# GENERAL EDUCATION ASSESSMENT COMMITTEE ANNUAL REPORT, 2009


Office of University Assessment and Testing
Jeremy Penn, Ph.D., Director
Chris Ray, Ph.D., Assistant Director
uat@okstate.edu
(405) 744-6687

Contributions to this report were made by Tom Gross and Lihua Xu, Graduate Research Associates

# Executive Summary

## Introduction

General education at Oklahoma State University (OSU) is intended to:
A. Construct a broad foundation for the student's specialized course of study,
B. Develop the student's ability to read, observe, and listen with comprehension,
C. Enhance the student's skills in communicating effectively,
D. Expand the student's capacity for critical analysis and problem solving,
E. Assist the student in understanding and respecting diversity in people, beliefs, and societies, and
F. Develop the student's ability to appreciate and function in the human and natural environment.

OSU has been involved in assessment of general education for more than ten years. Three approaches are used to evaluate the general education program: institutional portfolios, review of general education course database, and college-, department-, and program-level approaches. This report focuses on OSU's use of institutional portfolios to assess the general education program.

Institutional portfolios provide direct evidence of student achievement of the overall goals of general education. Institutional portfolios have been developed in five areas that represent the overall goals of the general education program:
1. Written communication (B and C)
2. Critical thinking (D)
3. Math problem solving (D)
4. Science problem solving (D)
5. Diversity (E and F)

Recognizing that these goals cannot be achieved only through completion of courses with general education designations, student artifacts are collected from courses across campus that reveal students' achievement in each institutional portfolio area. These student artifacts are then assessed by a panel of faculty members using rubrics created by faculty members at OSU. Each rubric has a different number of categories used in the scoring process. All rubrics use a 1 to 5 scale where a 1 is low and a 5 is high. In 2008-2009 four institutional portfolios were developed in the areas of written communication, critical thinking, science problem solving, and diversity.

## Written Communication Results

In 2008-2009, 146 student artifacts (25 from freshmen, 19 from sophomores, 39 from juniors, and 63 from seniors) were assessed by six faculty members working in two teams using the writing rubric developed by faculty members at OSU. Of the 146 artifacts, 2 (1.4%) were given an overall score of 1, 57 (39%) were given an overall score of 2, 64 (44%) were given an overall score of 3, 19 (13%) were given an overall score of 4, and 4 (2.7%) were given an overall score of 5.

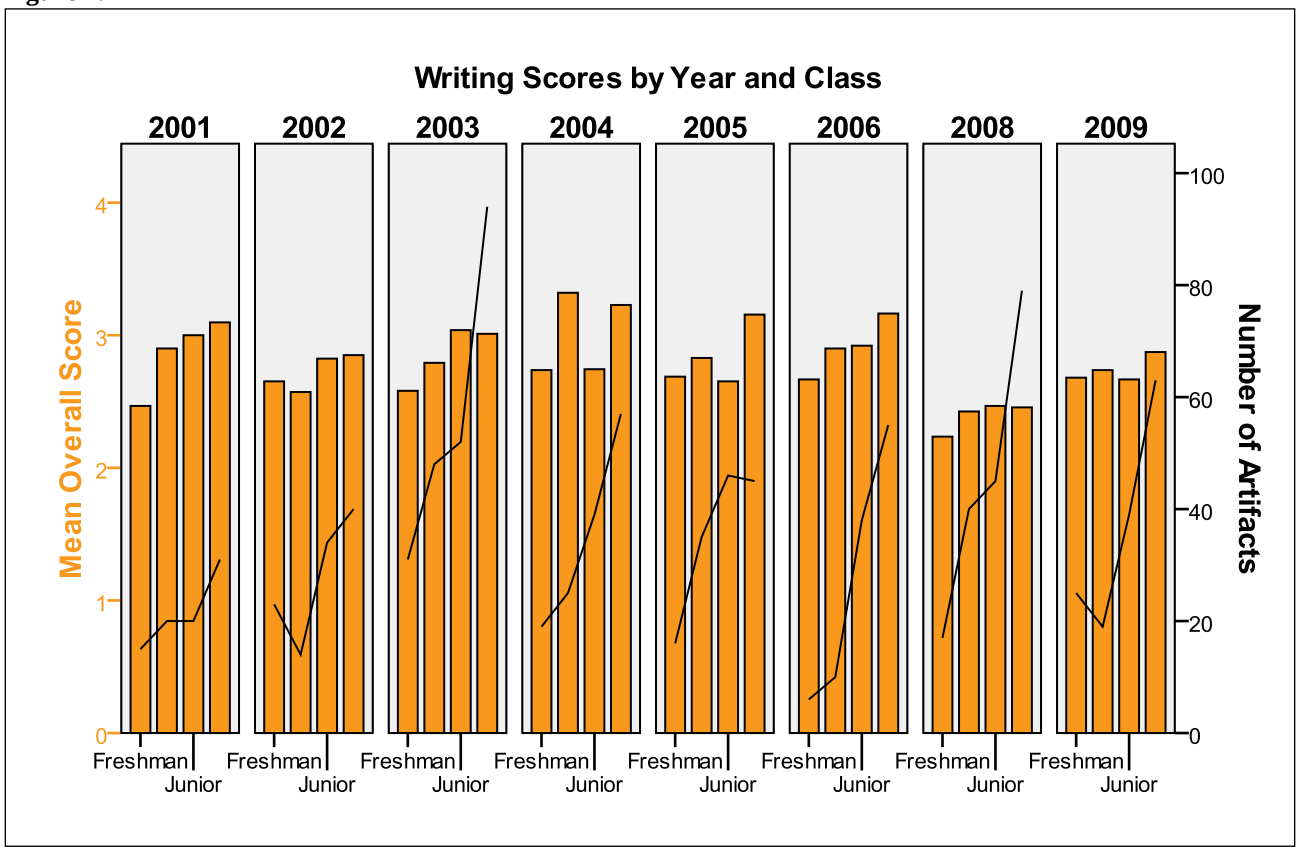
The average score was 2.77 (2.97 in content, 2.90 in organization, 2.80 in style / mechanics, and 2.72 in documentation). The average score for 2009 was significantly higher than the average score for 2008 ($p < 0.05$, effect size Hedge's $G = 0.40$) but was not significantly different from the average score in 2001, 2002, 2003, 2004, 2005, or 2006. The average in 2008 was significantly lower than the average in 2001, 2002, 2003, 2004, 2005, 2006, and 2009.

No significant differences were identified in writing scores by classification year or by transfer status in 2009. Analysis of combined scores for 2001-2006, 2008, and 2009 found seniors performed significantly better than freshmen for all admission types ($p < 0.001$, effect size Hedge's $G = 0.42$) and for regular

admits only ($p < 0.001$, effect size Hedge's $G = 0.50$), significantly better than sophomores for regular admits only ($p < 0.05$, effect size Hedge's $G = 0.27$), and significantly better than juniors for all admission types ($p < 0.05$, effect size Hedge's $G = 0.20$).

Students' ACT English subscore and OSU grade point average significantly predicted writing scores (adjusted $R^2 = .18$, $F_{(2,109)} = 12.77$, $p < 0.001$, $n = 112$)[1]. Cohen (1988)[2] proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

**Figure 1.**




[1] Students who did not have the appropriate ACT subscores were not included in the analysis.
[2] Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition). Hillsdale, NJ: Lawrence Erlbaum.

## Critical Thinking Results

In 2008-2009, 155 student artifacts (35 from freshmen, 14 from sophomores, 42 from juniors, and 64 from seniors) were assessed by six faculty members working in two teams using the critical thinking rubric developed by OSU faculty members. Of the 155 artifacts, 1 (0.6%) was given an overall score of 1, 35 (23%) were given an overall score of 2, 93 (60%) were given an overall score of 3, 24 (16%) were given an overall score of 4, and 2 (1.3%) were given an overall score of 5.

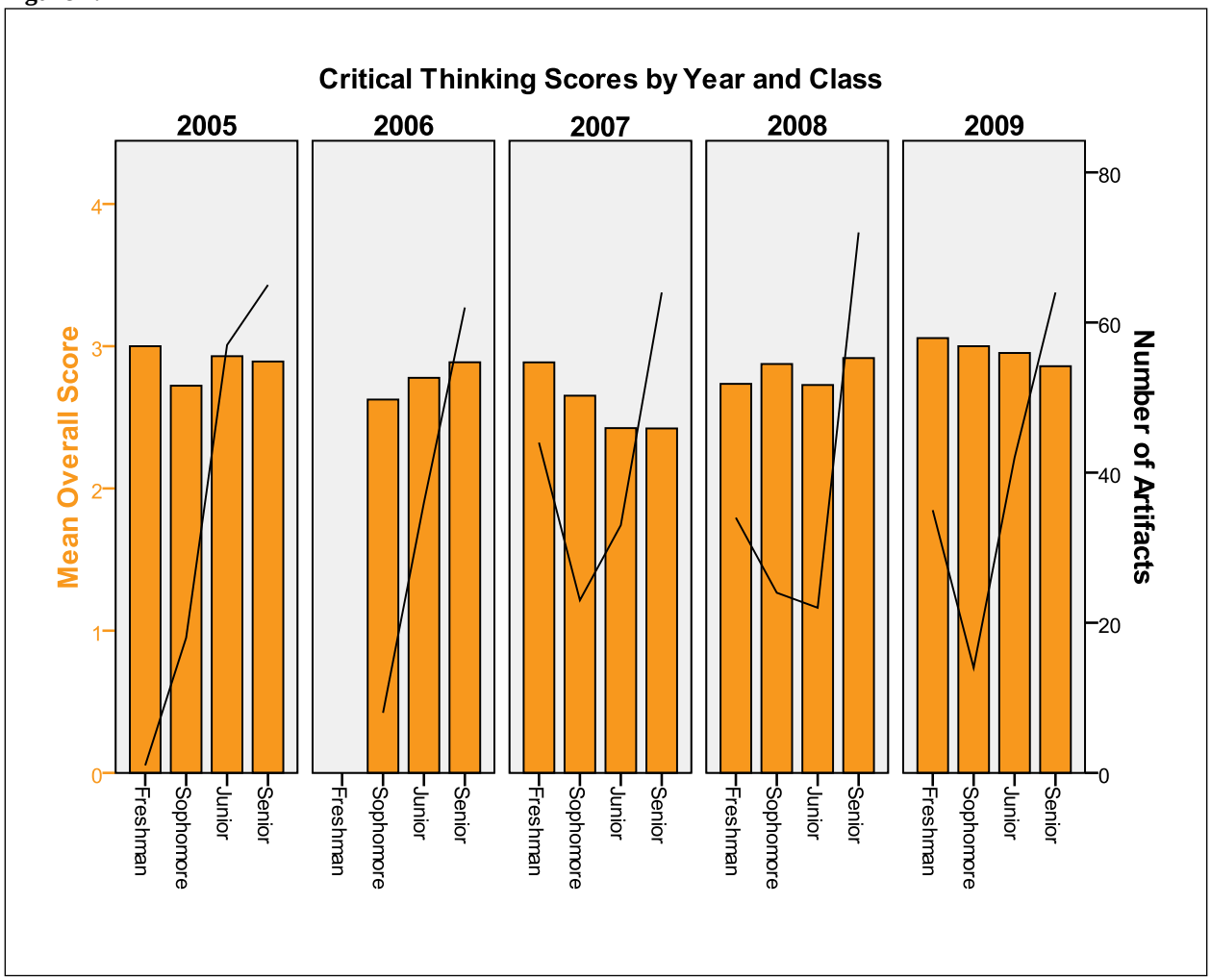
The average score was 2.94 (3.08 for problem, 3.08 for perspective, 2.97 for support, 2.87 for conclusion, 2.02 for assumptions ($n = 20$), and 2.51 for context ($n = 73$)[3]). The average for 2009 was significantly higher than the 2005-2008 combined average ($p < 0.01$). Follow-up tests found the 2009 results were significantly higher than the 2007 results (effect size Hedge's $G = 0.44$) but were not significantly different than results from 2005, 2006, or 2008. In addition, the 2007 results were found to be significantly lower than results from 2005, 2006, and 2008.

No significant differences were identified by classification year or transfer status in 2009. Analysis of combined scores for 2005, 2006, 2007, 2008, and 2009 found transfer students scored significantly lower than non-transfer students ($F_{(1, 318.97)} = 9.90$, $p = 0.002$, $n = 717$, effect size Hedge's $G = -0.23$).

Students' ACT English subscores significantly predicted critical thinking scores in 2009 (adjusted $R^2 = .11$, $F_{(1,123)} = 16.51$, $p < 0.001$, $n = 125$)[4]. Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

[3] Not all artifacts were assessed for assumptions and context as determined by the reviewers.
[4] Students who did not have the appropriate ACT subscores were not included in the analysis.

**Figure 2.**


Critical Thinking Scores by Year and Class
2005
2006
2007
2008
2009
Mean Overall Score
Number of Artifacts
0
1
2
3
4
0
20
40
60
80
Freshman
Sophomore
Junior
Senior

**Science Problem Solving Results**

In 2008-2009, 88 student artifacts (27 from freshmen, 17 from sophomores, 21 from juniors, and 23 from seniors) were assessed by three faculty members working in a team using the science problem solving rubric developed by OSU faculty members. Of the 88 artifacts, 9 (10%) were given an overall score of 1, 33 (38%) were given an overall score of 2, 33 (38%) were given an overall score of 3, 11 (13%) were given an overall score of 4, and 2 (2.3%) were given an overall score of 5.

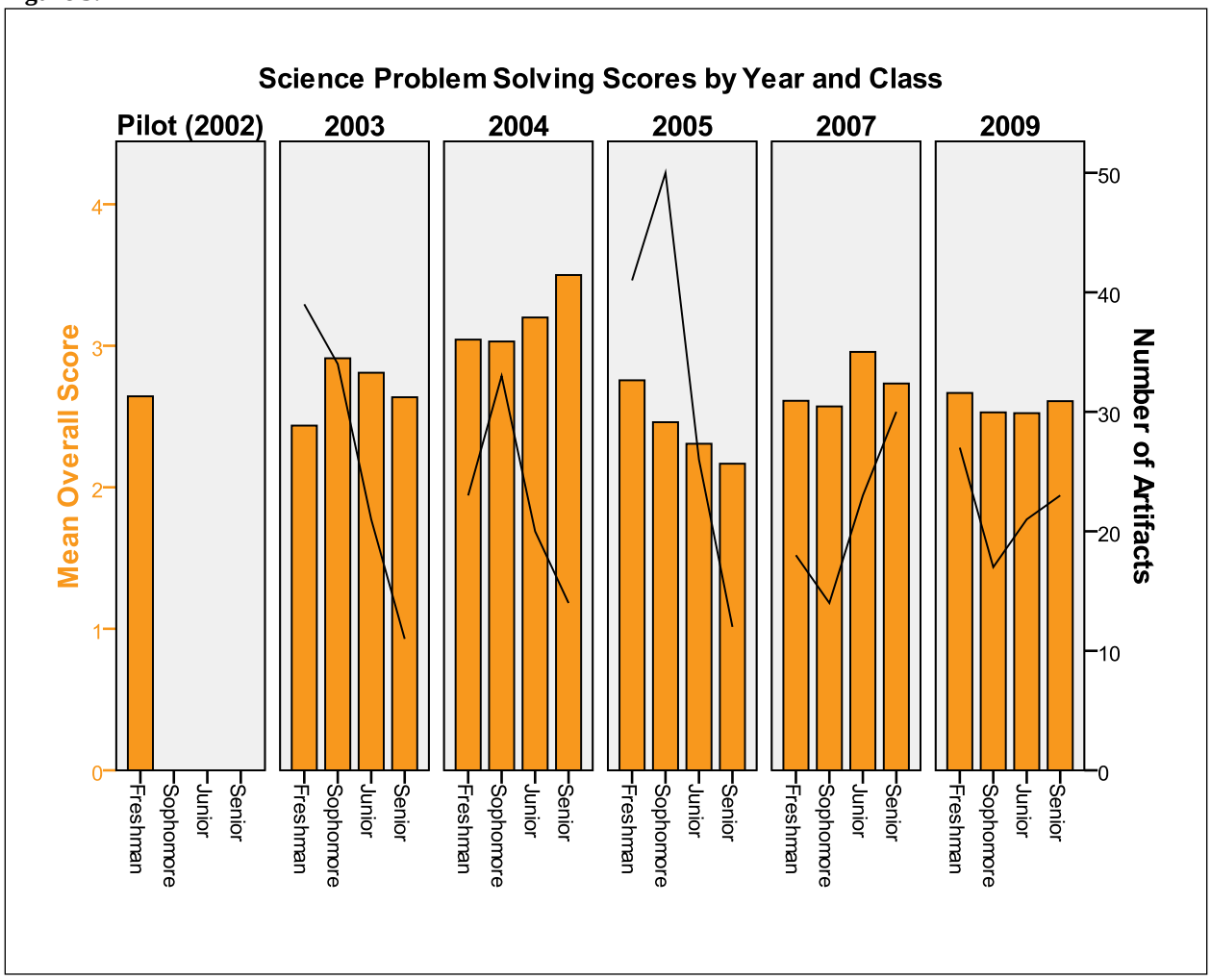
The average score was 2.59 (2.91 for problem, 2.90 for terms, 2.60 for presentation, 2.61 for interpretation, 2.63 for conclusion, and 2.63 for higher level). The average for 2009 was significantly lower than the average for 2004 ($p = 0.002$, effect size Hedge's $G = -0.68$) but was not significantly different from 2002 (a pilot year), 2003, 2005, 2007, or 2008. The average for 2004 was significantly higher than the average for 2003, 2005, 2007, and 2009.

No significant differences were identified by classification year or transfer status in 2009. Analysis of combined scores for 2003, 2004, 2005, 2007, 2008, and 2009 did not find any significant differences by classification year or transfer status.

Students' composite ACT score and OSU grade point average significantly predicted science reasoning scores in 2009 (adjusted $R^2 = .15$, $F_{(2,73)} = 7.45$ $p < 0.01$, $n = 76$)[5]. Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

[5] Students who did not have the appropriate ACT subscores were not included in the analysis.

**Figure 3.**


Science Problem Solving Scores by Year and Class
Pilot (2002)
2003
2004
2005
2007
2009
Mean Overall Score
Number of Artifacts
0
1
2
3
4
10
20
30
40
50
Freshman
Sophomore
Junior
Senior

**Diversity Results**

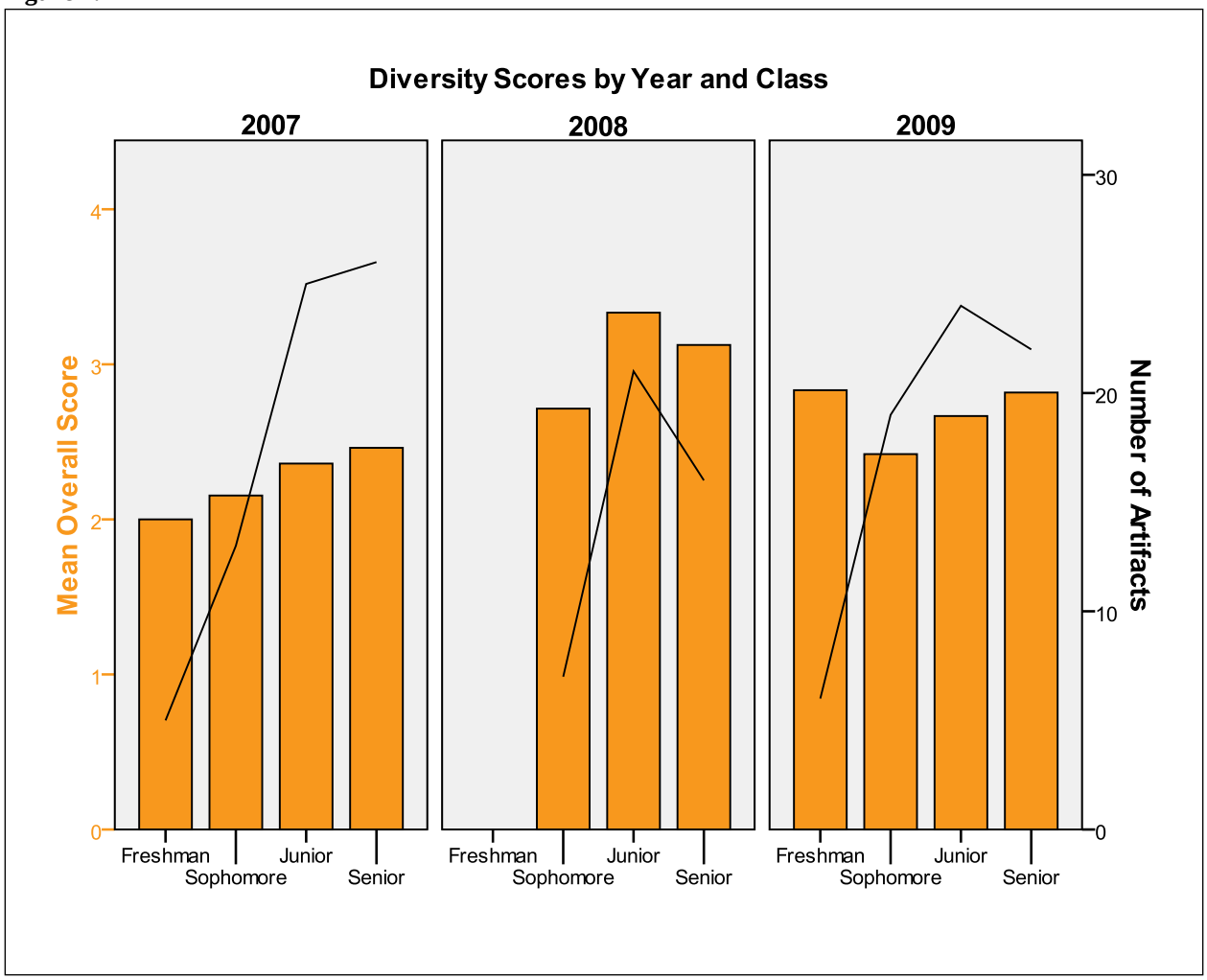
In 2008-2009, 71 student artifacts (6 from freshmen, 19 from sophomores, 24 from juniors, and 22 from seniors) were assessed by three faculty members working in a team using the diversity rubric developed by OSU faculty members. Of the 71 artifacts, 12 (17%) were given an overall score of 1, 17 (24%) were given an overall score of 2, 26 (37%) were given an overall score of 3, 15 (21%) were given an overall score of 4, and 1 (1.4%) was given an overall score of 5.

The average score was 2.66 (2.70 for conceptual understanding, 2.78 for values diversity, 2.51 for knowledge of historical context, and 2.69 for sources of understanding). The average for 2009 was significantly lower than the average for 2008 ($p = 0.02$, effect size Hedge's $G = -0.53$) but was not significantly different than the average for 2007. The average for 2008 was significantly higher than the average for 2007 ($p < 0.001$, effect size Hedge's $G = 0.89$).

No significant differences were identified by classification year or transfer status in 2009. Analysis of combined scores for 2007, 2008, and 2009 did not find any significant differences by classification year. Analysis of combined scores for 2007, 2008, and 2009 found non-transfer students scored significantly higher than transfer students, ($F_{(1, 181)} = 9.89$, $p = 0.002$, $n = 183$, effect size Hedge's $G = 0.49$).

Students' OSU grade point average significantly predicted diversity scores in 2009 (adjusted $R^2 = 0.15$, $F_{(1,69)} = 12.17$, $p < 0.01$, $n = 71$). Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

**Figure 4.**


Diversity Scores by Year and Class
2007
2008
2009
Mean Overall Score
Number of Artifacts
0
1
2
3
4
0
10
20
30
Freshman
Sophomore
Junior
Senior

**Use of Results**

Assessment data from the general education assessment process are used primarily in three ways:

- To implement improvement initiatives
- To monitor recent curricular changes
- To consider and discuss additional modifications to the general education program

*Implementation of Improvement Initiatives*. In response to data from the general education assessment process, in 2008-2009 the Provost's Office, the Office of University Assessment, the General Education Assessment Committee, and the Institute for Teaching and Learning Excellence collaborated to implement the *Provost's Faculty Development Initiative: Focus on General Education*. The purpose of this initiative is to develop faculty members' expertise in teaching and assessing the general education learning goal, in integrating the general education learning goal into existing courses, and in creating high quality assignments that demonstrate students' achievement of the general education goal. The initiative was very effective in 2008-2009 and was implemented again in 2009-2010 in the areas of writing, critical thinking, and diversity.

*Monitor Recent Curricular Changes*. In response to data from the general education assessment process the general education designation requirements were changed to increase the amount of required writing in courses receiving general education designations. Although the writing results were significantly higher in 2009 than they were in 2008, they were not significantly higher than the scores in 2001, 2002, 2003, 2004, 2005, or 2006. With the phase-in period for the new writing requirement now ending, it is important to continue to monitor changes in the writing scores to determine if additional curricular changes are needed.

*Consider Modifications to the General Education Program*. The joint meeting of the General Education Assessment Committee, the General Education Advisory Council, and the Assessment and Academic Improvement Council that will be held in the spring of 2010 will provide an opportunity to discuss these results in more detail and develop plans for improving student achievement. Some topics that may be discussed include:

- What can OSU do to systematically improve student achievement in these areas?
- Do we expect seniors to achieve higher scores than freshmen? How does OSU help students develop these abilities over time?
- Do students have limited opportunities to demonstrate their achievement of the general education learning goals during the freshman, sophomore, and junior years? There appears to be an over-representation of seniors in three of the four institutional portfolios (critical thinking: 46% from seniors, 28% from freshmen or sophomores; diversity: 35% from seniors, 27% from freshmen or sophomores; science reasoning: 18% from seniors, 61% from freshmen or sophomores; writing: 41% from seniors, 32% from freshmen or sophomores).
- Do we need to develop specific strategies to provide additional academic support to transfer students?
- Do the assignments given across campus motivate students to perform their best? What might we do to increase the number of high scoring artifacts?
- Is the institutional portfolio process giving us the information we need to improve the general education program? How might the process be improved?

**Future Plans**

The General Education Assessment Committee discussed future plans at their meeting in the fall of 2009. First, to decrease confusion with the General Education Advisory Council, the General Education Assessment Committee would like to change its name to the Committee for the Assessment of General Education (CAGE). This name change will be discussed with the relevant councils in the spring semester.

Second, due to the continuing success of the *Provost's Faculty Development Initiative: Focus on General Education,* the initiative will be continued in 2010-2011. The committee will continue to work on developing a level-2 workshop process at the college or department level to engage additional faculty members in the initiative.

Third, in response to recommendations, the committee is planning a change to the sampling process in 2009-2010. The Provost has written a letter reminding instructors of courses with general education designations about the expectations for the submission of artifacts for general education assessment upon request from the committee. This letter will be sent to all instructors for courses with general education designations at the start of the spring semester. The sampling process will be split between direct requests to randomly sampled courses with general education designations and courses sampled through the traditional process. A record will be kept of all direct request to ensure compliance with the requirement to submit student artifacts upon request.

Fourth, the committee is considering the use of nationally-developed rubrics as a replacement or supplement to current rubrics. The VALUE project, administered by the Association of American Colleges and Universities through a FIPSE grant, developed meta-rubrics from rubrics in use at institutions across the country (http://www.aacu.org/value/rubrics/index.cfm). VALUE project leaders are working on developing a sharing process where institutions can share data for comparison purposes using the common rubrics.

Fifth, the committee is considering discussing strategies for scoring the assignments and developing a process to include assignment difficulty as an element in the scoring process.

Finally, a small group of faculty members is being formed to more closely examine critical thinking results. This group, loosely affiliated with the Assessment and Academic Improvement Council, will examine students' achievement in the area of critical thinking and the opportunities OSU offers to students to help them increase their critical thinking skills to develop recommendations for improvement. This study group will begin meeting in the spring of 2010 and currently includes 6 faculty members from CEAT, SSB, CASNR, CAS, and representatives from UAT.

OSU has a strong commitment to student achievement of the general education goals. Assessment of the general education program is an important tool in understanding the strengths and weaknesses of OSU's general education program and in taking steps to improve the general education program.

Jeremy Penn, Ph.D.
Director, University Assessment and Testing
Oklahoma State University
jeremy.penn@okstate.edu
http://uat.okstate.edu
405-744-6687

# GENERAL EDUCATION ASSESSMENT COMMITTEE ANNUAL REPORT, 2009

## 2009 General Education Assessment Committee Membership

Jon Comer (Geography), Chair; John Gelder (Chemistry); Frances Griffin (Business Management); Deb Jordan (Leisure Studies); Ed Walkiewicz (English); Greg Wilber (Civil and Environmental Engineering); Chris Ray (ex officio, University Assessment and Testing).

## General Education Assessment Committee History

Assessment of OSU's general education program is required by the Higher Learning Commission of the North Central Association (HLC, OSU's accrediting body) and by the Oklahoma State Regents for Higher Education. The Assessment Council and Office of University Assessment and Testing formed a faculty General Education Assessment Task Force in May 2000 for the purpose of developing and implementing a new plan to assess the effectiveness of OSU's general education program. Although general education and "mid-level" assessment methods such as standardized tests and surveys had been conducted intermittently at OSU since 1993, no sustainable approach to evaluating the general education curriculum had been established. The task force formed in 2000 was the first group of OSU faculty members who were paid to work on this university-wide assessment project and marked a renewed commitment to general education assessment at OSU.

Following the assessment standard of articulating desired student outcomes first, the Task Force started in 2000 by revising OSU's *Criteria and Goals for General Education Courses* document and identifying "assessable" outcomes for the general education program. After studying general education assessment practices at other institutions, the task group developed the following guidelines for effective and sustainable general education assessment for OSU:

- the process must not be aimed at individual faculty members or departments,
- the process should be led by faculty members, and faculty participation should be voluntary,
- the process should use student work already produced in courses, and
- the process should assess all undergraduates, including transfer students, because general education outcomes describe qualities expected for all OSU graduates.

After summer-long study and discussion, the 2000 task group agreed to initiate two assessment methods to evaluate general education that were consistent with these guidelines: institutional portfolios and a course-content database. Institutional portfolios directly assess student achievement of the expected learning outcomes for the general education program, and the course database evaluates how each general education course contributes to student achievement of those articulated outcomes. These methods were implemented in 2001.

In 2003, the Assessment Council and General Education Advisory Council approved the task force's name change to the General Education Assessment Committee. The Committee is charged with continuing to develop and implement general education assessment and reports to the Assessment Council and General Education Advisory Council; membership in these committees is intentionally overlapped. Committee members serve rotating 3-year terms, are extensively involved in undergraduate teaching at OSU, represent a range of disciplines, and are paid summer stipends for their work on general education assessment.

*Institutional Portfolios.* The Committee has developed institutional portfolios to assess students' written communication skills (data collection in 2001, 2002, 2003, 2004, 2005, 2006, 2008, and 2009), math

problem solving skills (data collection in 2002, 2003 and 2005), science problem solving skills (data collection in 2003, 2004, 2005, 2007, and 2009), critical thinking (data collection in 2005, 2006, 2007, 2008, and 2009), and diversity (data collection in 2007, 2008, and 2009).

Separate portfolios are developed to evaluate each general education learner goal, and each portfolio includes students' work from course assignments collected across the undergraduate curriculum. Faculty members (including Committee members and additional faculty members involved in undergraduate teaching) work in groups to evaluate the work in each portfolio and assess student achievement relative to the learner goal that is being assessed by using standardized scoring rubrics. The results provide a measure of the extent to which students are achieving OSU's general education learning goals. The Committee plans to continue to develop institutional portfolios to assess the learner goals for general education as described in the *Criteria and Goals for General Education Courses* (http://osu.okstate.edu/acadaffr/aa/gened-CriteriaGoals.htm).

*General Education Course Database.* The General Education Course Database is a tool for evaluating how each general education course is aligned with the overall expected learning outcomes for the general education program as a whole. Instructors are asked to submit their course information online via a web-based form, and the General Education Advisory Council reviews the submitted information during regular course reviews. The database form requests information about what general education learning goals are associated with the course and how the course provides students with opportunities to achieve those learning goals. Instructors are also asked to describe how student achievement of those goals is assessed within the course. The database provides a useful tool for holistically evaluating general education course offerings and the extent to which the overall general education goals are targeted across the curriculum.

*College-, Department-, and Program-level Approaches.* Many colleges, departments, and programs include elements from the general education goals in their own assessment efforts. For example, a program may assess students' ability to write a research paper relevant to the discipline. This integrates elements from the general education program (e.g., written communication) with elements from the discipline and provides additional information on student achievement of this important goal. Colleges and departments may also incorporate elements of the general education goals into their ongoing assessment processes.

In addition to these three primary assessment tools, student surveys such as the National Survey of Student Engagement and OSU Survey of Alumni from Undergraduate Programs contribute to the general education assessment process and are considered in reviewing general education assessment results.

## Status of Committee Goals for 2008-09

The Committee met in Fall 2008 to determine committee membership for work to be completed in Summer 2009. The membership remained the same as the previous year, and Jon Comer continued to serve as chair for 2008-09.

A. The committee continued the institutional portfolio for evaluating students' critical thinking skills. Two portfolio-scoring groups, consisting of six faculty members (two Committee members and four additional faculty reviewers), evaluated the critical thinking portfolio. These groups of reviewers evaluated a total of 155 samples of student work demonstrating critical thinking skills.

B. The committee continued the institutional portfolio for evaluating students' written communication skills. Two portfolio-scoring groups, consisting of six faculty members (two

Committee members and four additional faculty reviewers), evaluated the written communication portfolio. This group of reviewers evaluated 146 samples of student work in this portfolio.

C. The committee continued the institutional portfolio for evaluating students' knowledge, skills and attitudes regarding diversity. One portfolio-scoring group, consisting of three faculty members (two Committee members and one additional faculty reviewer), evaluated the diversity portfolio. This group of reviewers evaluated 71 samples of student work in this portfolio.

D. The committee resumed the institutional portfolio for evaluating students' science reasoning skills. One portfolio-scoring groups, consisting of three faculty members (two Committee members and one additional faculty reviewer), evaluated the science reasoning portfolio. This group of reviewers evaluated 88 samples of student work in this portfolio.

E. A joint meeting of the General Education Assessment Committee, the Assessment Council and the General Education Advisory Council was held on March 6, 2009 to conduct a review of General Education Assessment. This purpose of this meeting was to review the assessment process, and results of assessments, and recommend action for improvement, if warranted. Minutes from the meeting are available on the UAT website (http://uat.okstate.edu/assessment/council/council_minutes/documents/2009JointMeetingMinutes.doc). Recommendations will be considered by the committee in 2009-10.

## Assessment of Critical Thinking Skills

### 2009 collection of critical thinking samples

The Office of University Assessment and Testing supervised the collection of student artifacts for the Critical Thinking Institutional Portfolio in Spring 2009. Instructors from the following undergraduate courses contributed random samples of student work to the portfolio:

| Course No. | Course Name | General Education Designation (if any) | Number of artifacts randomly collected from one assignment | Number of artifacts reviewed | Number of artifacts used in data analysis |
|---|---|---|---|---|---|
| ANSI 4863 | Capstone for Animal Agriculture | | 20 | 20 | 20 |
| ASTR 1024 | Stars, Galaxies and the Universe | N | 19 | 0 | 0 |
| BIOC 1990 | Freshman Research in Biochemistry | | 20 | 20 | 20 |
| CHE 2033 | Intro to Chemical Processes Engineering | | 20 | 0 | 0 |
| DHM 3023 | Computer-aided Flat Pattern Design | | 14 | 0 | 0 |
| ENGL 1113 | Composition I | | 18 | 0 | 0 |
| ENGR 1111 | Intro to Engineering | | 15 | 15 | 15 |
| ENGR 1111 | Intro to Engineering | | 19 | 9 | 9 |
| ENGR 1111 | Intro to Engineering | | 20 | 0 | 0 |
| GEOG 1113 | Intro to Cultural Geography | I, S | 20 | 0 | 0 |
| HDFS 3203 | Children's Play: A World Perspective | I | 21 | 0 | 0 |
| HHP 3613 | Community Health | | 21 | 0 | 0 |
| HHP 3643 | Health Behavior Theory | | 19 | 0 | 0 |
| HONR 3053 | Biology, Race and Gender | H, D | 20 | 18 | 18 |
| HRAD 3363 | Hotel Operations | | 17 | 0 | 0 |
| NREM 4990 | Ecology of Invasive Species | | 18 | 18 | 18 |
| NSCI 2114 | Principles of Human Nutrition | N | 19 | 0 | 0 |
| NSCI 3813 | Nutritional Assessment and Counseling Skills | | 15 | 15 | 15 |
| PHIL 3513 | Social Philosophy | H | 20 | 20 | 20 |
| PLNT 4613 | Forage and Grazinglands Resource Management | | 19 | 0 | 0 |
| SCFD 3223 | Role of the Teacher in American Schools | D | 17 | 0 | 0 |
| ZOOL 3104 | Invertebrate Zoology | | 20 | 20 | 20 |
| | **Total Number of Critical Thinking Artifacts (samples)** | | **411** | **155** | **155** |

*The number of artifacts reviewed in 2009 was less than the number collected. More artifacts were collected than could be evaluated by the reviewers, so those artifacts were selected that reviewers found to be best suited for the assessment (n=155).

Artifacts selected for the Institutional Portfolio were coded and all identifying information was removed from the samples. Demographic data were collected for each artifact using the OSU student database; these data were collected for analysis purposes only and the information cannot be used to identify an individual. The student demographic information associated with the samples was not shared with reviewers prior to the reviews.

### 2009 critical thinking portfolio reviews

Six faculty reviewers for the critical thinking skills institutional portfolio conducted this assessment in June and July 2009. Portfolio reviewers included Greg Wilber (Civil and Environmental Engineering), Jeff Hattey (Plant and Soil Sciences), John Gelder (Chemistry), Frances Griffin (Management), Doren

Recker (Philosophy), and Karen High (Chemical Engineering). Initially, the reviewers met for two training sessions where they received background information on the procedure and practiced scoring artifacts using the critical thinking rubric developed for this purpose in 2004 and revised in 2008. Then, reviewers independently evaluated a set of training artifacts using the critical thinking rubric. During these two initial sessions, reviewers discussed questions and concerns regarding the use of the rubric, discussed scores given to samples of student work, and developed a common approach for evaluating student critical thinking samples.

As with past groups of reviewers, by the end of the training sessions with all reviewers present, the reviewers were scoring fairly consistently with little variation among individual members. The scoring committee then divided into two sub-groups, which undertook to score 74 and 81 artifacts. Scoring was done individually, and each sub-group then met to reach consensus scores in cases where there was variation across individual scores for the same artifact. The final scores were then submitted to the office of University Assessment and Testing for initial interpretation.

## Critical thinking skills scores from each review group

| Review Group | Artifact Score | Number of Artifacts | Percent of Artifacts |
|---|---|---|---|
| #1 (74 artifacts scored) | 1 | 0 | 0% |
| | 2 | 20 | 27% |
| | 3 | 46 | 62% |
| | 4 | 7 | 9.5% |
| | 5 | 1 | 1.4% |
| #2 (81 artifacts scored) | 1 | 1 | 1.2% |
| | 2 | 15 | 19% |
| | 3 | 47 | 58% |
| | 4 | 17 | 21% |
| | 5 | 1 | 1.2% |

Reviewers scored each artifact from the 2009 portfolio independently and then met to develop a consensus overall score for each artifact. Each artifact received an overall, whole-number score from 1 to 5, as well as a sub-score for each rubric component that was determined to be appropriate for the assignment. All artifacts were scored on rubric components 1- 4; other components were only scored if the group agreed they were relevant for the assignment. Reviewers discussed sub-scores and came to agreement (within one point) on each component score.

## Learning Outcome: Graduates will be able to critically analyze and solve problems.

| | Characteristics<br><br>1 -4: Essential Characteristics | Level of Achievement | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2* | 3 | 4** | 5 |
| 1 | **Identification** and/or summary of the **problem/question** at issue. | No identification and/or summary of the problem. | | The main question is apparent or implied, but not clearly stated. | | The main question and subsidiary, embedded, or implicit aspects of a question are identified and clearly stated. |
| 2 | Presentation of the **STUDENT'S OWN perspective and position** as it is important to the analysis of the issue. | The student's own interpretation or position relative to the question is not provided. | | The student's own interpretation or position on the question is implied or unclearly stated. | | The student's own interpretation or position on the issue is clearly stated. |
| 3 | Use of **supporting data/evidence.** | No supporting data, logical argument or evidence is used. | | Evidence and logic are used, but source(s) of evidence are not evaluated for accuracy, precision, relevance, and completeness.<br><br>Inferences of cause and effect are stated, but not completely or entirely accurately. Facts and opinions are stated although not clearly distinguished from value judgments. | | Evidence is identified and carefully examined. Source(s) of the evidence are questioned for accuracy, precision, relevance, and completeness.<br><br>Accurately observes cause and effect. Facts, opinions and arguments are stated and clearly distinguished, and value judgments are acknowledged. |
| 4 | Discussion of **conclusions**, implications and consequences. | Conclusions are not provided. | | Conclusions are provided without discussion of implications or consequences. Some reflective thought is provided with regards to the assertions. | | Conclusions are clearly stated and discussed. Implications and consequences of the conclusion are considered in context, relative to assumptions, and supporting evidence. The student provides reflective thought with regards to the assertions. |
| **5 – 7: Optional Characteristics (evaluated where appropriate)** | | | | | | |
| 5 | Consideration of **OTHER salient perspectives and alternate positions** that are important to the analysis of the issue. | Does not acknowledge possible alternate perspectives. | | Acknowledges possible alternate perspectives although they are not clearly stated. | | Uses alternate perspectives and additional diverse perspectives drawn from outside information. |
| 6 | Assessment of the key **assumptions and the validity of the supporting/ background information**. | Does not identify the key assumptions and/or evaluate the given information that underlies the issue. | | The key assumption(s) that underlies the issue is clearly stated.<br><br>Necessary data or other background data is identified but not evaluated for validity, relevance or completeness. | | The key assumption that underlies the issue is clearly stated and the validity of the assumption that underlies the issue is assessed.<br><br>Key data and background information is evaluated for validity and used in a way consistent with this evaluation. |
| 7 | Consideration of the influence of the **context** on the issue (including, where appropriate, cultural, social, economic, technological, ethical, political, or personal context). | The problem is not connected to other issues or placed in context. | | The context of the question is provided although it is not clearly analyzed.<br><br>Limited consideration of the audience is provided.<br><br>Little consideration of other contexts is provided. | | The issue is clearly analyzed within the scope and context of the question.<br><br>An assessment of the audience is provided.<br><br>Consideration of other pertinent contexts is provided. |

* 2 - Exhibits most characteristics of '1' and some characteristics of '3'
** 4 - Exhibits most characteristics of '3' and some characteristics of '5'

***** adapted from Washington State University

revised 5-8-08

## Student demographics associated with critical thinking skills artifacts, 2005-2009

| | | 2005-08 | | 2009 | | Years Combined | |
|---|---|---|---|---|---|---|---|
| | | No. of Artifacts | Pct | No. of Artifacts | Pct | No. of Artifacts | Pct |
| Number of Artifacts | # collected | 925 | - | 411 | - | 1336 | - |
| | # scored | 568 | - | 155 | - | 723 | - |
| | # used in analysis | 563 | - | 155 | - | 718 | - |
| Class | Freshman | 79 | 14% | 35 | 23% | 114 | 16% |
| | Sophomore | 73 | 13% | 14 | 9.0% | 87 | 12% |
| | Junior | 148 | 26% | 42 | 27% | 190 | 27% |
| | Senior | 263 | 47% | 64 | 41% | 327 | 46% |
| College | CAS | 136 | 24% | 49 | 32% | 185 | 26% |
| | CASNR | 45 | 8.0% | 59 | 38% | 104 | 15% |
| | SSB | 66 | 12% | 1 | 0.6% | 67 | 9.3% |
| | COE | 31 | 5.5% | 2 | 1.3% | 33 | 4.6% |
| | CEAT | 134 | 24% | 24 | 16% | 158 | 22% |
| | CHES | 148 | 26% | 17 | 11% | 165 | 23% |
| | UAS | 3 | 0.5% | 3 | 1.9% | 6 | 0.8% |
| Gender | Female | 316 | 56% | 80 | 52% | 396 | 55% |
| | Male | 247 | 44% | 75 | 48% | 322 | 45% |
| Admit Type | Regular (A, AR, L) | 388 | 69% | 104 | 67% | 492 | 69% |
| | Alternative Admit (F) | 16 | 2.8% | 4 | 2.6% | 20 | 2.8% |
| | Adult Admit (G) | 2 | 0.3% | 0 | 0.0% | 2 | 0.3% |
| | "Third Door" Admit (K) | 0 | 0% | 0 | 0.0% | 0 | 0.0% |
| | International (J) | 9 | 1.6% | 0 | 0.0% | 9 | 1.3% |
| | Transfer (M, MR) | 145 | 26% | 47 | 30% | 192 | 27% |
| | Other or Blank | 3 | 0.5% | 0 | 0.0% | 3 | 0.4% |
| ACT | <22 | 123 | 26% | 21 | 17% | 144 | 24% |
| | 22 to 24 | 110 | 23% | 31 | 25% | 141 | 24% |
| | 25 to 27 | 124 | 26% | 26 | 21% | 150 | 25% |
| | 28 to 30 | 72 | 15% | 29 | 23% | 101 | 17% |
| | >30 | 44 | 9.3% | 18 | 14% | 62 | 10% |
| OSU GPA | <2.0 | 25 | 4.5% | 9 | 5.9% | 34 | 4.8% |
| | 2.0 to 2.49 | 71 | 13% | 18 | 12% | 89 | 13% |
| | 2.50 to 2.99 | 133 | 24% | 37 | 24% | 170 | 24% |
| | 3.00 to 3.49 | 173 | 31% | 30 | 20% | 203 | 29% |
| | 3.50 to 4.00 | 158 | 28% | 59 | 39% | 217 | 30% |

## Critical thinking scores, 2009

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 1 | 35 | 93 | 24 | 2 | 2.94 | 155 |
| | | % | 0.6% | 23% | 60% | 16% | 1.3% | | |
| By Class | Freshmen | n | 0 | 7 | 19 | 9 | 0 | 3.06 | 35 |
| | | % | 0.0% | 20% | 54% | 26% | 0.0% | | 23% |
| | Sophomores | n | 0 | 4 | 7 | 2 | 1 | 3.00 | 14 |
| | | % | 0.0% | 29% | 50% | 14% | 7.1% | | 9.0% |
| | Juniors | n | 0 | 11 | 22 | 9 | 0 | 2.95 | 42 |
| | | % | 0.0% | 26% | 52% | 21% | 0.0% | | 27% |
| | Seniors | n | 1 | 13 | 45 | 4 | 1 | 2.86 | 64 |
| | | % | 1.6% | 20% | 70% | 6.3% | 1.6% | | 41% |
| By Class (regular admit only) | Freshmen | n | 0 | 7 | 17 | 9 | 0 | 3.06 | 33 |
| | | % | 0.0% | 21% | 52% | 27% | 0.0% | | 32% |
| | Sophomores | n | 0 | 4 | 5 | 2 | 1 | 3.00 | 12 |
| | | % | 0.0% | 33% | 42% | 17% | 8.3% | | 12% |
| | Juniors | n | 0 | 8 | 14 | 6 | 0 | 2.93 | 28 |
| | | % | 0.0% | 29% | 50% | 21% | 0.0% | | 27% |
| | Seniors | n | 0 | 6 | 22 | 3 | 0 | 2.90 | 31 |
| | | % | 0.0% | 19% | 71% | 9.7% | 0.0% | | 30% |
| By Transfer Status | Native Students* | n | 0 | 27 | 60 | 20 | 1 | 2.96 | 108 |
| | | % | 0.0% | 25% | 56% | 19% | 0.9% | | 70% |
| | Transfer Students | n | 1 | 8 | 33 | 4 | 1 | 2.98 | 47 |
| | | % | 2.1% | 17% | 70% | 8.5% | 2.1% | | 30% |

*Native students refers to freshmen who started at OSU as first-time freshmen.

## Average component scores for sub-areas of critical thinking for 2009

| Component | Problem | Perspective | Support | Conclusion | Others | Assumptions | Context |
|---|---|---|---|---|---|---|---|
| Average Score | 3.08 (N=155) | 3.08 (N=155) | 2.97 (N=155) | 2.87 (N=155) | - - | 2.02 (N=20) | 2.51 (N=73) |

## Component scores and weights by reviewer: critical thinking

| | Problem | | Perspective | | Support | | Conclusion | |
|---|---|---|---|---|---|---|---|---|
| Reviewer | mean | β weight | mean | β weight | mean | β weight | mean | β weight |
| Team 1 | | | | | | | | |
| 1 | 2.96 | 0.04 | 3.05 | 0.26* | 2.91 | 0.36* | 2.83 | 0.23* |
| 2 | 3.07 | 0.16 | 3.47 | 0.22* | 2.99 | 0.42* | 3.01 | 0.03 |
| 3 | 3.20 | 0.27* | 3.16 | 0.32* | 2.84 | 0.31* | 2.88 | 0.11 |
| Team 2 | | | | | | | | |
| 4 | 3.07 | 0.08 | 2.95 | 0.22* | 3.11 | 0.19 | 2.70 | 0.41* |
| 5 | 3.05 | 0.25* | 2.83 | 0.22* | 2.98 | 0.42* | 2.86 | 0.16 |
| 6 | 3.16 | 0.12 | 3.04 | 0.22* | 2.99 | 0.37* | 2.95 | 0.23* |

*$p < 0.05$ for individual-level regression with overall score as the dependent variable

## Critical thinking skills scores, 2005-2009 (years combined)

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 21 | 209 | 376 | 109 | 3 | 2.81 | 718 |
| | | % | 2.9% | 29% | 52% | 15% | 0.4% | | |
| By Class | Freshmen | n | 2 | 32 | 56 | 24 | 0 | 2.96 | 114 |
| | | % | 1.8% | 28% | 49% | 21% | 0.0% | | 16% |
| | Sophomores | n | 1 | 26 | 52 | 7 | 1 | 2.65 | 87 |
| | | % | 4.4% | 30% | 60% | 8.0% | 1.1% | | 12% |
| | Juniors | n | 8 | 56 | 93 | 33 | 0 | 2.76 | 190 |
| | | % | 4.2% | 30% | 49% | 17% | 0.0% | | 27% |
| | Seniors | n | 10 | 95 | 175 | 45 | 2 | 2.78 | 327 |
| | | % | 3.1% | 29% | 54% | 14% | 0.6% | | 46% |
| By Class (regular admit only)* | Freshmen | n | 1 | 32 | 53 | 23 | 0 | 2.90 | 109 |
| | | % | 0.9% | 29% | 49% | 21% | 0.0% | | 22% |
| | Sophomores | n | 0 | 15 | 42 | 6 | 1 | 2.89 | 64 |
| | | % | 0.0% | 23% | 66% | 9.4% | 1.6% | | 13% |
| | Juniors | n | 7 | 31 | 67 | 27 | 27 | 2.86 | 132 |
| | | % | 5.3% | 24% | 51% | 21% | 21% | | 27% |
| | Seniors | n | 2 | 47 | 109 | 29 | 0 | 2.88 | 187 |
| | | % | 1.1% | 25% | 58% | 16% | 0.0% | | 38% |
| By Transfer Status | Native Students** | n | 10 | 142 | 282 | 90 | 1 | 2.87 | 525 |
| | | % | 1.9% | 27% | 54% | 17% | 0.2% | | 73% |
| | Transfer Students | n | 10 | 67 | 94 | 19 | 2 | 2.70 | 192 |
| | | % | 5.2% | 35% | 49% | 9.9% | 1.0% | | 27% |

*Admission type unknown for one student.
**Native students refers to freshmen who started at OSU as first-time freshmen.

## Average component scores for sub-areas of critical thinking for 2005–2009

| Component | Problem | Perspective | Support | Conclusion | Others | Assumptions | Context |
|---|---|---|---|---|---|---|---|
| Average Score | 2.93 (N=718) | 3.00 (N=718) | 2.85 (N=718) | 2.71 (N=718) | 2.59 (N=90) | 2.43 (N=116) | 2.52 (N=280) |

## Comparison of overall average critical thinking scores by year

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 21 | 209 | 376 | 109 | 3 | 2.81 | 718 |
| | | % | 2.9% | 29% | 52% | 15% | 0.4% | | |
| By Year | 2005 | n | 2 | 40 | 72 | 26 | 1 | 2.89 | 141 |
| | | % | 1.4% | 28% | 51% | 18% | 0.7% | | |
| | 2006 | n | 4 | 29 | 54 | 19 | 0 | 2.83 | 106 |
| | | % | 3.8% | 27% | 51% | 18% | 0.0% | | |
| | 2007 | n | 13 | 59 | 76 | 16 | 0 | 2.58 | 164 |
| | | % | 7.9% | 36% | 46% | 9.8% | 0.0% | | |
| | 2008 | n | 1 | 46 | 81 | 24 | 0 | 2.84 | 152 |
| | | % | 0.7% | 30% | 53% | 16% | 0.0% | | |
| | 2009 | n | 1 | 35 | 93 | 24 | 2 | 2.94 | 155 |
| | | % | 0.6% | 23% | 60% | 16% | 1.3% | | |

## Comparison of overall average critical thinking scores by classification and by year

| | | | Year | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **2005** | **2006** | **2007** | **2008** | **2009** | **N** |
| | Freshmen | n | 1 | 0 | 44 | 34 | 35 | 114 |
| | | avg | 3.00 | - | 2.89 | 2.74 | 3.06 | |
| | Sophomores | n | 18 | 8 | 23 | 24 | 14 | 87 |
| | | avg | 2.72 | 2.63 | 2.65 | 2.88 | 3.00 | |
| | Juniors | n | 57 | 36 | 33 | 22 | 42 | 190 |
| | | avg | 2.93 | 2.78 | 2.42 | 2.73 | 2.95 | |
| | Seniors | n | 65 | 62 | 64 | 72 | 64 | 327 |
| | | avg | 2.89 | 2.89 | 2.42 | 2.92 | 2.86 | |

## Key findings

- Critical Thinking (CT) average scores by classification year were compared using ANOVA. No statistically significant differences were found between groups.
- CT average scores by transfer status were compared using independent T-test, and no statistically significant differences were found between groups in 2009.
- CT average scores for 2009 were significantly higher than those for 2005-2008 combined ($p < .01$).
- CT overall scores were found to be correlated with ACT composite scores ($p < .01$) and math sub-scores ($p < .05$).
- Regression analysis indicated that the ACT English sub-score significantly predicted students' Critical Thinking scores in 2009 (adjusted $R^2 = .11$, $F_{(1,123)} = 16.51$, $p < 0.001$, $n = 125$). The prediction equation is CT = 1.84 + .044 * ACT_ENGLISH. Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

## Assessment of Diversity Learning Goal

### 2009 collection of diversity samples

The Office of University Assessment and Testing supervised the collection of student artifacts for the Diversity Institutional Portfolio in Spring 2009. Instructors from the following undergraduate courses contributed random samples of student work to the portfolio:

| Course No. | Course Name | General Education Designation (if any) | Number of artifacts randomly collected from one assignment | Number of artifacts reviewed | Number of artifacts used in data analysis |
|---|---|---|---|---|---|
| AGEC 4703 | American Agricultural Policy | | 16 | 0 | 0 |
| AMST 3950 | America in International Perspective | H | 7 | 0 | 0 |
| BIOC 4990 | Special Problems | | 20 | 0 | 0 |
| CPSY 4443 | Cultural Diversity in Professional Life | D | 20 | 8 | 8 |
| CPSY 4443 | Cultural Diversity in Professional Life | D | 20 | 8 | 8 |
| CPSY 4443 | Cultural Diversity in Professional Life | D | 20 | 0 | 0 |
| ENGL 2413 | Intro to Literature | H, D | 20 | 0 | 0 |
| GEOG 1113 | Intro to Cultural Geography | I, S | 20 | 0 | 0 |
| HDFS 2223 | Foundations in Early Childhood | | 20 | 8 | 8 |
| HONR 3043 | Contemporary Culture and the American Dream | D, S | 18 | 8 | 8 |
| HONR 3053 | Biology Race and Gender | D, S | 20 | 0 | 0 |
| HRAD 3783 | Hospitality Industry Human Resources Management | | 9 | 0 | 0 |
| JB 3013 | Advertising Media and Markets | | 15 | 8 | 8 |
| MSIS 3023 | Technology, Diversity and Entrepreneurship | D | 10 | 8 | 8 |
| NSCI 4643 | Capstone for Nutritional Science | | 13 | 8 | 8 |
| PSYC 1113 | Intro to Psychology | S | 30 | 8 | 8 |
| REL 1103 | Religions of Mankind | | 20 | 0 | 0 |
| SCFD 3223 | Social Foundations | | 17 | 8 | 7 |
| SPED 3202 | Diversity in Education | | 16 | 0 | 0 |
| | **Total Number of Diversity Artifacts (samples)** | | **331** | **72** | **71** |

*The number of artifacts reviewed in 2009 was less than the number collected; artifacts that reviewers found to be best suited for the assessment method were included (n=72). Artifacts were not included in the assessment if the students' performance did not demonstrate the knowledge, skills and attitudes described in components of the rubric to an extent that reviewers felt they could make a fair evaluation. More artifacts were evaluated than were used because demographic information was unavailable for one student.

Artifacts selected for the Institutional Portfolio were coded and all identifying information was removed from the samples. Demographic data were collected for each artifact using the OSU student database; these data were collected for analysis purposes only and the information cannot be used to identify an individual. The student demographic information associated with the samples was not shared with reviewers prior to the reviews.

### 2009 diversity portfolio reviews

Three faculty reviewers for the diversity institutional portfolio conducted this assessment in June 2009. Portfolio reviewers included Deb Jordan (Applied Health and Educational Psychology), Jamie Van Dycke (Teaching and Curriculum Leadership), and Jean Van Delinder (Sociology). Initially, the reviewers met for a training session where the new member to group received background information on the procedure

and all reviewers practiced scoring artifacts using the diversity rubric developed for this purpose in 2006. Then, reviewers independently evaluated a set of training artifacts using the diversity rubric. During this initial training session, reviewers discussed questions and concerns regarding the use of the rubric, discussed scores given to samples of student work, and developed a common approach for evaluating student diversity samples.

Following the training sessions, each member of the group took copies of the 80 papers to score individually. The group then met to reach a consensus scores in cases where there was variation across individual scores (for the same artifact). The group also worked to agree within one point on sub-scores for each artifact. The final scores were then submitted to the office of University Assessment and Testing for data entry and initial analysis.

Some artifacts were excluded from the assessment. The decision to include or exclude an assignment was not intended as a judgment about the quality of the assignment itself, but was a judgment about the "fit" or "match" of the content of the papers to the components of the rubric. Faculty reviewers described papers that work well for the assessment as having some critical analysis of a cultural or diversity-related issue; describing some reflection on the issue or related personal experience; and often including comparison of two or more cultures or diverse groups.

The criteria and goals for General Education state that the curriculum is intended to "assist students in understanding and respecting diversity in people, beliefs and societies." A new general education designation for courses with this focus was created in Fall 2007. In Fall 2008, a policy was implemented that requires all incoming students to take at least one course with this designation as part of the general education curriculum. However, assessment of students' achievement of the learning goal regarding diversity will not be limited to these designated courses. It is expected that many courses provide experiences to help students achieve this goal, and that students' activities outside of class, such as interacting with others in student organizations, living environments, and participating in other extra-curricular activities also contribute to their achievement (see http://diversity.okstate.edu).

## Statement of Learning Outcome: "Graduates will understand and respect diversity in people, beliefs and societies."

| Outcome Components: | | Level of Achievement 1 | 2* | 3 | 4** | 5 |
|---|---|---|---|---|---|---|
| A | **Conceptual understanding** | Understands diversity to mean differences among people. The lowest level of achievement is one that recognizes difference in a superficial and one-dimensional manner (catalogues differences). Can only evaluate others in comparison to herself and in an implied hierarchical manner (exhibits ethnocentrism). | | Understands diversity as knowledge of differences in cultural practices, attitudes, and beliefs. Moderate appreciation for the value of any of this understanding in application or in navigating the social and cultural environment.<br><br>Goes beyond "cataloguing" differences | | Understands diversity as multidimensional in nature. Strong appreciation for the value of knowledge and understanding in application and in navigating the social and cultural environment. |
| B | **Values diversity** | Demonstrates minimal tendency to try to understand and to value multiple perspectives. Is unable to draw on diverse opinion when making decisions. | | Demonstrates moderate tendency to try to understand and to value multiple perspectives. Demonstrates ability to examine more than one opinion and consider relevant cultural differences when making decisions. | | Demonstrates a strong perspective of inclusion. Demonstrates strong tendency to try to understand and to value multiple perspectives. |
| C | **Knowledge of historical context** | Student's work demonstrates minimal knowledge of history of racial, ethnic or other relevant groups. Lacks perspective on the issue. | | Student's work demonstrates moderate knowledge of historical context and how that historical context is important to the issue. | | Student's work demonstrates substantial knowledge of historical context and how that history applies to present-day situations relating to inter-group relations. |
| D | **Sources of understanding, value, and knowledge**. | Student's understanding and values regarding diversity are based primarily on limited factual knowledge and personal observation; little apparent influence of personal experience outside own immediate environment. | | Student's understanding and values regarding diversity are based primarily on moderate factual knowledge and personal observation; some apparent influence of personal experience outside own immediate environment. | | Student's understanding and values regarding diversity are based on reflection and integration of substantial factual knowledge and personal observation; strong apparent influence of personal experience outside own immediate environment. |

* Exhibits most characteristics of '1' and some of '3'
** Exhibits most characteristics of '3' and some of '5'

revised 12-13-07

## Student demographics associated with diversity artifacts, 2007-2009

| | | 2007-2008 | | 2009 | | Years Combined | |
|---|---|---|---|---|---|---|---|
| | | No. of artifacts | Pct | No. of Artifacts | Pct | No. of artifacts | Pct |
| Number of Artifacts | # collected | 538 | - | 331 | - | 869 | - |
| | # scored | 124 | - | 72 | - | 196 | - |
| | # used in analysis | 113 | - | 71 | - | 184 | - |
| Class | Freshman | 5 | 4.4% | 6 | 8.5% | 11 | 6.0% |
| | Sophomore | 20 | 18% | 19 | 27% | 39 | 21% |
| | Junior | 46 | 41% | 24 | 34% | 70 | 38% |
| | Senior | 42 | 37% | 22 | 31% | 64 | 35% |
| College | CAS | 42 | 37% | 21 | 30% | 63 | 34% |
| | CASNR | 1 | 0.9% | 3 | 4.2% | 4 | 2.2% |
| | SSB | 4 | 3.5% | 11 | 16% | 15 | 8.2% |
| | COE | 45 | 40% | 13 | 18% | 58 | 32% |
| | CEAT | 8 | 7.1% | 0 | 0% | 8 | 4.3% |
| | CHES | 3 | 2.7% | 17 | 24% | 20 | 11% |
| | UAS | 10 | 8.8% | 6 | 8.5% | 16 | 8.7% |
| Gender | Female | 42 | 37% | 35 | 49% | 77 | 42% |
| | Male | 71 | 63% | 36 | 51% | 107 | 58% |
| Admit Type | Regular (A, AR, L) | 50 | 44% | 44 | 62% | 94 | 51% |
| | Alternative Admit (F) | 10 | 8.8% | 11 | 16% | 21 | 11% |
| | Adult Admit (G) | 0 | 0% | 0 | 0% | 0 | 0% |
| | "Third Door" Admit (K) | 0 | 0% | 0 | 0% | 0 | 0% |
| | International (J) | 2 | 1.8% | 1 | 1.4% | 3 | 1.6% |
| | Transfer (M, MR) | 50 | 44% | 15 | 21% | 65 | 35% |
| | Other or Blank | 1 | 0.9% | 0 | 0% | 1 | 0.5% |
| ACT | <22 | 27 | 35% | 15 | 27% | 42 | 32% |
| | 22 to 24 | 23 | 30% | 18 | 32% | 41 | 31% |
| | 25 to 27 | 11 | 14% | 11 | 20% | 22 | 17% |
| | 28 to 30 | 8 | 10% | 6 | 11% | 14 | 11% |
| | >30 | 8 | 10% | 6 | 11% | 14 | 11% |
| OSU GPA | <2.0 | 4 | 3.5% | 3 | 4.2% | 7 | 3.8% |
| | 2.0 to 2.49 | 26 | 23% | 11 | 16% | 37 | 20% |
| | 2.50 to 2.99 | 37 | 33% | 21 | 30% | 58 | 32% |
| | 3.00 to 3.49 | 18 | 16% | 18 | 25% | 36 | 20% |
| | 3.50 to 4.00 | 28 | 25% | 18 | 25% | 46 | 25% |

## Diversity scores, 2009

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 12 | 17 | 26 | 15 | 1 | 2.66 | 71 |
| | | % | 17% | 24% | 37% | 21% | 1.4% | | |
| By Class | Freshmen | n | 0 | 1 | 5 | 0 | 0 | 2.83 | 6 |
| | | % | 0% | 17% | 83% | 0% | 0% | | 8.5% |
| | Sophomores | n | 4 | 7 | 4 | 4 | 0 | 2.42 | 19 |
| | | % | 21% | 37% | 21% | 21% | 0% | | 27% |
| | Juniors | n | 6 | 4 | 7 | 6 | 1 | 2.67 | 24 |
| | | % | 25% | 17% | 29% | 25% | 4.2% | | 34% |
| | Seniors | n | 2 | 5 | 10 | 5 | 0 | 2.82 | 22 |
| | | % | 9.1% | 23% | 46% | 23% | 0% | | 31% |
| By Class (regular admit only) | Freshmen | n | 0 | 0 | 4 | 0 | 0 | 3.00 | 4 |
| | | % | 0% | 0% | 100% | 0% | 0% | | 9.1% |
| | Sophomores | n | 0 | 4 | 3 | 4 | 0 | 3.00 | 11 |
| | | % | 0% | 36% | 27% | 36% | 0% | | 25% |
| | Juniors | n | 2 | 2 | 4 | 4 | 1 | 3.00 | 13 |
| | | % | 15% | 15% | 31% | 31% | 7.7% | | 30% |
| | Seniors | n | 1 | 3 | 9 | 3 | 0 | 2.88 | 16 |
| | | % | 6.3% | 19% | 56% | 19% | 0% | | 36% |
| By Transfer Status | Native Students* | n | 8 | 12 | 22 | 13 | 1 | 2.77 | 56 |
| | | % | 14% | 21% | 39% | 23% | 1.8% | | 79% |
| | Transfer Students | n | 4 | 5 | 4 | 2 | 0 | 2.27 | 15 |
| | | % | 27% | 33% | 27% | 13% | 0% | | 21% |

*Native students refers to freshmen who started at OSU as first-time freshmen.

## Average component scores for sub-areas of diversity for 2009

| Component | Conceptual Understanding | Values Diversity | Knowledge of Historical Context | Sources of Understanding |
|---|---|---|---|---|
| Average Score | 2.70 (N=71) | 2.78 (N=71) | 2.51 (N=71) | 2.69 (N=71) |

**Component scores and weights by reviewer: diversity**

| | Conceptual understanding | | Values diversity | | Knowledge of context | | Sources of understanding | |
|---|---|---|---|---|---|---|---|---|
| Reviewer | mean | β weight | mean | β weight | mean | β weight | mean | β weight |
| Team 1 | | | | | | | | |
| 1[a] | 3.10 | | 3.10 | | 3.00 | | 3.14 | |
| 2[b] | 3.27 | 0.51* | 3.23 | 0.33 | 2.72 | | 3.16 | |
| 3 | 2.03 | 0.39 | 2.31 | 0.08 | 2.03 | 0.06 | 2.16 | 0.15 |

a. Only 29 artifacts had complete scores. Beta weights could not be accurately computed.

b. Beta weights could not be accurately computed for knowledge of context or sources of understanding.

*$p < 0.05$ on individual-level regression with overall score as the dependent variable.

## Diversity scores, 2007-2009 (years combined)

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 22 | 62 | 60 | 37 | 3 | 2.66 | 184 |
| | | % | 12% | 34% | 33% | 20% | 1.6% | | |
| By Class | Freshmen | n | 1 | 4 | 6 | 0 | 0 | 2.45 | 11 |
| | | % | 9.1% | 36% | 55% | 0% | 0% | | 6.0% |
| | Sophomores | n | 7 | 17 | 9 | 5 | 1 | 2.38 | 39 |
| | | % | 18% | 44% | 23% | 13% | 2.6% | | 21% |
| | Juniors | n | 10 | 19 | 20 | 20 | 1 | 2.76 | 70 |
| | | % | 14% | 27% | 29% | 29% | 1.4% | | 38% |
| | Seniors | n | 4 | 22 | 25 | 12 | 1 | 2.75 | 64 |
| | | % | 6.3% | 34% | 39% | 19% | 1.6% | | 35% |
| By Class (regular admits only) | Freshmen | n | 0 | 2 | 5 | 0 | 0 | 2.71 | 7 |
| | | % | 0% | 29% | 71% | 0% | 0% | | 7.4% |
| | Sophomores | n | 0 | 8 | 6 | 5 | 1 | 2.95 | 20 |
| | | % | 0% | 40% | 30% | 25% | 5.0% | | 21% |
| | Juniors | n | 2 | 4 | 11 | 14 | 1 | 3.25 | 32 |
| | | % | 6.3% | 13% | 34% | 44% | 3.1% | | 34% |
| | Seniors | n | 1 | 8 | 17 | 8 | 1 | 3.00 | 35 |
| | | % | 2.9% | 23% | 49% | 23% | 2.9% | | 37% |
| By Transfer Status* | Native Students** | n | 11 | 34 | 41 | 29 | 3 | 2.82 | 118 |
| | | % | 9.3% | 29% | 35% | 25% | 2.5% | | 65% |
| | Transfer Students | n | 11 | 28 | 18 | 8 | 0 | 2.35 | 65 |
| | | % | 17% | 43% | 28% | 12% | 0% | | 36% |

*Admission type unknown for one student.
**Native students refers to freshmen who started at OSU as first-time freshmen.

## Average component scores for sub-areas of diversity for 2007–2009

| Component | Conceptual Understanding | Values Diversity | Knowledge of Historical Context | Sources of Understanding |
|---|---|---|---|---|
| Average Score | 2.62 (N=184) | 2.65 (N=184) | 2.56 (N=184) | 2.59 (N=184) |

## Comparison of overall average diversity scores by year

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 22 | 62 | 60 | 37 | 3 | 2.66 | 184 |
| | | % | 12% | 34% | 33% | 20% | 1.6% | | |
| By Year | 2007 | n | 9 | 35 | 18 | 7 | 0 | 2.33 | 69 |
| | | % | 13% | 51% | 26% | 10% | 0% | | |
| | 2008 | n | 1 | 10 | 16 | 15 | 2 | 3.16 | 44 |
| | | % | 2.3% | 23% | 36% | 34% | 4.5% | | |
| | 2009 | n | 12 | 17 | 26 | 15 | 1 | 2.66 | 71 |
| | | % | 17% | 24% | 37% | 21% | 1.4% | | |

## Comparison of overall average diversity scores by classification and by year

| | | Year | | | |
|---|---|---|---|---|---|
| | | **2007** | **2008** | **2009** | **N** |
| Freshmen | n | 5 | 0 | 6 | 11 |
| | avg | 2.00 | - | 2.83 | |
| Sophomores | n | 13 | 7 | 19 | 39 |
| | avg | 2.15 | 2.71 | 2.42 | |
| Juniors | n | 25 | 21 | 24 | 70 |
| | avg | 2.36 | 3.33 | 2.67 | |
| Seniors | n | 26 | 16 | 22 | 64 |
| | avg | 2.46 | 3.13 | 2.82 | |

## Key findings

- Diversity average scores by transfer status (native vs. transfer students) were compared using independent t-test. No statistically significant differences were found between the groups in 2009.
- Diversity average scores by classification year were compared using ANOVA. No statistically significant differences were found by classification year.
- Regression analysis indicated that students' OSU GPA significantly predicted their diversity scores in 2009 (adjusted $R^2$ = .15, $F_{(1,69)}$ = 12.17, $p$ < 0.01, $n$ = 71). The prediction equation is Diversity = 0.609 + 0.681 * OSU_GPA. Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.
- Diversity average scores by year were compared using ANOVA. The average score in 2009 was significantly lower than the average score in 2008 ($p$ = 0.02, effect size Hedge's $G$ = -0.53) and the average for 2008 was significantly higher than the average for 2007 ($p$ < 0.001, effect size Hedge's $G$ = 0.89).
- As in previous years, it was difficult or impossible to apply the rubric to some artifacts collected. The committee will ask faculty to consider developing assignments that require students to demonstrate the knowledge, skills, and attitudes represented in the learning outcome being assessed. The Diversity faculty development workshop series will also help to address this in the future.

- Although some faculty instructions for the assignments asked students to address diversity issues in their papers, many students tended to focus more on other components of the assignments and somewhat avoid the diversity aspect. Students' work often indicated limited experiences with diversity.

## Assessment of Science Reasoning Skills

### 2009 collection of science samples

The University Assessment and Testing Office supervised the collection of artifacts for the Science Reasoning Skills Institutional Portfolio in Spring 2009 using methods described in previous annual reports. As with the other portfolios, the artifacts were collected from sciences courses that are part of the general education course offerings. Instructors from the following courses contributed artifacts to the 2009 science reasoning skills institutional portfolio.

| Course No. | Course Name | General Education Designation (if any) | Number of artifacts randomly collected from one assignment | Number of artifacts reviewed | Number of artifacts used in data analysis |
|---|---|---|---|---|---|
| ASTR 1024 | Stars, Galaxies, and the Universe | N | 19 | 0 | 0 |
| BOT 1404 | Plant Biology | N | 16 | 16 | 15 |
| CHE 2033 | Intro to Chemical Process Engineering | | 20 | 0 | 0 |
| CHEM 1314 | Intro to Chemistry | L, N | 20 | 20 | 20 |
| ENGR 1111 | Intro to Engineering | | 15 | 15 | 15 |
| ENGR 1111 | Intro to Engineering | | 19 | 0 | 0 |
| ENTO 2003 | Insects and Society | N | 20 | 20 | 20 |
| GEOL 2364 | Geology and Human Affairs | L, N | 32 | 0 | 0 |
| HORT 1013 | Principles of Horticultural Science | L, N | 20 | 0 | 0 |
| MAE 4623 | Biomechanics | | 17 | 0 | 0 |
| NREM 4990 | Ecology of Invasive Species | | 18 | 18 | 18 |
| PHYS 3213 | Optics | | 3 | 0 | 0 |
| | **Total Number of Science Artifacts (samples)** | | **219** | **89** | **88** |

*The number of artifacts reviewed in 2009 was less than the number collected. More artifacts were collected than could be evaluated by the reviewers, so those artifacts were selected that reviewers found to be best suited for the assessment (n=89). More artifacts were evaluated than were used because one student was found to be a non-degree-seeking exchange student, and was thus removed from the sample.

### 2009 science reasoning portfolio reviews

Three faculty reviewers for the science reasoning skills institutional portfolio met and completed their work in July 2009. The portfolio reviewers included John Gelder (Chemistry), Ed Walkiewicz (English), and Eric Rebek (Entomology & Plant Pathology). Initially, the reviewers met for a training session where the new member to group received background information on the procedure and all reviewers practiced scoring artifacts from previous portfolio years using the science reasoning rubric, which was last revised in 2007. During this initial training session, reviewers discussed questions and concerns regarding the use of the rubric, discussed scores given to samples of student work, and developed a common approach for evaluating student science reasoning samples.

Following the training sessions, each member of the group took copies of the 89 papers to score individually. The group then met to reach a consensus scores in cases where there was variation across individual scores for the same artifact. The group also worked to agree within one point on sub-scores for each artifact. The final scores were then submitted to the Office of University Assessment and Testing for data entry and initial analysis.

## Rubric for evaluating students' science reasoning skills

The General Education Assessment Committee developed the following rubric for evaluating students' science problem-solving skills in 2003, and made minor revisions in 2005 and 2007. Reviewers scored the artifacts independently and then met to develop a consensus score for each artifact; each artifact received a whole-number score from 1 to 5. Reviewers also assigned a sub-score to each artifact for each of six components: understanding of problem; use of terms and symbols; calculations and graphical data presentation; solution and graphical data interpretation; answer and conclusions; and evidence of higher level thinking.

**Learning Outcome: Graduates will understand the scientific inquiry process and be able to critically analyze the physical world using the methodologies and models of science.**

| Aspects | 1 | 2* | 3 | 4** | 5 |
|---|---|---|---|---|---|
| Understanding of problem | Student does not exhibit a clear understanding of the problem; Displays little comprehension of the important elements of the problem; Failed to understand enough to start to work the problem. | | Response is free of misconceptions that lead to wrong answers; Student grasps basic parts of the problem as well as the general framework; Understands enough to work most of the problem; Can make a diagram that exhibits some understanding of the model; Can demonstrate some conceptualization of the model. | | Student manifests a thorough understanding of concepts and relationships between concepts; Identifies all the important elements of the problem; Organization of the response demonstrates clarity of understanding. |
| Use of terms and symbols | Student is unable to communicate scientific concepts through terminology; Fails to employ technical, mathematical, or scientific terms or employs them inappropriately; Fails to use symbols or uses them incorrectly. | | Student uses most terminology and symbols correctly; Provides evidence of reasonable understanding of terms and symbols. | | Student explains thoughts thoroughly using correct terminology and clearly displayed, appropriate symbols; Communicates ideas clearly and concisely; Demonstrates superior knowledge of scientific language and symbolic usage; Knows all the symbols and terms in a mathematical relationship and their association with the scientific model of interest. |
| Calculations and graphical data presentation | Student provides no evidence of manipulation of mathematical expressions; Commits numerous arithmetic errors; Fails to present data in graphical or tabular format. | | Response is mainly accurate with some minor arithmetic errors; Student has sufficient understanding to work the problem, but presentation is not sophisticated; Provides graphical representation but cannot extract abstract information or interpretation; Presents calculations in an orderly manner, but misses some details; Represents data graphically but commits minor errors. | | Response is fully mathematically accurate; Solution is clearly displayed with various computation steps shown; Student executes algorithms completely and correctly; Presents data in appropriate graphical or tabular format; Provides clear interpretation and conceptualization of results; Displays results graphically in a clear and illuminating way. |
| Solution and graphical data interpretation | Student shows significant misunderstanding of the process; Does not correctly apply or even attempt to apply appropriate solution; Adopts inappropriate strategy for solving the problem; Attempts to use irrelevant information; Fails to provide, or provides incorrect, graphical representation of the mathematical thought process | | Student shows understanding of the process; Adopts a reasonable strategy for solving most of the problem; Displays solution in a rote manner indicating a simple conceptualization of the problem; Shows understanding of some of the problem's concepts. | | Student shows mastery of the process; Presents a detailed solution characterized by logical sequencing and systematic progression; Offers strong supporting arguments; Uses relevant outside information; Solution reflects excellent problem-solving skills. |
| Answer and conclusions | Answer lacks units or units are stated incorrectly; Student offers an invalid answer; Fails to offer any empirical findings. | | Answer is stated in correct units; Student expresses empirical findings but is limited in identification of related issues; Is unable to demonstrate complete understanding of the mathematical result and its relationship to the conceptual model. | | Answer is stated in correct units with any unit changes clearly illustrated; Student provides a complete response with a clear, unambiguous, accurate explanation; Fully describes findings in words; Convincingly connects the numeric results and the conceptual model. |
| Evidence of higher level thinking | Student is unable to plug values directly into equation; Seems incapable of mathematical manipulation. | | Student combines two related concepts; Substitutes correct values and manipulates equation but still has some difficulty with more complicated relationships or model; Has some difficulty in developing a mathematical relationship from the written form. | | Student can solve problems requiring multiple steps with development of concepts evolving into the solution; Can clearly synthesize information and organize it in a path through multiple steps to arrive at the solutions; Has no difficulty connecting mathematical relationships or expressing ideas mathematically; Is capable of interpreting and applying results in a new or modified situation. |

*2 - Exhibits most characteristics of '1' and some characteristics of '3'

** 4 - Exhibits most characteristics of '3' and some characteristics of '5'

revised 12-2007

## Student demographics associated with science reasoning artifacts, 2003-05, 2007, 2009

| | | 2003-05, 2007 | | 2009 | | Total Years | |
|---|---|---|---|---|---|---|---|
| | | **No. of Artifacts** | **Pct** | **No. of artifacts** | **Pct** | **No. of artifacts** | **Pct** |
| Number of Artifacts | # collected | 811 | - | 219 | - | 1040 | - |
| | # scored | 426 | - | 89 | - | 515 | - |
| | # used in analysis | 423 | - | 88 | - | 511 | - |
| Class | Freshman | 135 | 32% | 27 | 31% | 162 | 32% |
| | Sophomore | 131 | 31% | 17 | 19% | 148 | 29% |
| | Junior | 90 | 21% | 21 | 24% | 111 | 22% |
| | Senior | 67 | 16% | 23 | 26% | 90 | 18% |
| College | CAS | 160 | 38% | 23 | 26% | 183 | 36% |
| | CASNR | 92 | 22% | 35 | 40% | 127 | 25% |
| | SSB | 45 | 11% | 8 | 9.1% | 53 | 10% |
| | COE | 79 | 19% | 5 | 5.7% | 84 | 16% |
| | CEAT | 17 | 4.0% | 14 | 16% | 31 | 6.1% |
| | CHES | 20 | 4.7% | 2 | 2.3% | 22 | 4.3% |
| | UAS | 10 | 2.4% | 1 | 1.1% | 11 | 2.2% |
| Gender | Female | 271 | 64% | 44 | 50% | 315 | 62% |
| | Male | 152 | 36% | 44 | 50% | 196 | 38% |
| Admit Type | Regular (A, AR, L) | 298 | 70% | 63 | 72% | 361 | 71% |
| | Alternative Admit (F) | 18 | 4.3% | 1 | 1.1% | 19 | 3.7% |
| | Adult Admit (G) | 0 | 0% | 0 | 0% | 0 | 0% |
| | "Third Door" Admit (K) | 1 | 0.2% | 0 | 0% | 1 | 0.2% |
| | International (J) | 7 | 1.7% | 0 | 0% | 7 | 1.4% |
| | Transfer (M, MR) | 97 | 23% | 24 | 27% | 121 | 24% |
| | Other or Blank | 2 | 0.5% | 0 | 0% | 2 | 0.4% |
| ACT | <22 | 111 | 32% | 16 | 21% | 127 | 30% |
| | 22 to 24 | 105 | 30% | 20 | 26% | 125 | 29% |
| | 25 to 27 | 75 | 22% | 25 | 33% | 100 | 24% |
| | 28 to 30 | 38 | 11% | 11 | 15% | 49 | 12% |
| | >30 | 19 | 5.5% | 4 | 5.3% | 23 | 5.4% |
| OSU GPA | <2.0 | 28 | 6.6% | 6 | 6.8% | 34 | 6.7% |
| | 2.0 to 2.49 | 61 | 14% | 16 | 18% | 77 | 15% |
| | 2.50 to 2.99 | 104 | 25% | 25 | 28% | 129 | 25% |
| | 3.00 to 3.49 | 106 | 25% | 19 | 22% | 125 | 25% |
| | 3.50 to 4.00 | 124 | 29% | 22 | 25% | 146 | 29% |

## Science Reasoning scores, 2009

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 9 | 33 | 33 | 11 | 2 | 2.59 | 88 |
| | | % | 10% | 38% | 38% | 13% | 2.3% | | |
| By Class | Freshmen | n | 1 | 10 | 14 | 1 | 1 | 2.67 | 27 |
| | | % | 3.7% | 37% | 52% | 3.7% | 3.7% | | 31% |
| | Sophomores | n | 3 | 5 | 6 | 3 | 0 | 2.53 | 17 |
| | | % | 18% | 29% | 35% | 18% | 0% | | 19% |
| | Juniors | n | 3 | 9 | 5 | 3 | 1 | 2.52 | 21 |
| | | % | 14% | 43% | 24% | 14% | 4.8% | | 24% |
| | Seniors | n | 2 | 9 | 8 | 4 | 0 | 2.61 | 23 |
| | | % | 8.7% | 39% | 35% | 17% | 0% | | 26% |
| By Class (regular admit only) | Freshmen | n | 1 | 8 | 14 | 1 | 1 | 2.72 | 25 |
| | | % | 4.0% | 32% | 56% | 4% | 4% | | 40% |
| | Sophomores | n | 3 | 3 | 5 | 3 | 0 | 2.57 | 14 |
| | | % | 21% | 21% | 36% | 21% | 0% | | 22% |
| | Juniors | n | 1 | 4 | 5 | 1 | 1 | 2.75 | 12 |
| | | % | 8.3% | 33% | 42% | 8.3% | 8.3% | | 19% |
| | Seniors | n | 2 | 3 | 5 | 2 | 0 | 2.58 | 12 |
| | | % | 17% | 25% | 42% | 17% | 0% | | 19% |
| By Transfer Status | Native Students* | n | 7 | 19 | 29 | 7 | 2 | 2.66 | 64 |
| | | % | 11% | 30% | 45% | 11% | 3.1% | | 73% |
| | Transfer Students | n | 2 | 14 | 4 | 4 | 0 | 2.42 | 24 |
| | | % | 8.3% | 58% | 17% | 17% | 0% | | 27% |

*Native students refers to freshmen who started at OSU as first-time freshmen.

## Average component scores for sub-areas of science reasoning for 2009

| Component | Problem | Terms | Presentation | Interpretation | Conclusion | Higher Level |
|---|---|---|---|---|---|---|
| Average Score | 2.91 (N=88) | 2.90 (N=88) | 2.60 (N=88) | 2.61 (N=53) | 2.63 (N=88) | 2.63 (N=88) |

**Component scores and weights by reviewer: science reasoning**

| | Problem | | Terms | | Presentation | | Interpretation | | Conclusion | | Higher Level | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reviewer | mean | β weight | mean | β weight | mean | β weight | mean | β weight | mean | β weight | Mean | β weight |
| Team 1 | | | | | | | | | | | | |
| 1[a] | 3.21 | | 3.11 | 0.64* | 2.94 | 0.17 | 3.27 | | 2.84 | 0.45 | 2.87 | 0.09 |
| 2[b] | 2.71 | 0.24* | 2.99 | 0.10 | 2.49 | 0.03 | 2.13 | 0.22 | 2.53 | 0.22 | 2.52 | 0.28 |
| 3[c] | 2.81 | 0.26 | 2.60 | 0.19 | 2.37 | 0.08 | 2.75 | 0.08 | 2.51 | 0.20 | 2.52 | 0.31 |

a. Only 30 artifacts had complete scores. Beta weights could not be accurately calculated for all areas.

b. Only 46 artifacts had complete scores.

c. Only 20 artifacts had complete scores.

*$p < 0.05$ on individual-level regression with overall score as the dependent variable.

## Science reasoning skills scores, 2003-2005, 2007, 2009 (years combined)

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 36 | 183 | 194 | 89 | 9 | 2.71 | 511 |
| | | % | 7.0% | 36% | 38% | 17% | 1.8% | | |
| By Class | Freshmen | n | 10 | 62 | 63 | 24 | 3 | 2.68 | 162 |
| | | % | 28% | 34% | 33% | 27% | 33% | | 32% |
| | Sophomores | n | 13 | 49 | 56 | 28 | 2 | 2.71 | 148 |
| | | % | 36% | 27% | 29% | 32% | 22% | | 29% |
| | Juniors | n | 10 | 38 | 37 | 23 | 3 | 2.74 | 111 |
| | | % | 28% | 21% | 19% | 26% | 33% | | 22% |
| | Seniors | n | 3 | 34 | 38 | 14 | 1 | 2.73 | 90 |
| | | % | 8.3% | 19% | 20% | 16% | 11% | | 18% |
| By Class (regular admits only) | Freshmen | n | 8 | 54 | 60 | 22 | 3 | 2.71 | 147 |
| | | % | 5.4% | 37% | 41% | 15% | 2.0% | | 41% |
| | Sophomores | n | 12 | 36 | 42 | 22 | 1 | 2.68 | 113 |
| | | % | 11% | 32% | 37% | 20% | 0.9% | | 31% |
| | Juniors | n | 2 | 19 | 21 | 14 | 3 | 2.95 | 59 |
| | | % | 3.4% | 32% | 36% | 24% | 5.4% | | 16% |
| | Seniors | n | 2 | 12 | 18 | 9 | 1 | 2.88 | 42 |
| | | % | 4.8% | 29% | 43% | 21% | 2.4% | | 12% |
| By Transfer Status | Native Students* | n | 28 | 132 | 152 | 70 | 8 | 2.74 | 390 |
| | | % | 7.2% | 34% | 39% | 18% | 2.1% | | 76% |
| | Transfer Students | n | 8 | 51 | 42 | 19 | 1 | 2.62 | 121 |
| | | % | 6.6% | 42% | 35% | 16% | 0.8% | | 24% |

*Native students refers to freshmen who started at OSU as first-time freshmen

## Average component scores for sub-areas of science reasoning for 2009

| Component | Problem* | Terms* | Presentation* | Interpretation* | Conclusion* | Higher Level* |
|---|---|---|---|---|---|---|
| Average Score | 2.91 (N=88) | 2.90 (N=88) | 2.60 (N=88) | 2.61 (N=53) | 2.63 (N=88) | 2.63 (N=88) |

* No sub-area scores are available for 03-05 and 07.

## Comparison of overall average science reasoning scores by year

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 36 | 183 | 194 | 89 | 9 | 2.71 | 511 |
| | | % | 7.0% | 36% | 38% | 17% | 1.8% | | |
| By Year | 2003 | n | 1 | 30 | 28 | 8 | 1 | 2.68 | 68 |
| | | % | 1.5% | 44% | 41% | 12% | 1.5% | | |
| | 2004 | n | 4 | 40 | 55 | 39 | 3 | 3.04 | 141 |
| | | % | 2.8% | 28% | 39% | 28% | 2.1% | | |
| | 2005 | n | 15 | 57 | 38 | 16 | 3 | 2.42 | 129 |
| | | % | 12% | 44% | 30% | 12% | 2.3% | | |
| | 2007 | n | 7 | 23 | 40 | 15 | 0 | 2.72 | 85 |
| | | % | 8.2% | 27% | 47% | 18% | 0% | | |
| | 2009 | n | 9 | 33 | 33 | 11 | 2 | 2.59 | 88 |
| | | % | 10% | 38% | 38% | 13% | 2.3% | | |

## Comparison of overall average science reasoning scores by classification and by year

| | | Year | | | | | |
|---|---|---|---|---|---|---|---|
| | | **2003** | **2004** | **2005** | **2007** | **2009** | **N** |
| Freshmen | n | 27 | 49 | 41 | 18 | 27 | 162 |
| | avg | 2.52 | 2.73 | 2.76 | 2.61 | 2.67 | |
| Sophomores | n | 21 | 46 | 50 | 14 | 17 | 148 |
| | avg | 2.76 | 3.07 | 2.46 | 2.57 | 2.53 | |
| Juniors | n | 14 | 27 | 26 | 23 | 21 | 111 |
| | avg | 2.93 | 3.04 | 2.31 | 2.96 | 2.52 | |
| Seniors | n | 6 | 19 | 12 | 30 | 23 | 90 |
| | avg | 2.50 | 3.32 | 2.17 | 2.73 | 2.61 | |

## Key findings

- Average scores by classification year were compared using ANOVA. No statistically significant differences were found by classification year.
- Average science reasoning scores by year were compared using ANOVA. The average score in 2009 was significantly lower than the average score in 2004 at $\alpha = .05$ level.
- Students' OSU grade point average and composite ACT score were found to correlate significantly with students' science reasoning scores.
- Regression analysis indicated students' OSU GPA and composite ACT score significantly predicted science reasoning scores (adjusted $R^2 = .15$, $F_{(2,73)} = 7.45$ $p < 0.01$, $n = 76$). The prediction equation is Science Reasoning = 0.288 + 0.053 * COMPOSITE ACT + 0.363 * OSU_GPA. Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

## Assessment of Written Communication Skills

### 2009 collection of writing samples

The Office of University Assessment and Testing supervised the collection of student writing artifacts in Spring 2009 for the Written Communication Skills Institutional Portfolio. Instructors from the following undergraduate courses contributed random samples of student work to the portfolio:

| Course No. | Course Name | General Education Designation (if any) | Number of artifacts randomly collected from one assignment | Number of artifacts reviewed | Number of artifacts used in data analysis |
|---|---|---|---|---|---|
| AGCM 3113 | Writing for Agricultural Communications | | 24 | 6 | 5 |
| AGEC 5343 | International Agricultural Markets and Trade | | 6 | 6 | 5 |
| AMST 3950 | America in International Perspective | H | 7 | 6 | 6 |
| AMST 4910 | The Jazz Age | | 12 | 0 | 0 |
| ANSI 3903 | Agricultural Animals of the World | I | 20 | 6 | 6 |
| ARCH 2003 | Architecture and Society | H, I | 20 | 6 | 6 |
| BAE 2012 | Intro to Engineering in Biological Systems | | 11 | 6 | 6 |
| CHE 2033 | Intro to Chemical Processes Engineering | | 20 | 6 | 6 |
| DHM 1433 | Innovation and Marketing of Fashion Products | | 55 | 6 | 6 |
| ECON 3903 | Economics of Energy and the Environment | S | 10 | 6 | 6 |
| ENGL 1113 | Composition I | | 18 | 6 | 6 |
| ENGL 3410 | Popular Fiction | H | 19 | 6 | 6 |
| ENGR 1111 | Intro to Engineering | | 15 | 6 | 6 |
| ENGR 1111 | Intro to Engineering | | 19 | 6 | 6 |
| ENGR 1111 | Intro to Engineering | | 20 | 6 | 6 |
| ENSC 3213 | Computer Based Systems in Engineering | | 30 | 3 | 3 |
| ENTO 2003 | Insects and Society | N | 20 | 4 | 4 |
| GEOG 4233 | Human Dimensions of Global Environmental Change | | 7 | 6 | 5 |
| HDFS 4793 | The Family: A World Perspective | S | 20 | 6 | 6 |
| HHP 3723 | Principles of Epidemiology | | 19 | 6 | 6 |
| HIST 3643 | The Jacksonian Era | H | 20 | 6 | 6 |
| HIST 3980 | Immigration, Race, and Nativism | | 4 | 4 | 4 |
| HIST 4513 | American Economic History | S | 20 | 3 | 3 |
| IEM 4163 | Service Systems and Processes | | 20 | 0 | 0 |
| MICR 3103 | Microbes: Friends or Foes | N | 27 | 3 | 3 |
| NREM 4990 | Ecology of Invasive Species | | 18 | 0 | 0 |
| NSCI 2211 | Professional Careers in Dietetics | | 20 | 6 | 6 |
| NSCI 4643 | Capstone for Nutritional Sciences | | 13 | 6 | 6 |
| PHIL 3513 | Social Philosophy | H | 20 | 6 | 6 |
| PLNT 2013 | Applied Plant Science | | 15 | 0 | 0 |
| TCOM 3153 | International Telecom Business Environment | I | 10 | 6 | 6 |
| | **Total Number of Writing Artifacts (samples)** | | **568** | **149** | **146** |

*The number of artifacts reviewed in 2009 was less than the number collected. The number of artifacts used in data analysis is less than the number reviewed because three artifacts were submitted by graduate students.

Artifacts were collected as in previous years. Artifacts selected for the Institutional Portfolio were coded and all identifying information was removed from the samples. Demographic data were collected for each artifact using the OSU student database; these data were collected for analysis purposes only and the information cannot be used to identify an individual. The student demographic information associated with the samples was not shared with reviewers prior to the reviews.

## 2009 written communication skills portfolio reviews

Six faculty reviewers for the written communication skills institutional portfolio conducted this assessment in June and July 2009. The portfolio reviewers included Ed Walkiewicz (English), Sohum Sohoni (Electrical and Computer Engineering), Lou Anella (Horticulture and Landscape Architecture), Jon Comer (Geography), Becky Damron (English), and Camille DeYong (Industrial Engineering). All portfolio reviewers met for two training sessions where they received background information on the procedure, and practiced scoring samples of student work using the written communication skills scoring rubric developed for this purpose in 2001 and revised in 2008. During these two initial sessions, reviewers discussed questions and concerns regarding use of the rubric, discussed scores given to samples of student work, and developed a common approach for evaluating student writing samples.

As with past groups of reviewers, by the end of training sessions with all reviewers present, the reviewers were scoring fairly consistently with little variation among individual members. The scoring committee then divided into two sub-groups: review group 1 undertook to review 76 artifacts, out of which two were removed because they were from graduate students; review group 2 reviewed 73 artifacts, out of which one was removed because it was from a graduate student. Scoring was done individually, and each sub-group then met to reach consensus scores where there was variation across individual scores. The final scores were then submitted to the office of University Assessment and Testing for compilation and interpretation.

## Written communication skills scores from each review group

| Review Group | Artifact Score | Number of Artifacts | Percent of Artifacts |
|---|---|---|---|
| #1 (74 artifacts scored) | 1 | 2 | 2.7% |
| | 2 | 29 | 39% |
| | 3 | 35 | 47% |
| | 4 | 7 | 9.5% |
| | 5 | 1 | 1.4% |
| #2 (72 artifacts scored) | 1 | 0 | 0.0% |
| | 2 | 28 | 39% |
| | 3 | 29 | 40% |
| | 4 | 12 | 17% |
| | 5 | 3 | 4.2% |

## Rubric for evaluating student written communication skills

The General Education Assessment Committee developed the following rubric for evaluating samples of student writing in 2001. In 2006, the rubric was re-organized to reflect the three components that were scored separately in the assessment. As a result of discussion during the scoring and consensus process, the Style and Mechanics component of the rubric was modified in 2008 to make more explicit the characteristics of appropriate documentation of resources. Consequently, the review committee used the rubric revised in 2008 during their evaluation.

Reviewers scored the artifacts independently and then met to develop a consensus score for each artifact; each artifact received an overall, whole-number score from 1 to 5. Reviewers also assigned a sub-score to each artifact for each of four components: content, organization, style/mechanics, and documentation.

## Learning Outcome: Graduates will be able to communicate effectively in writing.

| | Skill | Level of Achievement 1 | 2* | 3 | 4** | 5 |
|---|---|---|---|---|---|---|
| 1 | Content | Topic is poorly developed; support is only vague or general; ideas are trite; wording is unclear, simplistic; reflects lack of understanding of topic and audience; minimally accomplishes goals of the assignment. | | Topic is evident; some supporting detail; wording is generally clear; reflects understanding of topic and audience; generally accomplishes goals of the assignment. | | Topic/thesis is clearly stated and well developed; details/wording is accurate, specific, appropriate for the topic & audience, with no digressions; evidence of effective, clear thinking; completely accomplishes the goals of the assignment. |
| 2 | Organization | Most paragraphs are rambling and unfocused; no clear beginning or ending paragraphs; inappropriate or missing sequence markers.<br><br>No clear over-all organization | | Most paragraphs are focused; discernible beginning and ending paragraphs; some appropriate sequence markers.<br><br>Overall organization can be inferred and is appropriate for the assignment | | Paragraphs are clearly focused and organized around a central theme; clear beginnings and ending paragraphs; appropriate, coherent sequences and sequence markers.<br><br>Overall organization is clearly marked and is appropriate for the assignment |
| 3 | Style and mechanics | Inappropriate or inaccurate word choice; repetitive words and sentence types; inappropriate or inconsistent point of view and tone.<br><br>Frequent non-standard grammar, spelling, punctuation interferes with comprehension and writer's credibility. | | Generally appropriate word choice; variety in vocabulary and sentence types; appropriate point of view and tone.<br><br>Some non-standard grammar, spelling, and punctuation; errors do not generally interfere with comprehension or writer's credibility. | | Word choice appropriate for the task; precise, vivid vocabulary; variety of sentence types; consistent and appropriate point of view and tone.<br><br>Standard grammar, spelling, punctuation; no interference with comprehension or writer's credibility. |
| 4 | Documentation | Intext and ending documentation are generally inconsistent and incomplete; cited information is not incorporated into the document. | | Intext and ending documentation are generally clear, consistent, and complete; cited information is somewhat incorporated into the document. | | Intext and ending documentation are clear, consistent, and complete; cited information is incorporated effectively into the document. |

* Exhibits most characteristics of '1' and some of '3'
** Exhibits most characteristics of '3' and some of '5'

revised 5-14-08

## Student demographics associated with written communication artifacts, 2001- 2006, 2008-2009

| | | 2001-06, 2008 | | 2009 | | Years Combined | |
|---|---|---|---|---|---|---|---|
| | | no. of artifacts | pct | no. of artifacts | pct | no. of artifacts | pct |
| Number of Artifacts | # collected | 1301 | - | 158 | - | 1459 | - |
| | # scored | 1010 | - | 149 | - | 1159 | - |
| | # used in analysis | 994 | - | 146 | - | 1140 | - |
| Class | Freshman | 127 | 13% | 25 | 17% | 152 | 13% |
| | Sophomore | 192 | 19% | 19 | 13% | 211 | 19% |
| | Junior | 274 | 28% | 39 | 27% | 313 | 27% |
| | Senior | 401 | 40% | 63 | 43% | 464 | 41% |
| College | CAS | 312 | 31% | 40 | 27% | 352 | 31% |
| | CASNR | 115 | 12% | 15 | 10% | 130 | 11% |
| | SSB | 173 | 17% | 21 | 14% | 194 | 17% |
| | COE | 125 | 13% | 10 | 7% | 135 | 12% |
| | CEAT | 110 | 11% | 37 | 25% | 147 | 13% |
| | CHES | 133 | 13% | 20 | 14% | 153 | 13% |
| | UAS | 26 | 2.6% | 3 | 2.1% | 29 | 2.5% |
| Gender | Female | 545 | 55% | 61 | 42% | 606 | 53% |
| | Male | 447 | 45% | 85 | 58% | 532 | 47% |
| Admit Type | Regular (A, AR, L) | 626 | 63% | 93 | 67% | 719 | 63% |
| | Alternative Admit (F) | 38 | 3.8% | 2 | 1.4% | 40 | 3.5% |
| | Adult Admit (G) | 11 | 1.1% | 0 | 0% | 11 | 0.9% |
| | "Third Door" Admit (K) | 5 | 0.5% | 0 | 0% | 5 | 0.4% |
| | International (J) | 4 | 0.4% | 1 | 0.7% | 5 | 0.4% |
| | Transfer (M, MR) | 292 | 29% | 50 | 34% | 342 | 30% |
| | Other or Blank | 18 | 1.8% | 0 | 0% | 18 | 1.6% |
| ACT | <22 | 239 | 29% | 22 | 20% | 261 | 28% |
| | 22 to 24 | 217 | 27% | 30 | 27% | 247 | 27% |
| | 25 to 27 | 188 | 23% | 31 | 28% | 219 | 24% |
| | 28 to 30 | 115 | 14% | 14 | 13% | 129 | 14% |
| | >30 | 57 | 7.0% | 15 | 13% | 72 | 7.8% |
| OSU GPA | <2.0 | 46 | 4.6% | 16 | 11% | 62 | 5.4% |
| | 2.0 to 2.49 | 128 | 13% | 13 | 8.9% | 141 | 12% |
| | 2.50 to 2.99 | 222 | 22% | 39 | 27% | 261 | 23% |
| | 3.00 to 3.49 | 316 | 32% | 45 | 31% | 361 | 32% |
| | 3.50 to 4.00 | 280 | 28% | 33 | 23% | 313 | 28% |

## Written communication scores, 2009

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 2 | 57 | 64 | 19 | 4 | 2.77 | 146 |
| | | % | 1.4% | 39% | 44% | 13% | 2.7% | | |
| By Class | Freshmen | n | 0 | 12 | 9 | 4 | 0 | 2.68 | 25 |
| | | % | 0.0% | 48% | 36% | 16% | 0.0% | | 17% |
| | Sophomores | n | 1 | 8 | 6 | 3 | 1 | 2.74 | 19 |
| | | % | 5.3% | 42% | 32% | 16% | 5.3% | | 13% |
| | Juniors | n | 0 | 16 | 20 | 3 | 0 | 2.67 | 39 |
| | | % | 0.0% | 41% | 51% | 7.7% | 0.0% | | 27% |
| | Seniors | n | 1 | 21 | 29 | 9 | 3 | 2.87 | 63 |
| | | % | 1.6% | 33% | 46% | 14% | 4.8% | | 43% |
| By Class (regular admit Only) | Freshmen | n | 0 | 10 | 8 | 4 | 0 | 2.73 | 22 |
| | | % | 0.0% | 46% | 36% | 18% | 0.0% | | 24% |
| | Sophomores | n | 1 | 5 | 5 | 2 | 1 | 2.79 | 14 |
| | | % | 7.1% | 36% | 36% | 14% | 7.1% | | 15% |
| | Juniors | n | 0 | 5 | 11 | 2 | 0 | 2.83 | 18 |
| | | % | 0.0% | 28% | 61% | 11% | 0.0% | | 19% |
| | Seniors | n | 0 | 10 | 21 | 7 | 1 | 2.97 | 39 |
| | | % | 0.0% | 26% | 54% | 18% | 2.6% | | 42% |
| By Transfer Status | Native Students* | n | 1 | 32 | 46 | 15 | 2 | 2.84 | 96 |
| | | % | 1.0% | 33% | 48% | 16% | 2.1% | | 66% |
| | Transfer Students | n | 1 | 25 | 18 | 4 | 2 | 2.62 | 50 |
| | | % | 2.0% | 50% | 36% | 8.0% | 4.0% | | 34% |

*Native students refers to freshmen who started at OSU as first-time freshmen.

## Average component scores for sub-areas of written communication for 2009

| Component | Content | Organization | Style/Mechanics | Documentation |
|---|---|---|---|---|
| Average Score | 2.97 (N=146) | 2.90 (N=146) | 2.80 (N=146) | 2.72 (N=91) |

**Component scores and weights by reviewer: written communication**

| | Content | | Organization | | Style / Mechanics | |
|---|---|---|---|---|---|---|
| Reviewer | mean | β weight | mean | β weight | mean | β weight |
| Team 1 | | | | | | |
| 1 | 2.99 | 0.40* | 2.95 | 0.07 | 2.95 | 0.47* |
| 2 | 2.89 | 0.30* | 3.00 | 0.38* | 3.01 | 0.24* |
| 3 | 3.11 | 0.32* | 3.16 | 0.20 | 2.90 | 0.36* |
| Team 2 | | | | | | |
| 4 | 3.04 | 0.37* | 2.82 | 0.27* | 2.86 | 0.29* |
| 5 | 2.81 | 0.48* | 2.58 | 0.28* | 2.26 | 0.32* |
| 6 | 2.97 | 0.14 | 2.91 | 0.35* | 2.84 | 0.44* |

*$p < 0.05$ on individual-level regression with overall score as the dependent variable.

## Written communication skills scores, 2001-2006, 2008-2009 (years combined)

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 45 | 382 | 477 | 201 | 35 | 2.82 | 1140 |
| | | % | 3.9% | 34% | 42% | 18% | 3.1% | | |
| By Class | Freshmen | n | 10 | 64 | 58 | 18 | 2 | 2.59 | 152 |
| | | % | 6.6% | 42% | 38% | 12% | 1.3% | | 13% |
| | Sophomores | n | 13 | 68 | 89 | 33 | 8 | 2.79 | 211 |
| | | % | 6.2% | 32% | 42% | 16% | 3.8% | | 19% |
| | Juniors | n | 9 | 113 | 136 | 49 | 6 | 2.78 | 313 |
| | | % | 2.9% | 36% | 44% | 16% | 1.9% | | 28% |
| | Seniors | n | 13 | 137 | 194 | 101 | 19 | 2.95 | 464 |
| | | % | 2.8% | 30% | 42% | 22% | 4.1% | | 41% |
| By Class (regular admit only) | Freshmen | n | 6 | 55 | 52 | 16 | 2 | 2.64 | 131 |
| | | % | 4.6% | 42% | 40% | 12% | 1.5% | | 18% |
| | Sophomores | n | 7 | 47 | 67 | 24 | 6 | 2.83 | 151 |
| | | % | 4.6% | 31% | 44% | 16% | 4.0% | | 21% |
| | Juniors | n | 3 | 52 | 85 | 28 | 4 | 2.87 | 172 |
| | | % | 1.7% | 30% | 49% | 16% | 2.3% | | 24% |
| | Seniors | n | 2 | 69 | 119 | 62 | 13 | 3.06 | 265 |
| | | % | 1.8% | 26% | 45% | 23% | 4.9% | | 37% |

*ANOVA analysis indicated statistically significant differences between average scores of freshmen and seniors for both overall and for regular admits only ($p < .001$), between juniors and seniors for overall admits ($p < .05$) and statistically significantly differences between sophomores and seniors for regular admits ($p < .05$).

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| By Transfer Status | Native Students* | n | 31 | 256 | 343 | 141 | 27 | 2.85 | 798 |
| | | % | 3.9% | 32% | 43% | 18% | 3.4% | | 70% |
| | Transfer Students | n | 14 | 126 | 134 | 60 | 8 | 2.77 | 342 |
| | | % | 4.1% | 37% | 39% | 18% | 2.3% | | 30% |

*Native students refers to freshmen who started at OSU as first-time freshmen

## Average component scores for sub-areas of written communication for 2006, 2008–2009*:

| Component | Content | Organization | Style/Mechanics | Documentation** |
|---|---|---|---|---|
| Average Score | 2.92 (N=436) | 2.75 (N=436) | 2.71 (N=436) | 2.53 (N=210) |

*Written communication sub-scores unavailable prior to 2006.
**'Documentation' sub-area added in 2008.

## Comparison of overall average written communication scores by year

| | | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | **Avg** | **N** |
| Overall Scores | Overall | n | 45 | 382 | 477 | 201 | 35 | 2.82 | 1140 |
| | | % | 3.9% | 34% | 42% | 18% | 3.1% | | |
| By Year | 2001 | n | 2 | 28 | 36 | 15 | 5 | 2.92 | 86 |
| | | % | 2.3% | 33% | 42% | 17% | 5.8% | | |
| | 2002 | n | 11 | 26 | 53 | 20 | 1 | 2.77 | 111 |
| | | % | 9.9% | 23% | 48% | 18% | 0.9% | | |
| | 2003 | n | 8 | 64 | 99 | 48 | 6 | 2.91 | 225 |
| | | % | 3.6% | 28% | 44% | 21% | 2.7% | | |
| | 2004 | n | 6 | 37 | 53 | 33 | 11 | 3.04 | 140 |
| | | % | 4.3% | 26% | 38% | 24% | 7.9% | | |
| | 2005 | n | 7 | 41 | 65 | 23 | 6 | 2.86 | 142 |
| | | % | 4.9% | 29% | 46% | 16% | 4.2% | | |
| | 2006 | n | 2 | 25 | 51 | 30 | 1 | 3.03 | 109 |
| | | % | 1.8% | 23% | 47% | 28% | 0.9% | | |
| | 2008 | n | 7 | 105 | 55 | 13 | 1 | 2.43 | 181 |
| | | % | 3.9% | 58% | 30% | 7.2% | 0.6% | | |
| | 2009 | n | 2 | 57 | 64 | 19 | 4 | 2.77 | 146 |
| | | % | 1.4% | 39% | 44% | 13% | 2.7% | | |

## Comparison of overall average written communication scores by classification and by year

| | | | Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2008** | **2009** | **N** |
| | Freshmen | n | 15 | 23 | 31 | 19 | 16 | 6 | 17 | 25 | 152 |
| | | avg | 2.47 | 2.65 | 2.58 | 2.74 | 2.69 | 2.67 | 2.24 | 2.68 | |
| | Sophomores | n | 20 | 14 | 48 | 25 | 35 | 10 | 40 | 19 | 211 |
| | | avg | 2.90 | 2.57 | 2.79 | 3.32 | 2.83 | 2.90 | 2.43 | 2.74 | |
| | Juniors | n | 20 | 34 | 52 | 39 | 46 | 38 | 45 | 39 | 313 |
| | | avg | 3.00 | 2.82 | 3.04 | 2.74 | 2.65 | 2.92 | 2.44 | 2.67 | |
| | Seniors | n | 31 | 40 | 94 | 57 | 45 | 55 | 79 | 63 | 464 |
| | | avg | 3.10 | 2.85 | 3.01 | 3.23 | 3.16 | 3.16 | 2.46 | 2.87 | |

## Key findings

- ANOVA analysis of average scores by year indicated average scores for 2009 were significantly higher than those for 2008 ($p < .05$) but not significantly different from average scores for other years (2001-2006).
- Average scores for 2009 by classification year were compared using ANOVA. No statistically significant differences were found by classification year.

- Average scores by classification and by year were compared using ANOVA. No statistically significant differences were found between 2009 and other years for any level of classification at $\alpha = .05$ level.
- Average scores by transfer status were compared using independent T test, and no statistically significant difference were found between native (students who start their career at OSU) and transfer students.
- Regression analysis indicated that students' ACT English score and OSU grade point average significantly predicted writing scores (adjusted $R^2 = .18$, $F_{(2,109)} = 12.77$, $p < 0.001$, $n = 112$). The prediction equation is Writing = 0.913 + 0.039 * ACT_ENGLISH + 0.301*OSU_GPA. Cohen (1988) proposed $R^2$ values of 0.26, 0.13, and 0.0196 as "large," "medium," and "small," respectively.

## General Education Institutional Portfolios Overview

The numbers of samples scored and used in analysis for each institutional portfolio developed in 2001-2009 are shown below. Institutional Portfolios for written communication skills assessment were developed in 2001 (pilot test year), 2002, 2003, 2004, 2005, 2006, 2008 and 2009; portfolios for math problem-solving skills were developed in 2002 (pilot test year), 2003, 2005 and 2007; and portfolios for science problem-solving skills were developed in 2003 (pilot test year), 2004, 2005, 2007 and 2009. An Institutional Portfolio for assessment of critical thinking was assessed in 2004 (pilot test year), 2005, 2006, 2007, 2008 and 2009. An Institutional Portfolio for assessment of students' achievement of the diversity learning goal was pilot tested in 2006 and assessed in 2007, 2008 and 2009; 2006 results are not reported because the primary work of the committee was to develop a rubric for the assessment.

## Number of samples in each portfolio, 2001-2009

| | Portfolio Type | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **Written Communication Skills** | **Math Problem-Solving Skills** | **Science Problem-Solving Skills** | **Critical Thinking Skills** | **Diversity Learning Outcomes** | **Total number of samples - all portfolios** |
| 2001 | 86 | - | - | - | - | 86 |
| 2002 | 111 | 76 | - | - | - | 187 |
| 2003 | 225 | 268 | 68 | - | - | 561 |
| 2004 | 140 | - | 141 | - | - | 281 |
| 2005 | 142 | 189 | 129 | 141 | - | 601 |
| 2006 | 109 | - | - | 106 | - | 215 |
| 2007 | - | - | 85 | 164 | 69 | 318 |
| 2008 | 181 | - | - | 152 | 44 | 377 |
| 2009 | 146 | - | 88 | 155 | 71 | 460 |
| **All Years** | **1140** | **533** | **511** | **718** | **184** | **3086** |

## Overall portfolio scores for subject-area portfolios, years combined

| | | Score | | | | |
|---|---|---|---|---|---|---|
| | **Artifacts** | **1** | **2** | **3** | **4** | **5** |
| **Critical Thinking Skills** (2005-2009) | N | 21 | 209 | 376 | 109 | 3 |
| | % | 2.9% | 29% | 52% | 15% | 0.4% |
| **Diversity Learning Outcomes** (2007, 2008, 2009) | N | 22 | 62 | 60 | 37 | 3 |
| | % | 12% | 34% | 33% | 20% | 1.6% |
| **Math Problem-Solving Skills** (2002, 2003, 2005) | N | 60 | 155 | 159 | 118 | 41 |
| | % | 11% | 29% | 30% | 22% | 7.7% |
| **Science Problem-Solving Skills** (2003, 2004, 2005, 2007, 2009) | N | 36 | 183 | 194 | 89 | 9 |
| | % | 7.0% | 36% | 38% | 17% | 1.8% |
| **Written Communication Skills** (2001-2006, 2008, 2009) | N | 45 | 382 | 477 | 201 | 35 |
| | % | 3.9% | 34% | 42% | 18% | 3.1% |

The development of the critical thinking skills institutional portfolio has provided opportunities for useful discussion among faculty about ways to develop and assess students' critical thinking skills in the classroom. The committee will continue to engage other faculty members in interpretation and analysis of the results as well as discussion about action for improvement of students' achievement. The component scores provide especially useful information for focusing efforts to improve students' critical thinking skills.

The portfolio to assess students' knowledge, skills and attitudes regarding diversity has not reached sufficient sample size to provide assessment results that can be generalized. However, the assessment process has resulted in many useful conversations among faculty about how to develop class activities and assignments to facilitate students' achievement of desired knowledge, skills and attitudes. The addition of the "D" general education designation and requirement should result in additional courses from which to sample student work, thus allowing the portfolio to expand more quickly in future years.

The portfolio for science reasoning also has the potential to provide useful information for assessing student achievement of general education learner goals, and results will continue to be discussed with faculty for development of recommendations for improvement. However, the science portfolio is different from the critical thinking and diversity portfolios in some important ways. Unlike the other samples, which are collected from courses across the undergraduate curriculum, science artifacts can only be obtained from a limited number of lower division courses. Students in some majors that are not related to science may choose to take as few as two science courses to meet general education requirements, and would generally not be expected to demonstrate science problem-solving skills in other courses. Also, the variability in the level of difficulty of the problems presented to students in courses from which artifacts can be obtained adds to the difficulty in holistically evaluating these skills using work produced in a range of courses. The General Education Assessment Committee will further consider these unique characteristics in the continued development of these and other institutional portfolios.

The written communication skills institutional portfolio is developing into an effective assessment tool. The increased sample size in this portfolio has allowed more confidence in the analysis and implications of the results. Much like the critical thinking portfolio, the component scores provide especially useful information for focusing efforts to improve students' writing abilities. Although no significant improvement in writing skills is indicated over the combined six year period, the impact of curricular changes implemented in 2005 should become apparent over the next few years.

## Proposed General Education Assessment Activity for 2009-2010

A. The Committee plans to continue the institutional portfolio for assessing student critical thinking skills. The committee recommends that two portfolio-scoring groups each review about 80 samples of randomly collected student work demonstrating critical thinking skills. Because each group consists of three faculty members, this will require six faculty reviewers for the 2010 critical thinking portfolio (two Committee members and four additional faculty reviewers).

B. The Committee plans to continue the institutional portfolio to evaluate students' written communication skills. The Committee recommends that 2 portfolio-scoring groups, consisting of 3 faculty members, evaluate the written communication skills portfolio (two Committee members and four additional faculty reviewers).

C. The Committee plans to continue the institutional portfolio to assess students' learning about diversity. The Committee recommends that 1 portfolio-scoring group, consisting of 3 faculty members, evaluate the diversity portfolio (one Committee member and two additional faculty reviewers).

D. The Committee plans to continue three series of faculty development workshops, with each series to focus on one of the portfolio topics to be assessed in Summer 2010 (Critical Thinking, Diversity, and Written Communication). Faculty participants will be asked to create or revise a class assignment to produce an example of student work that demonstrates the desired learning goal. A sample of student work will be collected from each assignment and included in the assessment in Summer 2010. Faculty participants will continue to be paid a stipend for their work.