QUANTITATIVE REASONING COMPETENCY ASSESSMENT PLAN[1]

UNIVERSITY OF VIRGINIA

JUNE 15, 2007

Definition:

Quantitative reasoning is correctly using numbers and symbols, studying measurement, properties, and the relationships of quantities, or formally reasoning within abstract systems of thought to make decisions, judgments, and predictions.

Goal:

The central purpose of the University of Virginia is to enrich the mind by stimulating and sustaining a spirit of free inquiry directed to understanding the nature of the universe and the role of humans in it. A specific, articulated goal associated with this purpose is "fostering in students the habits of mind and character required to develop…an ability to test hypotheses and re-interpret human experience." These habits of mind and character advance good citizenship in a democratic society, enrich the lives of individuals, and improve communities. The University expects graduating students to effectively use quantitative reasoning to evaluate information and argument, solve problems, and make decisions to these ends.

Student Learning Outcomes:

A graduating fourth-year undergraduate at the University of Virginia will be able to:

(1) Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them.
(2) Communicate mathematical information symbolically, visually, numerically, and verbally.
(3) Use arithmetical, algebraic, and geometric methods to solve problems.
(4) Estimate and check answers to mathematical problems in order to determine reasonableness.
(5) Solve word problems using quantitative techniques and interpret the results.
(6) Apply mathematical/statistical techniques and logical reasoning to produce predictions, identify optima, and make inferences based on a given set of data or quantitative information.
(7) Judge the soundness and accuracy of conclusions derived from quantitative information, recognizing that mathematical and statistical methods have limits and discriminating between association and causation.
(8) Solve multi-step problems.
(9) Apply statistics to evaluate claims and current literature.
(10) Demonstrate an understanding of the fundamental issues of statistical inference, including measurement and sampling.

[1] The development of the University of Virginia's quantitative reasoning competency assessment plan was coordinated by the Office of Institutional Assessment and Studies. A faculty committee composed of representatives of the undergraduate schools wrote the definition, goal, learning outcomes and standards.

Standards:

The following standards have been established for graduating fourth-years:

25% of undergraduates are expected to be highly competent;
75% competent or above;
90% minimally competent or above.

Standards for gain between first-years and fourth-years will be considered after this first administration of the assessment to both first and fourth years.

Description of Methodology Used to Gather Evidence:

Instrument
A faculty committee representing major disciplines and each undergraduate school are working to develop an "in-house" instrument to assess quantitative reasoning. The format will include a mix of multiple-choice questions and will be administered at scheduled one hour test sessions of 50 students each. The exam will be web-based and students will take the exam on their own laptop computers. Results will be reported and evaluated for the six undergraduate schools as well as aggregated for the University as a whole.

In addition, individual schools within the University are encouraged to add a small number of questions or measures that would allow them to assess quantitative reasoning abilities that are of particular importance to their students.

Sampling
Approximately 350 4th-year students will be sampled from five undergraduate schools at the University (Commerce, Engineering, Nursing, Architecture, and the College of Arts and Sciences) using a disproportionate stratified sampling method. Over-sampling in the smaller schools will allow the results to be analyzed by school. Because each undergraduate school is responsible for designing its own curriculum, this method will allow schools to make the best use of the results. Approximately 215 1st-year students also will be randomly sampled to add a value-added perspective. The first year cohort's results will be compared with the fourth years, and at a future point in time the cohort will be tested again to provide further perspective on value-added.. First-year students will not be over sampled by school. All school results for fourth-years will be aggregated to form an overall result for the University, but first-year results will be used exclusively as a point of comparison.

Confidentiality and Compensation
Only students who consent to participate voluntarily will be assessed. Confidentiality will be ensured. Students who consent to participate will be given a $25 gift certificate to the UVa bookstore to complete the test. As an incentive for students to do their best, the top scorers for each major within a school will be entered into a series of lotteries (one for each school), and the winners of these lotteries will win an additional $100 gift certificate.

Summary: *(Provide analysis of results)*

Results of the competency assessment will be reported to SCHEV in terms of percentage of students considered highly competent, competent, and minimally competent. Differences between performance of first-years and fourth-years will be analyzed using an independent t-test. The faculty committee will meet in the summer after the final report has been submitted to SCHEV. At that

time, the committee will conduct a detailed analysis of the findings and will write recommendations in a report submitted to the Provost and Deans for their consideration.