

# **Scientific Reasoning Competency Assessment Plan**

May 2002

**Institution: University of Virginia—College of Arts and Sciences, School of Architecture, School of Commerce, and School of Education**

## **Standards/Definition of Scientific Reasoning Competency**

The University of Virginia expects graduates of its College of Arts and Sciences, School of Architecture, School of Commerce, and School of Education to have and to understand basic knowledge and skills about scientific reasoning in order to use it effectively and productively for their own purposes. Specifically, the University expects these graduates to be able to use scientific reasoning to denote consistent, logical thought patterns which are employed during the process of scientific inquiry that enable individuals to propose relationships between observed phenomena in order to accomplish the following:

1. Design experiments which test hypotheses concerning the proposed relationships.
2. Determine possible alternatives and outcomes.
3. Consider probabilities of occurrences.
4. Predict logical consequences.
5. Weight evidence, or proof.
6. Use a number of instances to justify a particular conclusion.<sup>1</sup>

## **Description of Measure to be used**

The College of Arts and Sciences and the other schools listed do not require any specific course or courses in scientific reasoning. Rather, there are requirements in science and mathematics with students being able to choose the courses in which they wish to enroll. Our experience, based on statistics from the graduating undergraduate class of May 2001, is that almost all graduates of that class either have completed a course or courses in at least one of the science departments or have received credit for an advance placement course in one of these areas, or have transferred such credits from a previously attended college or university. In light of the nature of our curriculum, it is not possible to do course-embedded assessment of scientific reasoning. Instead, the University intends to administer the “Collegiate Assessment of Academic Proficiency” (CAAP) test in scientific reasoning to a random sample of fourth-year undergraduates enrolled in the Schools listed above to determine the extent to which students have mastered the skills described above. The American College Testing Service (ACT) has developed their CAAP tests for scientific reasoning to parallel the definition of scientific reasoning given

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<sup>1</sup> This definition of scientific reasoning has been adapted from, C. Stuessy, “Path Analysis: A Model for the Development of Scientific Reasoning in Adolescents,” Journal of Research in Science Teaching, 1984.

above. We believe, therefore, that the CAAP test will provide us a good reading on the extent to which undergraduates are achieving the goals listed. Moreover, results of this test will provide information on the competency levels of our students in comparison with students at other institutions using the same test. It is the University's intention to conduct an assessment of scientific reasoning of its students every three years beginning with the 2003-04 academic year. The University intends to evaluate the success of using the CAAP test for this purpose before making a decision on whether or not to continue using this test in future competency assessments.

### **Description of the Administration Process**

Administration of the CAAP scientific reasoning test to fourth-year students will take place at various times throughout the 2003-2004 academic session. The Office of Institutional Assessment and Studies will choose a random sample of not fewer than 5% of the fourth-year class. Students will be able to choose a convenient time and place for taking the test. We estimate that each assessment will require about one hour of each student's time. Staff of the Office of Institutional Assessment and Studies will administer the tests.

The Office of Institutional Assessment and Studies will assure that students are able to take the test anonymously. Students will be assigned a randomly selected ID number, not associated with their University ID number, for testing purposes. The ACT will grade the tests, and will report the scores to the University in an aggregate format. At no time will student names be associated with test scores, and no report of test results using student names will be made.

### **Preliminary proposal about how results of the competency assessments will be described in a way that will be meaningful to the various publics with a stake in the quality of Virginia higher education**

The University will describe the scientific reasoning assessment results as follows:

1. A description of the expectations for student competence in scientific reasoning.
2. A description of the assessment process.
3. A description of the aggregate results on the CAAP tests as provided to the University by the ACT including, if possible, results by School and comparative data with other institutions.

Submitted by: \_\_\_\_\_  
Vice President and Provost