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In Focus

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Office of
Institutional Assessment
D111 Mason Hall
MS 3D2
703-993-8834
assessment@gmu.edu
http://assessment.gmu.edu

Associate Provost for
Institutional Effectiveness
Karen M. Gentemann, Ph.D.
genteman@gmu.edu

Associate Director
Ying Zhou, Ph.D.
yzhou@gmu.edu

Assistant Director
Mary Zamon, M.A.T.
mzamon@gmu.edu

Applications Analyst
Rawa Abdalla, M.S.
rjassem1@gmu.edu

Program Support
Erin McSherry, B.A.
emcsherr@gmu.edu

Assessing Competence in Six Areas at Mason: A Summary of the First Cycle: 2002-2006

I. Introduction

Based on a request from the State Council of Higher Education for Virginia (SCHEV), George Mason began reporting in 2002, on a cyclical basis, the results of the assessment of six general education competencies: writing, information technology, quantitative reasoning, scientific reasoning, oral communication and critical thinking.

These assessments have been conducted using common organizing principles, including the following:

1. All competencies are defined by teams of faculty.
2. All assessments are course-embedded, i.e., they are part of a course requirement.
3. The primary purpose of assessment at Mason is to improve programs.

Close faculty involvement and support in the assessment process has ensured that results are utilized and curricular improvements made. By using a course-embedded approach, we increase the likelihood that students will give their best effort on the assignment and we avoid having to ask students to take a test outside of their regular classroom schedule. Most important, these assessments have already been used for curricular improvement.

Faculty from every college or school with undergraduate programs have been involved in these assessments. Their ongoing dedication and commitment to their students and to improving undergraduate education are inspiring. Please note the changes under each competency report below that have been implemented by these faculty as a result of the assessment process.

The results from each of the competency assessments are summarized here.

II. Writing Competence

Method

Writing competence is assessed in a discipline context with faculty from each department creating appropriate criteria, developing a rubric (a scoring guide), and assessing samples of student work taken from writing intensive courses. To date, the units listed in the table below have assessed student writing and submitted a report to the Writing Assessment Group, a committee comprised of representatives from each school. The first cycle of reviews should be complete by 2008-09.

College/Department	Date of Report	Number of Papers Assessed
College of Health and Human Services	June, 2002	153
School of Management	June, 2002	22
CHSS: Psychology	Spring 2002	32
CHSS: Public and International Affairs	Spring 2002	71

College/Department	Date of Report	Number of Papers Assessed
CVPA: Theater	Fall 2003	26
CVPA: Art & Visual Technology	Fall 2003	32
CHSS: English	Spring 2003	25
CHSS: Philosophy	Fall 2003	---
CHSS: Religious Studies	Spring 2003	5
CHSS: Communication	Fall 2003	34
VSITE: Computer Science	Fall 2005	24
CHSS: Economics	Spring 2005	20
CEHD/SRHT: Recreation, Health & Tourism	Spring 2006	27
VSITE: Electrical & Computer Engineering	Fall 2006	43

Major Findings

Taken as a whole, approximately 70 to 90% or more of student writing was judged satisfactory or better in this five year period. Weaknesses varied by discipline, although mechanics and grammar tended to appear more often than other criteria as potential problem areas.

Most Commonly Used Writing Assessment Criteria

- Purpose and audience
- Organization and coherence
- Critical thinking
- Grammar and mechanics
- Academic content
- Analysis
- Citation and documentation

Changes Made as a Result of the Assessment

There are several changes that are relatively common across units. Most units now share the writing rubrics with new faculty and with TA's, and most put their rubrics on their website or on course WebCT sites to ensure that students know the expectations for writing in that discipline. Several units have added a special training for TA's in using their rubric so that there is greater uniformity of standards across courses. Many planned to make greater use of the Writing Center.

Many units have developed workshops or instituted practices that they believe will help students to be better writers. For example, SOM has created several writing excellence awards to highlight the importance of good writing in the field. After the writing workshop and the assessment, SOM faculty came to an agreement about expectations for writing and reported that they are now able to spend more time on content in a higher level course and have reduced the assignments in that course that were previously intended to develop basic skills. Communication held several faculty workshops to develop shared and appropriate expectations for their majors. English faculty held focus groups with students to determine what practices were most helpful to them. Philosophy reported that having agreed-upon writing criteria helped their teaching because students now know explicitly what is expected for good writing in their discipline. Computer Science faculty are working with ENGL 302 faculty to clarify CS writing criteria and coordinate instruction to improve CS student skills.

III. Critical Thinking Competence

Method

A 10-member, multi-disciplinary faculty working group, assisted by the Office of Institutional Assessment, developed a definition of critical thinking, standards, and an instrument for measuring critical thinking competence. A plan to use a six criteria rubric for two student products, presentations and written essays, was carried out in 12 classes, including 6 disciplines and 110 students.

Trained administrative and teaching faculty teams of at least two raters observed student presentations in upper division General Education Synthesis courses required of every Mason student as the culminating course in general education. Additionally, presentations for the capstone course in the Bachelor of Individualized Studies, and student essays for the capstone seminar course in the College of Health and Human Services were rated using the same rubric.

Major Findings

Over 80% of the student ratings were competent or highly competent as measured by the rubric. However, "identification of problem/issue" and "conclusions/problem solution" were not scored as highly and warrant further examination. More than the small pilot test needs to be done to see how well the same rubric can be used for observation and rating of written student work. The working group met in spring 2007 to analyze results further, to review the rubric and to plan the next assessment. One revision already made is to expand levels of proficiency from three to four categories.

Critical Thinking Assessment Criteria

- Identification of important questions/problems/issues
- Identification of assumptions and consideration of alternative perspectives/solutions
- Selection of appropriate methods
- Analysis, interpretation and judgment about the relevance and quality of information
- Ability to draw conclusions and make judgments based on evidence gathered
- Integration of ideas into a coherent argument/solution/presentation, etc.
- Fresh ideas/engagement with the topic/idea
- Ability to communicate the results of critical thinking

Changes Made as a Result of the Assessment

The assessment of critical thinking has been administered just once to date. Nonetheless there are changes that individual faculty participating in the assessment have already made in their own courses. During the assessment processes, several professors reported using the rubric in assignment development and directions. Some of the faculty serving as raters expressed interest in using the rubric in their courses, and at least one has already done so. One program whose capstone course participated in the assessment has decided to look more carefully at assignment options in the capstone course in order to be sure all options are equally rigorous. Further, the Center for Teaching Excellence and the Office of Institutional Assessment co-sponsored a critical thinking workshop in February 2007 to engage faculty in developing appropriate critical thinking assignments and assessment. Significantly, the Provost has approved an initiative for Critical Thinking across the Curriculum which will further advance interest in this topic and should result in more substantial participation in the next critical thinking assessments.

IV. Oral Communication Competence

Method

Oral Communication competence is assessed in two Communication courses, COMM 100, Public Speaking and COMM 101, Interpersonal and Group Interaction. Students are required to take one or the other to satisfy university general education requirements. In fall 2005, 10 sections of COMM 100 and 9 sections of COMM 101 were randomly selected for assessment. A team of 7 faculty who taught basic communication courses volunteered to be the raters of student speeches. A rubric already in use in these classes was modified and all raters were trained together on this rubric to develop common standards for each item. The raters went into classes, not theirs, and rated a total of 152 presentations.

Oral Communication Assessment Criteria

- Analyze audience and adapt an oral presentation to audience
- Construct and deliver a well-organized, logical, and informative oral presentation that demonstrates analytical skills
- Use clear, concise, colorful, creative and culturally sensitive language in an oral presentation
- Use appropriate delivery techniques (e.g. maintain adequate eye contact, being vocally expressive, avoid distracting or nervous mannerisms, etc.) in an oral presentation.
- Use appropriate presentational technology to enhance messages and convey greater depths of information, knowledge and feeling in an oral presentation

Major Findings

A very high proportion of presentations were judged "competent," 95% of COMM 100 and 91% of COMM 101. Nonetheless, some student presentations were found to be less than competent in "using appropriate delivery techniques," one of five learning outcomes identified by the faculty. "Citing credible/appropriate source material" is a criterion within another outcome (constructing a well-organized presentation) that may need additional emphasis in class as well.

Changes Made as a Result of the Assessment

After a presentation of results to the Communication Department, faculty decided to revise the workbooks used in both classes and revise the rubrics to more explicitly state expectations for student competence. In spring 2007, the faculty will conduct another assessment of oral competence.

V. Quantitative Reasoning Competence

Method

Quantitative Reasoning competence is assessed in MATH 106, an entry level math course for students whose major does not require a high level of math skills beyond the requirement of general education. In fall and spring semesters, the course normally offers 10-12 sections with approximately 40 students enrolled in each section.

The assessment was embedded in final examinations in spring 2003, spring 2004 and spring 2006. After a new textbook was chosen for Math 106, original quantitative reasoning learning goals were re-defined to reflect what is taught in class and subsequently, a new assessment test with nine math problems was developed. Each math problem was associated with only one, or part of one, learning goal. In spring 2006, seven out of twelve sections of MATH 106 participated in the assessment with 260 students being tested.

Major Findings

The students who fail Math 106 are required to repeat the course. Thus, the following results are based on 237 students who participated in the assessment and who also got at least a D-grade from the course. Over 95% of the students achieved three learning goals: 1) identifying, classifying and counting objects as members of sets, and calculating and quantifying unions, intersections and complements of sets; 2) calculating/identifying measures of central tendency; and 3) computing probabilities in simple experiments. Between 85%-87% of students achieved the following two learning goals: computing probabilities in experiments involving conditional probability, and differentiating between conjunction and disjunction to determine the truth value of a statement.

Quantitative Reasoning Assessment Criteria (Revised in Spring 2006)

- Identify, classify and count objects as members of sets; calculate and quantify unions, intersections and complements of sets
- Calculate percentages in one- and multiple-step word problems
- Calculate and identify measures of central tendency and variability
- Compute probabilities in simple experiments and those involving conditional probability
- Use percentiles in word problems with normally distributed populations and draw accurate conclusions, when Z score/percentile conversion table is provided
- Differentiate between conjunction and disjunction to determine the truth value of a statement
- Identify the limitations of mathematical methods

Students' performance is relatively weak in the following areas:

- Calculating percentage of increase/decrease in one-step and multiple-step word problems
- Identifying/calculating variance and standard deviation when formulas or tables are provided
- Using percentiles in word problems relating to normally distributed populations and drawing accurate conclusions, when z-score/percentile conversion table is provided
- Identifying the limitations of mathematical methods

Changes Made as a Result of the Assessment

In the past, formative evaluation contributed to discussions among Math faculty about their choice of textbook, curricular development, and student learning outcomes. Faculty had conversations about the CORE requirements (knowledge and skills all students in MATH 106 should learn) and the alignment of these requirements with the quantitative reasoning goals. Due to changes in SCHEV requirements, the assessment of quantitative reasoning will be revised to include a pre-post test in 2007-08.

VI. Scientific Reasoning Competence

Method

Scientific reasoning assessment at George Mason is carried out by a committee of introductory science instructors and assessment professionals. The committee defines the scientific reasoning learning goals for non-science majors and develops assessment tests. Based on faculty feedback, the original learning goals are currently under revision and discussion.

In 2003, two scientific reasoning tests assessing five learning outcomes were developed based on two different articles in the *Science* section of *The Washington Post*. In spring 2004 and fall 2004, two assessments were conducted with more than 3000 students participating. The second assessment used a pre-post model, in which students enrolled in the following courses were give the test at the beginning and at the end of the semester: ASTR 111, BIOL 103, CHEM 101, 103, and GEOL 101.

Major Findings

In these assessments, students showed high achievement on two learning goals: 1) developing and testing a hypothesis, and 2) reading and interpreting data. On the ability to understand and value the role of science in personal and public decision-making, students who took one version of the test did better than those who took the other one. Relatively low percentages of students achieved the following two goals: 1) understanding ways of scientific reasoning (inductive, deductive, empirical and theoretical), and 2) evaluating primary and secondary scientific resources. These areas may need to be emphasized more in the curriculum. In the first assessment, overall, 36% of students were highly competent, 56% were competent and 9% had low competency.

Scientific Reasoning Assessment Criteria (Revised in Spring 2007)

- Understand the components of scientific reasoning, such as inductive and deductive reasoning, empirical and theoretical approaches
- Develop and test a hypothesis
- Read and interpret data
- Evaluate both primary and secondary scientific resources
- Understand both quantitative and qualitative methods
- Be aware of both the power of the scientific process and its limitations
- Demonstrate an awareness of communication as an integral part of scientific reasoning, both between and among scientists, and between scientists and the rest of society
- Understand and value the role of science in both personal and public/societal decision-making

Little difference was found between pre and post versions of the test. Nor were there significant differences based on the number of general education courses students had taken. There was some difference in scores based on discipline, but this finding was not conclusive.

Changes Made as a Result of the Assessment

Since 2005, the committee has been working on re-defining scientific reasoning competence and developing assessment tools to test it. One of the criticisms of the "science article" tests was that students with low reading competency might be at a disadvantage since the tests were based on comprehension of newspaper articles. A new *general* scientific reasoning test (less dependent on reading skills and unrelated to disciplinary specific knowledge) has been developed and will be piloted in selected science courses in spring 2007. Both the pilot results and the test are under review in spring 2007. A new value-added assessment will be conducted next year, with a pre-test carried out in several entry-level science courses in fall 2007 and a post-test in the second science courses in spring 2008, tracking the same cohort of students.

VII. Information Technology Competence

Method

The assessment of information technology competence is embedded in IT 103, an introductory course teaching fundamentals of computing. An assessment test was first piloted in summer 2001 and has been administered to all students who enroll in IT 103 in every semester since fall 2001. Every year, about 2300 students take the test in

computer labs. The test has four problem-based modules, assessing students' hands-on competency in four basic technology skills/applications: word processing, spreadsheets, presentations, and databases.

In January 2002, four faculty panels, comprised of individuals from various departments and schools, met to review the assessment results of fall 2001 and develop standards and expectations of student competency for each basic skill goal. These standards have been used since then.

Major Findings

Compared with fall 2001 and spring 2002, more students in fall 2005 have achieved the information technology competence defined by the faculty committees. In fall 2005, students demonstrated high competence levels in word processing, database and presentation. On average, 89% have achieved the competency goal, compared to 80% during fall 2001 and spring 2002.

IT Assessment Criteria

- Format and edit text using word processing
- Enter, format and edit spreadsheet data, understand differences between absolute and relative cell addresses, apply this understanding to formulas, and create charts from a spreadsheet
- Create, format and edit electronic presentations, use templates, incorporate graphs and charts, and apply transitions
- Create and edit database tables, understand differences between records and fields, sort and query records by selected criteria and generate basic reports

Modules	Standards (Acceptable Minimal Scores)	% of Students who Achieved Acceptable Scores (Fall 2005)	% of Students who Achieved Acceptable Scores (2001-2002)
Word Processing	80%	92%	83%
Spreadsheet	70%	84%	69%
Presentation	80%	90%	86%
Database	70%	91%	81%
Average	**75%**	**89%**	**80%**

Changes Made as a Result of the Assessment

Over the past five years, the assessment of information technology skills has been continuously improved. Faculty from IT&E developed a new workbook, *Fundamentals of Computing*, which better reflects the goals of the course. The testing software was also changed from SAM 2000 to CompAssess in 2005 – the latter being more user-friendly. Professors of IT 103 noticed an increase in student achievement level after the change of testing software, which, among other things, allows for alternative ways to solve problems. Over time, the pool of testing items has increased substantially, making for more robust tests. The assessment modules are an embedded part of the course and the process is carried out smoothly from semester to semester.

VIII. Conclusion

Students at George Mason have done well on the competency assessments reported here. Moreover, the strategies developed to conduct assessment in this first cycle provide a good foundation for the more extensive work needed to demonstrate that Mason programs produce graduates that are high functioning individuals who contribute to their communities and society. This first cycle has also identified areas that need improvement and one of the goals of the next assessment cycle will be to create plans to make that happen.

Faculty are strongly encouraged to participate in these processes and may take part in one of several ways. First, you can volunteer your class to participate in an appropriate assessment. Second, you can join one of the competency assessment committees that engage in the substantive development of each assessment, provide guidance for the implementation of the assessment, review the results and recommend improvements. Third, you can ask to have your name added to our mailing list to keep you informed about new developments in assessment, such as the upcoming new SCHEV guidelines for assessment.

For more information about each competency, including detailed lists of outcomes and results, please visit our website: http://assessment.gmu.edu/StudentLearningCompetencies/index.html.

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Associate Provost	Associate Director	Assistant Director	Applications Analyst	Program Support
Karen M. Gentemann, Ph.D.	Ying Zhou, Ph.D.	Mary Zamon, M.A.T.	Rawa Abdalla, M.S.	Erin McSherry, B.A.
genteman@gmu.edu	yzhou@gmu.edu	mzamon@gmu.edu	rjassem1@gmu.edu	emcsherr@gmu.edu
703-993-8836	703-993-8832	703-993-8616	703-993-8876	703-993-8834

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