QUANTITATIVE LITERACY VALUE RUBRIC

Based upon the AAC&U Quantitative Literacy VALUE Rubric: http://www.aacu.org/value/rubrics/quantitative-literacy

About the VALUE Rubrics

The AAC&U VALUE rubrics were developed by teams of faculty experts representing colleges and universities across the United States through a process that examined many existing campus rubrics and related documents for each learning outcome and incorporated additional feedback from faculty. The rubrics articulate fundamental criteria for each learning outcome, with performance descriptors demonstrating progressively more sophisticated levels of attainment. The rubrics are intended for institutional-level use in evaluating and discussing student learning, not for grading. The utility of the VALUE rubrics is to position learning at all undergraduate levels within a basic framework of expectations such that the evidence of learning can be shared nationally through a common dialog and understanding of student success.

In developing an assessment plan for the Core, the THECB strongly encouraged institutions to use "externally informed benchmarks"[1] in the assessment of the Core. As such, UHD has committed to using the VALUE rubrics as part of its assessment plan for the Core.

Definition

The THECB defines empirical and quantitative reasoning as manipulating and analyzing numerical data or observable facts resulting in informed conclusions. AAC&U has a slightly expanded definition of Quantitative Literacy – also known as Numeracy or Quantitative Reasoning (QR) – as a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and clearly communicate those arguments in various formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

Quantitative Literacy Across the Disciplines

Current trends in general education reform demonstrate that faculty recognize the steadily growing importance of Quantitative Literacy (QL) in an increasingly quantitative and data-dense world. AAC&U's recent survey showed that concerns about QL skills are shared by employers, who recognize that many of today's students will need a wide range of high-level quantitative skills to complete their work responsibilities. Virtually all of today's students, regardless of career choice, will need basic QL skills, such as the ability to draw information from charts, graphs, and geometric figures and accurately complete straightforward estimations and calculations.

Preliminary efforts to find student work products that demonstrate QL skills proved challenging in this rubric creation process. It's possible to find pages of mathematical problems, but what those problem sets don't reveal is whether the student was able to think about and understand the meaning of their work. It's possible to find research papers that include quantitative information. Still, those papers often don't provide evidence that allows the evaluator to see how much of the thinking was done by the original source (often carefully cited in the paper) and how much was done by the student themself, or whether conclusions drawn from analysis of the source material are even accurate.

Given widespread agreement about the importance of QL, it becomes incumbent on faculty to develop new kinds of assignments that give students substantive, contextualized experiences using skills such as analyzing quantitative information, representing quantitative information in appropriate forms, completing calculations to answer meaningful questions, making judgments based on quantitative data, and communicating the results of that work for various purposes and audiences. As students gain experience with those skills, faculty must develop assignments that require students to create work products that reveal their thought processes and demonstrate the range of their QL skills.

This rubric provides faculty with a definition for QL and a rubric describing four levels of QL achievement, which might be observed in work products within work samples or collections of work. Members of AAC&U's rubric development team for QL hope that these materials will aid in the assessment of QL – but, equally important, we hope that they will help institutions and individuals in the effort to embed QL more thoroughly across the curriculum of colleges and universities.

Framing Language

This rubric has been designed for the evaluation of work that addresses quantitative literacy (QL) substantively. QL is not just computation, not just the citing of someone else's data. QL is a habit of mind, a way of thinking about the world that relies on data and the mathematical analysis of data to make connections and draw conclusions. Teaching QL requires us to design assignments that address authentic, data-based problems. Such assignments may call for the traditional written paper, but we can imagine alternatives: a video of a PowerPoint presentation, perhaps, or a well-designed web page series. A successful demonstration of QL will place the mathematical work in the context of a full and robust discussion of the underlying issues addressed by the assignment.

Finally, QL skills can be applied to a wide array of problems of varying difficulty, confounding the use of this rubric. For example, the same student might demonstrate high levels of QL achievement when working on a simplistic problem and low levels of QL achievement when working on a complex problem. To accurately assess a student's QL achievement, it may be necessary to measure QL achievement within the context of problem complexity, much as is done in diving competitions where two scores are given, one for the difficulty of the dive and the other for the skill in accomplishing the dive. In this context, that would mean giving one score for the problem complexity and another for the QL achievement in solving the problem.

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[1] THECB Assessment of the Core Guidelines: http://www.thecb.state.tx.us/index.cfm?objectid=417252EA-B240-62F7-9F6A1A125C83BE08 (Retrieved 10/6/2014).

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Foundation Component Areas Where Empirical and Quantitative Reasoning is Taught: Life & Physical Sciences, Mathematics, and Social & Behavioral Sciences

	Mastery (Senior Level) *Point-value: 4*	*Proficient (Junior Level)* *Point-value: 3*	*Developing (Sophomore Level)* *Point-value: 2*	*Basic (Freshman Level)* *Point-value: 1*	*Skill is evident, but performance falls below Freshman Level*[2] *Point-value: 0*	*No Evidence: Assignment may not elicit skill, or student failed to articulate.*
Interpretation *Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).*	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. *For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.*	Provides accurate explanations of information presented in mathematical forms. *For instance, accurately explains thetrend data shown in a graph.*	Provides somewhat accurate explanations of information presented in mathematical forms but occasionally makes minor errors related to computations or units. *For instance, accurately explains trend data shown in a graph but may miscalculate the slope of the trend line.*	Attempts to explain information presented in mathematical forms but draws incorrect conclusions about what the information means. *For example, attempts to explain the trend data shown in a graph but frequently misinterprets the nature of that trend, perhaps by confusing positive and negative trends.*		
Representation *Ability to convert relevant informationinto various mathematical forms (e.g., equations, graphs, diagrams, tables, words).*	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes information conversion, but the resulting mathematical portrayal is only partially appropriate or accurate.	Completes information conversion, but the resulting mathematical portrayal is inappropriate or inaccurate.		
Manipulation *Ability to identify the proper calculations needed, organize appropriate data, and perform needed calculations accurately to solve a problem and communicate logical conclusions.*	Calculations identified and attempted are sufficiently comprehensive and successfully solve the problem. Additionally, calculations are presented elegantly (clearly, concisely, etc.) to communicate logical conclusions.	Calculations attempted are sufficiently comprehensive and successfully solve the problem.	Able to identify and carry out appropriate calculations.	Calculations are attempted but are both unsuccessful and are not comprehensive.		
Analysis *Ability to make judgments and draw appropriate conclusions based on the analysis of observable facts while recognizing the limits of this analysis.*	Uses the analysis of observable facts as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from work.	Uses the analysis of observable facts as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from work.	Uses the analysis of observable facts as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from work.	Able to duplicate methods based onprevious similar examples.		
Assumptions *Ability to make and evaluate important assumptions in estimation, modeling, and data analysis.*	Explicitly describes assumptions (regarding problem input and/or results) and provides written justification for why each assumption is appropriate. Considers final conclusions as limited by the accuracy of the assumptions.	Explicitly describes assumptions (regarding problem input and/or results) and provides written justification for why the assumptions are appropriate.	Somewhat accurately describes assumptions (regarding problem input and/or results).	Attempts to describe assumptions (regarding problem input and/or results) but incorrectly interprets them.		
Communication *Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)*	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and can identify additional pertinent information needed to extend the results.	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.	Uses quantitative information but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent but does not provide adequate explicit numerical support. (May use quasi-quantitative wordssuch as "many," "few," "increasing," "small," and the like in place of actual quantities.)		

[2] *Needs to be edited: Evaluators are encouraged to assign a zero to any work sample that does not meet Basic (Freshman Level) performance. Evaluators are encouraged to check the "No Evidence" if the rubric dimension is not evident in the work.*

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