Overview of Quantitative Literacy Across the Curriculum

St. Edward's Mission and Strategic Plan 2015 seek to educate students for the opportunities and challenges of a 21st century world. Distinctive for their understanding of the world and encouraged to confront the critical issues of society, our graduates should be prepared, through training in critical thinking, to analyze problems, propose solutions, and make responsible decisions. Most critical issues of society and challenges of our world are or can be described via quantitative information; our students must therefore be quantitatively literate to fully understand our world and analyze its problems. Most solutions and responsible decisions must also be quantitatively justified; therefore, our students must also hone the critical thinking skills required to draw and communicate appropriate conclusions from quantitative arguments and analysis.

A Spring 2010 survey of faculty by GEAC revealed deficiency in the quantitative literacy (QL) of our students and thus a need for reinforcement within the general education (GE) curriculum. Although implicit expectation of QL exists in courses throughout the GE curriculum, such as CULF 2321, CULF 3331 and Capstone, explicit presentation and formal assessment of QL occurs primarily in mathematics and statistics courses. Given the difficulty for students to remain quantitatively literate after potentially only one such course and little flexibility to add additional courses or content to the GE requirements, we propose to enhance the QL of our students by explicitly identifying and uniformly assessing QL outcomes implicit in courses throughout the GE curriculum in order to increase students' comfort, confidence, and willingness to work with quantitative information that arise naturally in critical issues of society and an individual's private, civic, and work life. Thus, the QL outcomes reflect basic quantitative competencies implicit in any course that addresses the critical issues of society and challenges of a 21st century world: interpretation, representation, calculation, analysis/application, assumptions, and communication of quantitative information (see common rubric on next page).

Implementation Strategy for Courses throughout the GE Curriculum

1. Map existing course content and assignments to specific QL outcomes on the attached rubric. If necessary or desired by instructor, modify or supplement content or assignments to make these mappings stronger, clearer, or more explicit or to refresh students' relevant quantitative skills. Note that not every outcome needs to be met in every course nor by every assignment within a course; our goal is to work with existing content and assignments and to modify or supplement only when necessary or desired by instructor.
2. Incorporate the common rubric that follows into the grading of assignments that have been mapped to one or more QL outcomes, e.g., students' composite achievement level for all QL outcomes mapped to the assignment could count for three points of the students' grade for the assignment. Students should be aware of this as our goal is to raise awareness and importance of QL in any context or course. Again, if necessary or desired by instructor, modify or supplement assignments to make incorporation of this rubric in grading easier, clearer, or more explicit or to refresh students' relevant quantitative skills.
3. At the beginning of the course administer a survey to measure students' self-assessed levels of comfort, confidence, and willingness to work with quantitative information in any context.
4. Throughout the semester record the class's average achievement level for each QL outcome on assignments that have been mapped to one or more outcomes.
5. At the end of the course administer a survey to measure students' self-assessed levels of comfort, confidence, and willingness to work with quantitative information in any context.

Our goals are for students' achievement levels for each QL outcome and their self-assessed levels of comfort, confidence, and willingness to work with quantitative information to increase over the course of the semester and as students proceed through the GE curriculum (the same survey and rubric will be used in every course in the GE curriculum to ensure that these comparisons are consistent).

Composed 6/3/12 by Jason Callahan

Common Rubric to Assess Students' Achievement Level of QL Outcomes

QL Outcome	3	2	1	0
Interpretation *Understand and explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, and words).*	Correctly identifies all relevant information.	Correctly identifies some, but not all, relevant information.	Some relevant information is identified, but none is correct.	No relevant information identified.
Representation *Convert relevant information from one mathematical form to another (e.g., equations, graphs, diagrams, tables, and words).*	All relevant conversions are present and correct.	Some correct and relevant conversions are present, but some conversions are incorrect or not present.	Some information is converted, but it is irrelevant or incorrect.	No conversion is attempted.
Calculation *Understand and perform mathematical calculations and operations.*	Calculations related to the problem are correct and lead to a successful completion of the problem.	Calculations related to the problem are attempted but either contain errors or are not complete enough to solve the problem.	Calculations related to the problem are attempted but contain errors and are not complete enough to solve the problem.	Calculations given are not related to the problem, or no work is present.
Application/Analysis *Make decisions and draw appropriate conclusions based on analysis of quantitative information (e.g., equations, graphs, diagrams, tables, and words).*	Uses correct and complete quantitative analysis to make relevant and correct conclusions.	Quantitative analysis is given to support a relevant conclusion, but it is either only partially correct or partially complete (e.g., there are logical errors or unsubstantiated claims).	An incorrect quantitative analysis is given to support a conclusion.	Either no reasonable conclusion is made or, if present, is not based on quantitative analysis.
Assumptions *Make and evaluate explicit and implicit assumptions in numerical estimation, mathematical modeling, and data analysis.*	All assumptions needed are present and justified when necessary.	At least one correct and relevant assumption is given (perhaps coupled with erroneous assumptions), yet some important assumptions are not present.	Attempts to describe assumptions, but none of the assumptions described are relevant.	No assumptions present.
Communication *Communicate quantitative evidence to support an argument or decision (i.e., what evidence is used and how it is formatted, presented, and contextualized).*	A correct and complete explanation is clearly presented.	A partially correct relevant explanation is present, but incomplete or poorly presented.	A relevant explanation is present, but is illogical, incorrect, illegible, or incoherent.	No relevant explanation is provided.

(adapted from AAC&U and Boersma et al, 2011)