College of Arts and Sciences

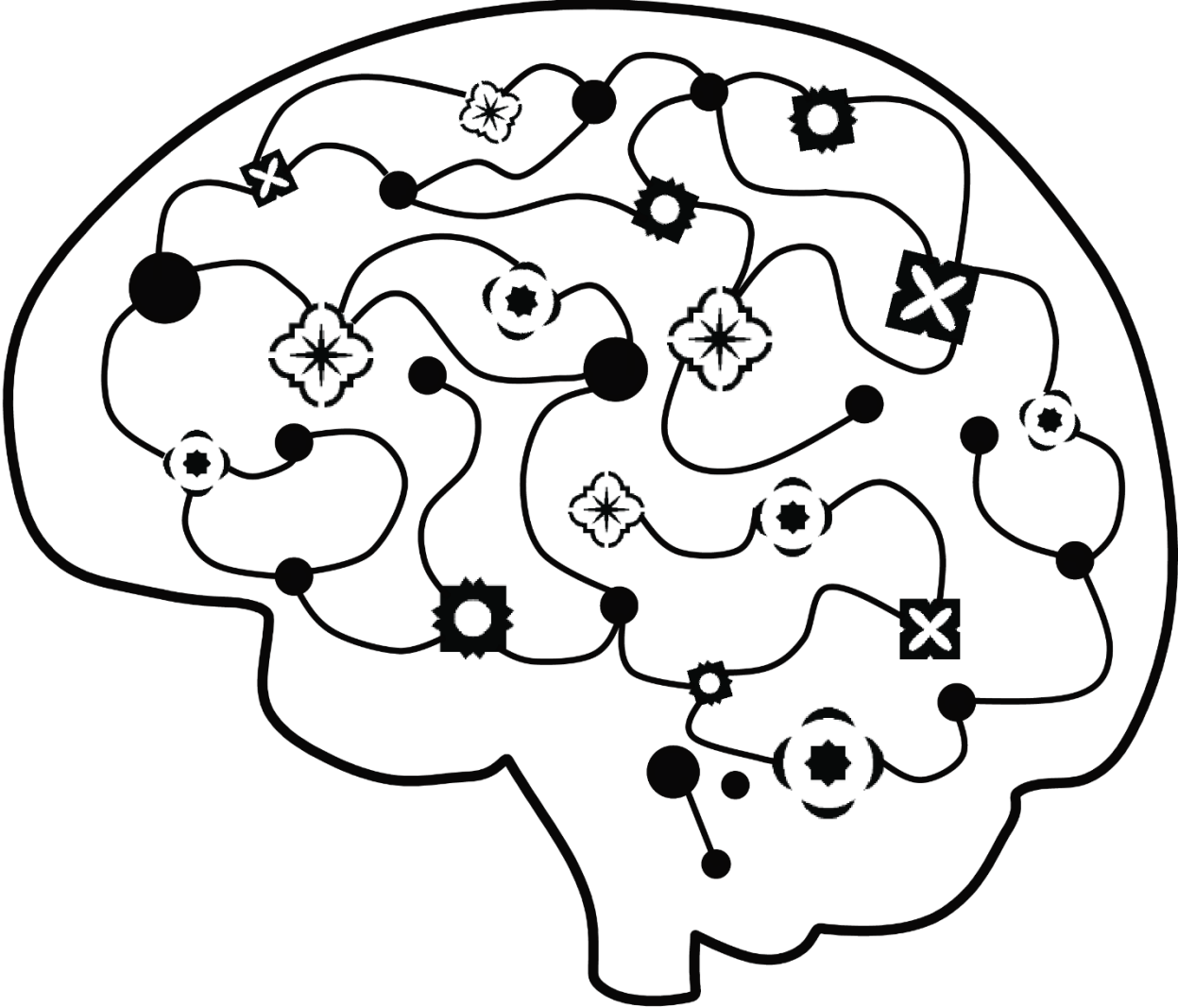
Dr. Richard Green, College of Business

Dr. Kathleen Voges, College of Business, Acting Dean

Dr. Juan Jasso, College of Education and Human Development

Dr. Edwin Blanton, Executive Director of the Mays Center for Experiential Learning

Appendix C: Logo



CONNECT THE DOTS

Appendix D: QEP Topic Suggestion Form



QEP Topic Suggestions Student Affairs Staff Meeting May 5, 2017

A&M-San Antonio’s Quality Enhancement Plan will become part of our SACSCOC reaffirmation documents in 2019. The QEP must be:

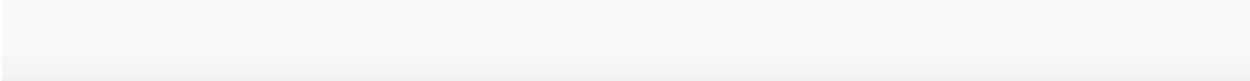
- Derived from an institutional process for identifying key issues emerging from institutional assessment, and
- Focused on student learning outcomes and accomplishing A&M-SA’s mission.

A&M-SA must also demonstrate the institutional capability for the initiation, implementation, and completion of the QEP, including clearly identifying the goals of the QEP and having a plan to assess the achievement of these goals.

With these standards in mind, what do you see as potential topics for A&M-San Antonio’s QEP?

Would you like me to come speak to your department or program? If so, please provide your contact information below or contact me at ext. 1204 or hverhass@tamusa.edu.

QEP Topics may also be submitted electronically: <http://bit.ly/AMSAQEP>



Appendix E: Quantitative Literacy Director Job Description

Job Title: Director, Quantitative Literacy Center

Agency: Texas A&M University - San Antonio

Department: Office of the Provost

Proposed Minimum Salary: \$6,000 monthly

Job Location: San Antonio, Texas

Job Type: Staff

Job Description

Summary:

As part of its QEP, A&M-SA seeks a director for the new Quantitative Literacy Center. The director, who will report to the provost, will provide leadership in the creation of the Quantitative Literacy Center. This position provides leadership and direction to faculty, staff, and students to develop programs that establish QL as an essential component of the student experience at A&M-SA. This position also manages the documentation and reporting requirements necessary to demonstrate compliance with the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) standards related to the QEP. This is a full-time, 12-month exempt professional staff position with opportunity for teaching.

This position typically works Monday-Friday; 8 a.m.-5 p.m. May work beyond normal office hours to include evening, weekends, and peak times.

Responsibilities:

- Lead the development of co-curricular programming that addresses acquisition of QL and promotes the application of QL across disciplines
- Facilitate efforts across campus to enhance support for students with identifiable skill gaps in QL, including minority, low-income, first-generation, and non-traditional college students
- Develop and present workshops for faculty on evidence-based, pedagogical approaches to teaching, incorporating, and/or reinforcing QL
- Support faculty to develop, test, and implement new approaches to QL in their courses, which may include the selection of effective materials, technology, or software
- Work with Institutional Research to assess student learning outcomes related to QL and use these data to support improvements in QL
- May lead or participate in committees related to QL
- Collaborates with faculty and staff to implement programs that support the development of students' QL, such as supplemental instruction, tutoring, or corequisite models of instruction
- Partner with institutional stakeholders to develop policies, procedures, facilities, and other resources necessary to achieve the goals of QEP
- Promote QL objectives to on-campus and off-campus constituents.
- May be responsible for hiring, training, and evaluating student, part-time or full-time employees
- Performs other duties as assigned

Education:

Master's degree in mathematics or statistics or a relevant discipline from a regionally accredited institution.

Experience:

- Progressively responsible experience that demonstrates an ability to develop and lead a program that enhances quantitative literacy, quantitative reasoning, or quantitative analysis
- Experience conducting training for faculty, staff, and tutors
- Experience working with underserved and non-traditional student groups, as demonstrated through academic credentials, research, or scholarly engagement.
- Ability to collaborate with faculty and staff and to interact effectively with students
- Two years of experience teaching college-level courses in math, computer science, philosophy, accounting, or related fields
- Knowledge of academic assessment, accreditation, and academic support-program development

Appendix F: Rubric for evaluating courses & co-curricular programs for QL designation

QUANTITATIVE LITERACY is the ability to interpret, represent, and apply numerical information and models in personal, academic, and professional contexts.

1. Does the course or co-curricular program contain problems or cases that require quantitative reasoning to solve?
2. Do course or co-curricular program learning objectives contain specific reference to quantitative thinking and application?
3. Is specific instruction provided in inferring the validity of stated and/or unstated quantitative assumptions?
4. Does the course explicitly require that students develop and test mathematical models for issues in the course?
5. Does the course specifically contain instruction in the use of mathematical modeling tools (Excel, SPSS, etc.) to assess issues of the course material?

QL STANDARDS	EXAMPLE OF STANDARD IN APPLICATION
INTERPRETATION OF QUANTITATIVE INFORMATION <i>Course or co-curricular program provides students an opportunity to demonstrate the ability to interpret data</i>	Assignment requires students to answer questions about a numerical set of data, e.g. identify relationship between two data points
VISUALIZATION OF QUANTITATIVE INFORMATION <i>Course or co-curricular program provides students an opportunity to demonstrate the ability to represent numerical data in a visual form</i>	Assignment requires students to represent data in a chart, table, or equation using appropriate units, scales, and symbols
IMPLICATIONS OF QUANTITATIVE INFORMATION <i>Course or co-curricular program provides students an opportunity to extend application of data to broader contexts</i>	Assignment requires students to identify and explain predictions, future directions, ramifications, or broader impacts of a given set of quantitative information
EVALUATION OF QUANTITATIVE INFORMATION <i>Course or co-curricular program provides students an opportunity to evaluate the accuracy of conclusions derived from quantitative data</i>	Assignment requires students to provide a detailed explanation that evaluates conclusions drawn from a given set of quantitative information and justifies the accuracy of the conclusion

Sources of evidence:

- syllabi
- learning outcomes for course, assignment, or co-curricular program
- textbook contents and learning objectives
- knowledge of the content of the discipline, e.g. specific mathematic classes, accounting, biology, chemistry, engineering, finance, etc.
- activity content for co-curricular program

Appendix G: Student Learning Outcomes Map

GOAL: Develop curriculum and co-curricular activities to ensure QL competency of A&M-San Antonio grads.					
Student Learning Outcome	Examples of Outcome Achievement	Experiences Provided for Learning	When Will Assessment Occur?	Assesment Methods	Goal Outcome
Student demonstrates the ability to interpret quantitative information presented in mathematical forms (e.g. graphs, tables, and diagrams) to analyze a real-world problem.	<p>Student accurately interprets trend data shown in a graph.</p> <p>Student accurately describes the relationship between data displayed in a graph or table.</p> <p>Student accurately describes the differences in returns on savings and investments.</p>	<p>All QL-designated courses.</p> <p>Academic Learning Center will provide at least one workshop per semester on interpreting graphs, tables, and diagrams.</p> <p>Financial literacy workshops provided by the University Library, Scholarships & Financial Aid, and Division of Student Affairs offered each semester.</p>	<p>At least once per semester in all QL-designated courses.</p> <p>At the conclusion of financial literacy workshops.</p>	<p>All QL-designated courses will submit student assignments that assess students' ability to interpret information presented in mathematical forms to OL Director for evaluation against QL rubric.</p> <p>Questionnaire completed at the conclusion of financial literacy workshops will assess student outcome achievement.</p>	<p>At least 60% of student assignments submitted from QL-designated courses will successfully demonstrate the ability to interpret information presented in mathematical forms as evaluated against QL rubric.</p> <p>At least 60% of students will accurately describe the differences in returns on savings and investments in the financial literacy workshop questionnaire.</p>
Student demonstrates the ability to represent quantitative information in various forms (e.g. graphs, tables, and diagrams) to pose argument in the context of a real-world problem.	<p>Student accurately represents numerical data in visual forms, such as graphs, tables, diagrams, and infographics, using appropriate units, scales, and symbols.</p> <p>Student accurately represents the relationship between numerical data in visual forms, such as graphs, tables, diagrams, and infographics.</p>	<p>All QL-designated courses.</p> <p>Academic Learning Center will provide at least one workshop per semester on representing numerical information in visual forms, such as graphs, tables, and diagrams.</p>	<p>At least once per semester in all QL-designated courses.</p> <p>□</p>	<p>All QL-designated courses will submit student assignments that assess students' ability to interpret information presented in mathematical forms to OL Director for evaluation against QL rubric.</p>	<p>At least 60% of student assignments submitted from QL-designated courses will successfully demonstrate the ability to interpret information presented in mathematical forms as evaluated against QL rubric.</p>
Student demonstrates the ability to apply a model based on quantitative information to formulate a solution of a real-world problem.	<p>Student uses a valid model to describe and solve a real-world problem.</p> <p>Student develops a personal budget for use in salary negotiations.</p>	<p>All QL-designated courses.</p> <p>Financial literacy workshops provided by the University Library, Scholarships & Financial Aid, and Division of Student Affairs offered each semester.</p>	<p>At least once per semester in all QL-designated courses.</p> <p>Questionnaire at the conclusion of financial literacy workshops.</p>	<p>All QL-designated courses will submit student assignments that assess students' ability to interpret information presented in mathematical forms to OL Director for evaluation against QL rubric.</p> <p>Questionnaire completed at the conclusion of financial literacy workshops will assess student outcome achievement.</p>	<p>At least 60% of student assignments submitted from QL-designated courses will successfully demonstrate the ability to interpret information presented in mathematical forms as evaluated against QL rubric.</p> <p>At least 60% of students will develop a personal budget at the conclusion of the financial literacy workshop.</p>
Student values quantitative literacy as an essential component of the A&M-San Antonio experience.	<p>Student affirms the value of quantitative literacy as an essential component of their A&M-San Antonio experience.</p> <p>Student affirms the value of quantitative literacy as an element of responsible global citizenship.</p>	<p>All QL-designated courses.</p> <p>Co-curricular programs including financial literacy workshop offered each semester.</p>	<p>At time of graduation.</p>	<p>Graduating student survey will include a five-point Likert scale response to statements like, "Quantitative literacy was an essential part of my A&M-San Antonio experience" or "Quantitative literacy is an important element of responsible global citizenship."</p>	<p>At least 70% of students completing graduating student survey will respond "Agree" or "Strongly Agree" to statements assessing students' value of quantitative literacy.</p>