GENERAL EDUCATION ASSESSMENT COMMITTEE ANNUAL REPORT, 2004

2004 General Education Assessment Committee Membership

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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. OSU's general education assessment efforts have been motivated by these requirements. 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, and 2004), math problem solving skills (data collection in 2002 and 2003), and science problem solving skills (data collection in 2003 and 2004). The Committee will begin developing an institutional portfolio for

assessment of students' critical thinking in 2005, using a rubric pilot tested in 2004. Separate portfolios are developed to evaluate each general education learner goal, and each portfolio includes students' work from course assignments collected throughout 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*.

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. When completed, the database will provide 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.

During the past academic year the General Education Designation Request form has been reconstructed to align with future institutional software. This form provides the data records that comprise the General Education Course Database. The existing database is currently being merged into the new database so that future analysis can include information gathered prior to conversion of the General Education Designation Request Form.

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

Committee Goals for 2004

A. The Committee planned to continue development of the institutional portfolio for assessing student written communication skills as in previous years. The committee recommended that two portfolio-scoring groups each review about 70 samples of randomly collected student work demonstrating written communication skills. Because each group consists of three faculty members, this required six faculty reviewers for the 2004 written communication skills portfolio (two Committee members and four additional faculty reviewers).

B. The Committee also projected continuation of the institutional portfolio for evaluating students' science problem solving skills as pilot-tested in 2003. The committee recommended that a portfolio-scoring group, consisting of three faculty members, evaluate the science skills portfolio (two Committee members and one additional faculty reviewers). It was expected that this group of reviewers could review about 150 samples of student work demonstrating science problem solving skills.

C. The Committee planned to develop and pilot-test an institutional portfolio to evaluate student critical thinking skills. Two Committee members worked on this portfolio with assistance from one additional faculty reviewer.

Assessment of Written Communication Skills

2004 collection of writing samples

The University Assessment and Testing Office supervised the collection of student writing artifacts for the Written Communication Skills Institutional Portfolio in Spring 2004. Instructors from the following undergraduate courses contributed random samples of student work to the 2004 written communication 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
AGEC 3323	Ag Product Marketing and Sales		10	2	0
AGED 3203	Planning the Community Program in Ag Ed		10	10	9
BCOM 3113	Written Communication		11	11	11
BCOM 3113	Written Communication		10	10	10
CIVE 3813	Environmental Engineering Science		10	10	10
ECON 3823/ HIST 4513	American Economic History	S	10	10	10
ENGL 1413	Critical Analysis and Writing II		9	9	8
ENGL 4520	Problems in English: Pursuing Postmodernism		10	10	10
GEOG 1113	Introduction to Cultural Geography	I, S	10	10	10
HDFS 3453	Management of Human Service Programs		10	10	10
HHP 2213	Principles in Health Ed & Health Promotion		12	12	12
HIST 1103	Survey of American History		10	10	10
PHIL 3803	Business Ethics	H	10	10	10
POLS 3953	Minorities in the American Political System	S	10	10	10
SOIL 4463	Soil and Water Conservation		10	10	10
	Total Number of Writing Artifacts (samples)		**152**	**144**	**140***

*The number of artifacts reviewed in 2004 was less than the number collected because the student information could not be found in OSU Student Information System databases (n=1), or the student was determined to be a graduate student (n=1). In one course, it was decided that all samples would not be evaluated because they did not meet the criteria for assessment (n=10).

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.

2004 written communication skills portfolio reviews

Six faculty reviewers for the written communication skills institutional portfolio met and completed their work in May and June 2004. The portfolio reviewers included Frances Griffin (Business Management), Rick Rohrs (History), Jon Comer (Geography), Sarah Price (Physical Education), Stacy Thompson (Human Development and Family Science), and Dwayne Cartmell (Agricultural Education, Communications, and 4-H Youth Development).

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. 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. Sixteen artifacts were scored during the training session. The scoring committee then divided into two sub-groups, each of which undertook to score 64 artifacts. Scoring was done individually, and each sub-group then met to reach consensus scores where there was variation in individual scores. The final scores were then submitted to the Assessment and Testing Office for compilation and interpretation.

Written communication skills scores from each review group

Review Group	Artifact Score	Number of Artifacts	Percent of Artifacts
#1 (64 artifacts scored)	1	6	9%
	2	16	25%
	3	23	36%
	4	15	23%
	5	4	6%
#2 (64 artifacts scored)	1	0	0%
	2	16	25%
	3	25	39%
	4	16	25%
	5	7	11%
16 artifacts scored during training	1	0	0%
	2	6	38%
	3	8	50%
	4	2	13%
	5	0	0%

Rubric for evaluating student written communication skills

The General Education Assessment Committee developed the following rubric for evaluating samples of student writing in 2001. Minor revisions were made to the rubric in 2004; the revised rubric is provided below. 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.

Score	Characteristics	
5	Content & Organization	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
		Paragraphs are clearly focused and organized around a central theme; clear beginnings and endings; appropriate, coherent sequences and sequence markers
	Style & Mechanics	Word choice appropriate for the task; precise, vivid vocabulary; variety of sentence types; consistent and appropriate point of view and tone
		Standard grammar, spelling, punctuation; no interference with comprehension or writer's credibility
4	Exhibits some characteristics of “3” and some characteristics of “5”	
3	Content & Organization	Topic is evident; some supporting detail; wording is generally clear; reflects understanding of topic and audience; generally accomplishes goals of the assignment
		Most paragraphs are focused; discernible beginning and ending paragraphs; some sequence markers
	Style & Mechanics	Generally appropriate word choice; variety in vocabulary and sentence types; appropriate point of view and tone
		Some non-standard grammar, spelling, and punctuation; errors do not generally interfere with comprehension or writer's credibility
2	Exhibits some characteristics of “1” and some characteristics of “3”	
1	Content & Organization	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
		Most paragraphs are rambling and unfocused; no clear beginning or ending; inappropriate or missing sequence markers
	Style & Mechanics	Inappropriate or inaccurate word choice; repetitive words and sentence types; inappropriate or inconsistent point of view and tone
		Frequent non-standard grammar, spelling, punctuation interferes with comprehension and writer's credibility

Student demographics associated with written communication skills artifacts, 2001- 2004

		2001-03		2004		All Years	
		no. of artifacts	pct	no. of artifacts	pct	no. of artifacts	pct
Number of Artifacts	# collected	521	-	152	-	673	-
	# scored	431	-	144	-	575	-
	#used in analysis	422	-	140	-	562	-
Class	Freshman	69	16%	19	14%	88	16%
	sophomore	82	19%	25	17.9%	107	19%
	junior	106	25%	39	27.9%	145	26%
	senior	165	39%	57	40.7%	222	40%
College	CAS	158	37%	38	27%	196	35%
	CASNR	52	12%	24	17%	76	14%
	CBA	67	16%	31	22%	98	17%
	COE	54	13%	13	9.3%	67	12%
	CEAT	34	8.1%	15	11%	49	8.7%
	CHES	43	10%	15	11%	58	10%
	UAS	8	1.9%	4	2.9%	12	2.1%
Gender	female	226	54%	73	52%	299	53%
	male	196	46%	65	46%	261	46%
Admit Type	Regular (A, AR)	256	61%	78	56%	334	59%
	Alternative Admit (F)	18	4.3%	4	2.9%	22	3.9%
	Adult Admit (G)	4	.9%	4	2.9%	8	1.4%
	"Third Door" Admit (K)	3	.7%	2	1.4%	5	.9%
	International (J)	2	.5%	1	.7%	3	.5%
	Transfer (M, MR)	123	29%	47	34%	170	30%
	Other or Blank	8	1.9%	4	2.9%	12	2.1%
ACT	<22	98	23%	38	36%	136	30%
	22 to 24	97	23%	29	21%	126	22%
	25 to 27	81	19%	20	14%	101	18%
	28 to 30	52	12%	17	12%	69	12%
	>30	25	5.9%	1	.7%	26	4.6%
OSU GPA	<2.0	24	5.7%	7	5%	31	5.5%
	2.0 to 2.49	54	13%	19	14%	73	13%
	2.50 t0 2.99	81	19%	46	33%	127	23%
	3.00 to 3.49	144	34%	31	22%	175	31%
	3.50 to 4.00	118	28%	37	26%	155	28%

Student demographics associated with written communication skills artifacts, 2001- 2004
(continued)

College	Major	No. of Artifacts
CASNR	AGBU	14
	AGCM	4
	AGEC	8
	AGED	17
	ANSI	16
	BIMB	6
	ENVR	5
	LCON	1
	PASS	5
	all	76
CAS	AMSD	2
	ART	15
	BIOC	5
	BIOL	6
	CDIS	3
	CHEM	3
	CLML	1
	CS	3
	ECON	1
	ENGL	32
	GEOL	3
	HIST	3
	JB	20
	MATH	2
	MUSC	1
	PHIL	3
	PHSL	1
	PHYS	1
	POLS	22
	PREP	2
	PSYC	6
	SOC	4
	SPAN	2
	UND	49
	WLDL	2
	ZOOL	4
	all	196
UAS	UAAA	8
	UAAD	4
	UAAS	1
	UACC	3
	UATP	1
	UAUN	1
	all	18

College	Major	No. of Artifacts
CBA	ACCT	12
	ECON	10
	FIN	3
	GNBU	10
	INBU	4
	MGMT	12
	MIS	6
	MKTG	20
	MSCS	1
	UND	20
	all	98
COE	ATRN	2
	AVED	3
	EDUCncrt	1
	ELEM	15
	HLTH	13
	HPRO	12
	LEIS	3
	PHED	2
	SCED	14
	UND	2
	all	67
CEAT	ARCE	1
	ARCH	7
	BAE	1
	CHEN	5
	CIVE	16
	CMT	1
	ELEN	3
	ET	1
	FPST	6
	IEM	1
	MEEN/AERS	4
	MET	2
	UND	1
	all	49
CHES	DHM	5
	FRCD/HDFS	29
	HRAD	5
	NSCI	18
	UND	1
	all	58

Written communication skills scores, 2001 - 2004 (years combined)

			Score 1	2	3	4	5	Avg	n
Overall Scores	Overall	n	27	155	241	116	23	2.92	562
		%	4.8%	27.6%	42.9%	20.6%	4.1%		
By Class	Freshmen	n	8	31	37	11	1	2.61	88
		%	9.1%	35.2%	42.0%	12.5%	1.1%		
	Sophomores	n	5	30	48	18	6	2.91	107
		%	4.7%	28.0%	44.9%	16.8%	5.6%		
	Juniors	n	7	41	61	31	5	2.90	145
		%	4.8%	28.3%	42.1%	21.4%	3.4%		
	Seniors	n	7	53	95	56	11	3.05	222
		%	3.2%	23.9%	42.8%	25.2%	5.0%		
By Class (regular admit only)	Freshmen	n	4	26	32	8	0	2.63	70
		%	5.7%	37.1%	45.7%	11.4%	0		
	Sophomores	n	2	18	33	14	5	3.03	72
		%	2.8%	25.0%	45.8%	19.4%	6.9%		
	Juniors	n	2	14	37	13	2	2.99	68
		%	2.9%	20.6%	54.4%	19.1%	2.9%		
	Seniors	n	2	25	51	31	7	3.14	116
		%	1.7%	21.6%	44.0%	26.7%	6.0%		
By Transfer Status	Native Students* (domestic only)	n	19	104	172	79	18	2.93	392
		%	4.8%	26.5%	43.8%	20.1%	4.5%		
	Transfer Students	n	8	51	69	37	5	2.89	170
		%	7.4%	30%	40.5%	21.7%	2.9%		

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

Key findings

- Writing scores for samples from freshmen had significantly lower scores than writing samples for seniors (n=562, $p<0.05$); 44% of the freshmen writing samples had scores of "1" or "2" and 56% had scores of "3" or higher. In contrast, 73% of writing samples from seniors received a score of "3" or higher. When only regularly admitted students were included in the analysis (i.e., excluding transfer, international, and alternatively admitted students), the contrast was even more pronounced. Considering only regularly admitted students, 77% of work produced by seniors received scores of 3 or higher.

- Although students who start their career at OSU ("native" OSU students) are slightly more likely to receive high scores on their writing samples, there is no statistically significant difference between the writing scores of native and transfer students, even when only regularly admitted native students are considered in the comparison.

Assessment of Science Problem-Solving Skills

2004 collection of science samples

The University Assessment and Testing Office supervised the collection of artifacts for the Science Problem-Solving Skills Institutional Portfolio in Spring 2004 using methods described in previous annual reports. As with the other portfolios, the artifacts were collected from introductory-level sciences courses that are part of the general education course offerings. Instructors from the following courses contributed artifacts to the 2004 science problem-solving skills institutional portfolio:

Three faculty reviewers for the science problem-solving skills institutional portfolio met and completed their work in June and July 2004. The portfolio reviewers included John Gelder (Chemistry), Ed Walkiewicz (English), and Nigel Jones (Architecture).

Course No.	Course Name	General Education Designation (if any)	Number of artifacts randomly collected	Number of artifacts reviewed	Number of artifacts used in data analysis
BOT 1404	Plant Biology	N	25	0	0
CHEM 1314	General Chemistry	L, N	26	26	26
CHEM 1515	General Chemistry	L, N	26	26	24*
GEOG 1114	Physical Geography	L, N	78	26	26
MICR 1513	Inquiry-Based Biology	L, N	26	0	0
NSCI 2114	Principles of Human Nutrition	N	26	0	0
PHYS 1014	Descriptive Physics	N	25	25	25
PHYS 1313	Inquiry-Based Physics	L, N	15	15	15
RLEM 2913	Ecology and Natural Resources	N	24	0	0
ZOOL 3123	Human Heredity	N	25	25	25
	Total Number of Science Artifacts (samples)		**296**	**143**	**141**

The artifacts collected from BOT 1404, MICR 1513, NSCI 2114, and RLEM 2913 were determined to not be appropriate for assessing science problem-solving skills using this method and were not scored or included in analysis. *Two artifacts could not be scored due to missing information.

Rubric for evaluating students' science problem-solving skills

The General Education Assessment Committee developed the following rubric for evaluating students' science problem-solving skills in 2003, and made minor revisions in 2004. 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. Scores of "2" indicate work that has some elements of "1" and some elements of "3." Scores of "4" indicate work that has some elements of "3" and some elements of "5."

Rubric for evaluating students' science problem solving skills

Aspects	(1)	(3)	(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; Organizes the response in a manner that 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 the language of science 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 possesses 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 an appropriate graphical or tabular format; Provides a 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 make attempt to apply appropriate solution; Adopts inappropriate strategy for solving the problem; Attempts to use irrelevant information; Fails to provide a graphical representation of the mathematical thought process or provides an incorrect one.	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 they 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.

Student demographics associated with science problem solving skills artifacts, 2003-2004

		2003		2004		Total Years	
		no. of artifacts	pct	no. of artifacts	pct	no. of artifacts	Pct
Number of Artifacts	# collected	165	-	296	-	461	-
	# scored	68	-	143	-	211	-
	#used in analysis	68	-	141	-	209	-
Class	freshman	27	39.7%	49	34.8%	76	36.4%
	sophomore	21	30.9%	46	32.6%	67	32.1%
	junior	14	20.6%	27	19.1%	41	19.6%
	senior	6	8.8%	19	13.5%	25	12.0%
College	CAS	19	27.9%	59	42.6%	78	37.3%
	CASNR	17	25.0%	38	26.2%	55	26.3%
	CBA	0	0%	9	6.4%	9	4.3%
	COE	22	32.4%	22	15.6%	44	21.1%
	CEAT	6	8.8%	8	5.7%	14	6.7%
	CHES	2	2.9%	5	3.5%	7	3.3%
	UAS	2	2.9%	0	0	2	1.0%
Gender	female	45	66.2%	90	63.8%	135	64.6%
	male	23	33.8%	51	36.2%	74	35.4%
Admit Type	Regular (A, AR)	47	69.1%	96	68.1%	143	68.4%
	Alternative Admit (F)	4	5.9%	4	2.8%	8	3.8%
	Adult Admit (G)	0	0%	0	0%	0	0%
	"Third Door" Admit (K)	0	0%	0	0%	0	0%
	International (J)	1	1.5%	3	2.1%	4	1.9%
	Transfer (M, MR)	15	22.1%	34	24.1%	49	23.4%
	Other or Blank	1	1.5%	4	2.8%	5	2.4%
ACT	<22	18	31.0%	28	24.6%	46	26.7%
	22 to 24	16	27.5%	34	29.8%	50	29.1%
	25 to 27	13	22.4%	32	28.1%	45	26.2%
	28 to 30	6	10.3%	15	13.1%	21	12.2%
	>30	5	8.6%	5	4.4%	10	5.8%
OSU GPA	<2.0	3	4.4%	10	7.1%	13	6.2%
	2.0 to 2.49	11	16.1%	13	9.2%	24	11.5%
	2.50 t0 2.99	16	23.5%	36	25.5%	52	24.9%
	3.00 to 3.49	20	29.4%	35	24.9%	55	26.3%
	3.50 to 4.00	18	26.4%	47	33.3%	65	31.1%

Science problem-solving skills scores, 2003-2004

			Score						
			1	**2**	**3**	**4**	**5**	**Avg**	**N**
Overall Scores	Overall	n	5	70	83	47	4	2.88	209
		%	2.4%	33.5%	39.7%	22.5%	1.9%		
By Class	Freshmen	n	2	32	32	10	0	2.66	76
		%	2.6%	42.1%	42.1%	13.2%	0		
	Sophomores	n	3	19	24	19	2	2.97	67
		%	4.5%	28.4%	35.8%	28.4%	3.0%		
	Juniors	n	0	12	18	10	1	3.00	41
		%	0	29.3%	43.9%	24.4%	2.4%		
	Seniors	n	0	7	9	8	1	3.12	25
		%	0	28.0%	36.0%	32.0%	4.0%		
By Class (regular admits only)	Freshmen	n	2	29	29	9	0	2.65	69
		%	2.9%	42.0%	42.0%	13.0%	0		
	Sophomores	n	3	11	17	14	0	2.93	45
		%	6.7%	24.4%	37.8%	31.1%	0		
	Juniors	n	0	4	8	5	1	3.17	18
		%	0	22.2%	44.4%	27.8%	5.6%		
	Seniors	n	0	1	3	6	1	3.64	11
		%	0	9.1%	27.3%	54.5%	9.1%		
By Transfer Status	Native Students* (domestic only)	n	5	50	61	37	3	2.89	156
		%	3.2%	32%	39.1%	23.7%	1.9%		
	Transfer Students	n	0	16	19	10	1	2.91	46
		%	0	34.8%	41.3%	21.7%	2.2%		

*all domestic native students, regardless of admit type

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

Key findings

- The science problem-solving skills portfolio is limited to assessing science problem-solving skills of students, primarily freshmen and sophomores, in entry-level science courses. The data are too limited at this point to make generalizations about students' science problem-solving skills, but this approach appears to be promising for this type of assessment.

- Science scores from the institutional portfolio were significantly correlated with OSU GPA, classification, credit hours earned from OSU, and cumulative hours earned ($n=141$, $p<0.01$); and with ACT Composite scores and ACT Reading sub-scores ($n=141$, $p<0.05$).

Assessment of Critical Thinking Skills

Background information regarding assessment of critical thinking

The criteria and goals for each General Education area designation include some aspect of critical thinking as part of their desired results. For example, those courses designated with an "A" (analytical and quantitative thought) list as their first goal that "Students will critically analyze and solve problems using quantitative, geometric, or logical models." Those courses designated with "H" (humanities) have the goal that "Students will critically analyze the relationships of aesthetics, ideas, or cultural values to historic and contemporary cultures." Similar goals are stated for those courses designated as social and behavioral sciences ("S"), natural sciences ("N"), contemporary international cultures ("I"), and scientific investigation ("L").

The General Education Assessment Committee focused on assessment of critical thinking as one of the committee's primary tasks over the summer of 2004. In addressing this topic, the committee took an approach similar to that previously taken in the development of rubrics to assess writing, math, and science problem-solving skills.

Development of critical thinking assessment plan

A sub-committee of the General Education Assessment Committee was formed to develop a quantitative measure that could be used to determine the extent to which the General Education program is achieving the stated goal of developing the critical thinking skills of OSU students. The instrument is intended for use in institution-level assessment, as part of the institutional portfolio, but it is hoped that it will also gain acceptance as a tool for faculty to assess critical thinking at the course- and assignment-level as well.

The development process involved the following steps:

1. Review of published information from peer institutions and researchers on assessment of critical thinking in an academic setting,
2. Participation in AAHE Critical Thinking Assessment Workshop (June 12),
3. Review of critical thinking assessment efforts on the OSU campus,
4. Development of draft rubric,
5. Pilot study applying draft rubric to artifacts already in hand,
6. Revision of rubric based on the pilot study, and
7. Development of a summary report of these activities.

The committee concluded that a campus-wide discussion of critical thinking and its assessment, parallel with this effort to develop a measurement process, would be valuable. These activities would be analogous to the "writing across the curriculum" efforts of previous years. A plan was developed to begin a series of "brown-bag" seminars on campus, with the purpose of introducing the findings of the committee, including the critical thinking assessment rubric, bringing in speakers with experience in teaching and assessing critical thinking at the college level, and highlighting the efforts of OSU faculty currently having success in assessing the critical thinking development of their students. Plans for these campus-wide efforts are presented below.

A pilot study using the rubric developed to assess critical thinking

The committee has focused particularly on efforts to assess critical thinking at the university or institution level. This, of course, ultimately involves assessing critical thinking at the course and assignment level. But institution-level assessment requires a broader approach that is not discipline specific. The literature on critical thinking and its assessment in educational settings is large and highly varied. The committee could not identify a universally accepted definition of critical thinking, especially one that fits across all disciplines. A variety of rubrics for evaluating the level and quality of critical thinking in individual writing examples are found in the literature, as

are discussions of their application in the classroom. A number of these sources have been collected in a "critical thinking" library in the Office of University Assessment and Testing.

A variety of rubrics for evaluating critical thinking, generally at the course or individual assignment level, have been published (Facione and Facione 1994, Condon *et al.* 2004). The rubric that seemed most readily applicable to the goals of the assessment committee, and that faculty felt had the greatest potential for use on campus, was that published by Condon and coworkers at Washington State University (Condon *et al.* 2004, also available at http://wsuctproject.wsu.edu). Use of this rubric does not require a precise definition of critical thinking, but rather lists many of the key characteristics of critical thinking, and allows the reviewer (or professor using it for an individual assignment) to describe the degree to which a completed assignment exhibits those characteristics.

This rubric was adapted, with the authors' permission, for use by the OSU general education assessment committee, and is shown in Figure 1. This adaptation has several features that make it useful. One important feature of this rubric is that it is consistent in format and scale to those rubrics already in use by the committee to assess student writing, math skills, and science problem-solving skills. This will allow for consistency in data collection and presentation. Furthermore, the rubric can be applied in the same way as the previously developed rubrics. That is, it can be applied to classroom artifacts from across campus, and these artifacts can be kept anonymous with respect to both student and professor. Lastly, the characteristics listed are broad enough that they can be applied across disciplines. While the details will be very different, a critical assessment of a work of art, an economic plan, or an engineering design, for example, will share these characteristics.

A trial run was performed with the rubric using twelve artifacts that had been previously collected for this year's writing assessments. With the permission of the course instructors, artifacts of assignments that specifically called for some level of critical analysis were chosen. Three evaluators read and evaluated the artifacts using the critical thinking rubric, ranking each artifact for each of the seven characteristics listed, on a 1 to 5 scale.

Any analysis of these results must first acknowledge the very small sample size used (12 artifacts). The primary conclusion that can be made from the data, perhaps, is that the overall consensus scores were low (2.5 out of 5). However, one of the apparent strengths of the rubric in this form is that it allows the monitoring of student achievement in the various aspects of critical thinking separately. It has the potential for allowing the identification of particular weaknesses in student performance. One category did yield noticeably lower scores than the other subcategories, (4) "Assessment of key assumptions." It was felt by the reviewers that this was, in part, due to the nature of the assignments and the vague description of this characteristic. This will be addressed further below. An attempt was also made to correlate the consensus scores with the classification of the students. Again, given the small sample size, no trend was seen and these data are not presented.

Following the pilot study, the evaluators assessed the rubric. Application of the rubric to specific student artifacts was challenging. In part, this was due to the nature of the assignments used. While all called for critical thinking, some had very specific constraints which made the rubric difficult to apply to them. For example, some assignments asked very specific questions, such that the basic premise of the question could be assumed without ever being acknowledged by the student. Other topics seemed to specifically omit certain aspects of the rubric. For example, an assignment explicitly asking only for the student's perspective may have precluded them from considering other relevant perspectives. Finally, the quality of writing in some of the artifacts made evaluation difficult at times. While most would agree that high-quality writing and high-quality thinking will be strongly correlated, reviewers found examples of insightful thinking hidden by poor use of language. Unclear writing also made it difficult to identify individual characteristics within the artifact for the rubric. It was sometimes difficult to discern, for example, the student's perspective and what the student considered to be a background fact.

Consequently, the rubric was further adapted to address some of these concerns. The revised rubric is shown in Figure 2. The primary difference here is that four characteristics have been listed as "essential," with the remaining characteristics listed as "optional." It will be at the discretion of the evaluating committee to determine which set of optional characteristics are evaluated, based on the assignment at hand. In this way, the rubric will maintain its flexibility, while still always providing four values, and a consensus score, that can be tracked and used for comparison (among groups, over time, etc.). Hence, it will be important for the review committee to see the assignment before evaluating the assignment's artifacts. Any "optional" characteristics that are to be evaluated should be determined at this time.

Campus-wide discussion of critical thinking assessment

The first step in starting a campus-wide discussion of critical thinking (and its assessment) took place on September 30. A lunch-hour seminar, "Developing and Assessing Critical Thinking" was presented by Jeff Hattey and Greg Wilber, members of the critical thinking assessment subcommittee. Lunch was provided by the Office of University Assessment and Testing. The seminar was attended by 57 faculty members and led to a lively discussion about critical thinking on the OSU campus. It also resulted in several participating faculty offering to provide artifacts for next summer's assessment activities in which the critical thinking rubric will be put to use.

Additional seminars, in conjunction with other university assessment activities, are being developed. Specifically, the leaders of the Washington State critical thinking project will be invited to present some of their work, most likely in the week before the Spring 2005 semester.

Committee plans for critical thinking assessment

During the 2004-2005 academic year, the critical thinking sub-committee's activities will be focused on two goals: continuing development of the campus-wide conversation on critical thinking, and gathering of artifacts for evaluation next summer using the adapted critical thinking rubric. Accumulating enough artifacts and enough data to be statistically meaningful takes time. These efforts will be critical in ensuring that data is available and can be used in improving critical thinking development and assessment in the General Education program, as well as throughout the college, at OSU.

References

Condon, W.; Kelly-Riley, D.; Johnstone-Yellin, J.; and Mincks, R. 2004. Integrating and Assessing Critical Thinking Horizontally and Vertically. Presented at the AAHE Assessment Conference, Denver, CO, June 2004.

Facione, P.A., and Facione, N.C.. 1994. Holistic Critical Thinking Scoring Rubric. California Academic Press.

Rubric adapted from Washington State University course evaluation for critical thinking

	Skill	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 identified and 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 position relative to the question is not provided.		The student's own position on the question is stated, however, little or no support for the position is provided.		The student's own position on the issue is stated and support has been drawn from experience or information not available from assigned sources.
3	Consideration of **OTHER salient perspectives and positions** that are important to the analysis of the issue.	Does not acknowledge other possible perspectives.		Acknowledges other possible perspectives although they are not clearly stated.		Uses other perspectives noted previously, and additional diverse perspectives drawn from outside information.
4	Assessment of the key **assumptions**.	Does not identify the key assumption and/or ethical issues that underlie the issue.		The key assumption(s) are and/or ethical issue(s) that underlies the issue is clearly stated. Data is identified but not evaluated for validity.		The key assumption and/or ethical issue that underlies the issue is clearly stated, and the validity of the assumption and ethical dimensions that underlie the issue is assessed. Data is identified but not evaluated for validity.
5	Assessment and use of **supporting data/evidence.**	No supporting data or evidence is utilized.		Evidence is identified but not carefully examined. Source(s) of evidence are not questioned for accuracy, precision, relevance, and completeness. Inferences of cause and effect are not stated. Facts and opinions are stated although not clearly distinguished for value judgments.		Evidence is identified and carefully examined. Source(s) of the evidence are questioned for accuracy, precision, relevance, and completeness. Inferences of cause and effect are stated and potential consequences are addressed. Facts and opinions are stated and clearly distinguished for acknowledgement of value judgments.
6	Consideration of the influence of the **context** on the issue.	The problem is not connected to other issues or placed context.		The context of the question is provided although it is not clearly analyzed. Limited consideration of the audience is provided. No consideration of other contexts is provided.		The issue is clearly analyzed within the scope and context of the question. An assessment of the audience is provided. Consideration of other pertinent contexts is provided.
7	Discussion of **conclusions**, implications and consequences.	Conclusions are not provided.		Conclusions are provided without discussion implications or consequences. No 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.

Figure 1. Critical Thinking rubric (version 1), used in pilot scoring study

Critical thinking rubric (adapted from Washington State University course evaluation for critical thinking)

Characteristics 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 identified and 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 position relative to the question is not provided.		The student's own position on the question is stated; however, little support for the position is provided.		The student's own position on the issue is stated and support has been drawn from experience or information not available from assigned sources.
3	Assessment and appropriate use of **supporting data/evidence.**	No supporting data or evidence is utilized.		Evidence is used but not carefully examined. Source(s) of evidence are not questioned for accuracy, precision, relevance, and completeness. 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. Accurately observes cause and effect. Facts and opinions 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. Little or no 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 positions** that are important to the analysis of the issue.	Does not acknowledge other possible perspectives.		Acknowledges other possible perspectives although they are not clearly stated.		Uses other perspectives noted previously, 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. 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. 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. Limited consideration of the audience is provided. No consideration of other contexts is provided.		The issue is clearly analyzed within the scope and context of the question. An assessment of the audience is provided. Consideration of other pertinent contexts is provided.

* 2 - Exhibits some characteristics of '3' and no characteristics of '5'
** 4 - Exhibits most characteristics of '3' and some characteristics of '5'

Figure 2. Critical Thinking rubric (version 2), based on revisions resulting from pilot study.

General Education Institutional Portfolios Overview

The numbers of samples scored and used in analysis for each institutional portfolio developed in 2001, 2002, 2003, and 2004 are shown below. Institutional Portfolios for written communication skills assessment were developed in 2001 (pilot test year), 2002, 2003 and 2004; portfolios for math problem-solving skills were developed in 2002 (pilot test year) and 2003; and portfolios for science problem-solving skills were developed in 2003 (pilot test year), and 2004. Samples sizes have been increased in each year of portfolio development to allow sufficient samples sizes for data analysis. The 2004 pilot study portfolio for the assessment of critical thinking is not reported here; a full-scale Institutional Portfolio for assessment of critical thinking will be developed and reported in 2004-05.

Number of samples in each portfolio, 2001 – 2004

	Portfolio Type			
Year	**Written Communication Skills**	**Math Problem-Solving Skills**	**Science Problem-Solving Skills**	**Total number of samples - all portfolios**
2001	86	-	-	86
2002	111	76	-	187
2003	225	269	68	562
2004	140	-	141	281
All Years	**562**	**345**	**209**	**1116**

Overall portfolio scores for subject-area portfolios, years combined

		Score				
	Artifacts	**1**	**2**	**3**	**4**	**5**
Written Communication Skills (2001, 2002, 2003, 2004)	N	27	155	241	116	23
	%	4.8%	27.6%	42.9%	20.6%	4.1%
Science Problem-Solving Skills (2003, 2004)	N	4	40	55	39	3
	%	2.8%	28.0%	38.5%	27.3%	2.1%
Math Problem-Solving Skills (2002, 2003)	N	26	100	102	88	29
	%	7.5%	29.0%	29.6%	25.5%	8.4%

The written communication skills institutional portfolio is developing into an effective assessment tool. Faculty reviewers agree that this as a reasonable way to holistically evaluate undergraduate students' written communication skills. The increased sample size in this portfolio has allowed more confidence in the analysis and implications of the results.

The portfolios for math and science also have the potential to provide useful information for assessing student achievement of general education learner goals. However, these portfolios are

different from the writing portfolio in some important ways. Unlike student writing samples, which are collected from courses across the undergraduate curriculum, math and science artifacts can only be obtained from a limited number of lower division courses. Students in some majors that are not related to math or science may choose to take as few as two math courses and two science courses to meet general education requirements, and would generally not be expected to demonstrate math or science problem-solving skills in other courses. Also, the variation 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. In contrast, courses in both upper and lower division and across all majors require students to demonstrate written communication skills. The General Education Assessment Committee will further consider these unique characteristics in the continued development of these and other institutional portfolios.

Proposed General Education Assessment Activity for 2005

A. The Committee will meet in Fall 2004 to determine committee membership for work to be completed in summer 2005. Although a 3-year rotating membership cycle has been articulated for the Committee, flexibility in this schedule may be required.

B. The Committee plans to continue the institutional portfolio for assessing student written communication skills as in previous years. The committee recommends that two portfolio-scoring groups each review about 70 samples of randomly collected student work demonstrating written communication skills. Because each group consists of three faculty members, this will require six faculty reviewers for the 2005 written communication skills portfolio (two Committee members and four additional faculty reviewers).

C. The Committee also plans continuation of the institutional portfolio for evaluating students' math problem-solving skills. The committee recommends that a portfolio-scoring group, consisting of three faculty members, evaluate the math skills portfolio (two Committee members and one additional faculty reviewer). It is expected that this group of reviewers could review about 150 samples of student work demonstrating math problem-solving skills.

D. The Committee recommends, if funding is available, continuation of the institutional portfolio for evaluating students' science problem-solving skills. Although the timeline calls for assessing science and math portfolios in alternate years, the committee believes it would be beneficial to do both, so that a sufficient sample size for analysis can be provided within a shorter timeframe. The committee recommends that a portfolio-scoring group, consisting of three faculty members, evaluate the science skills portfolio (two Committee members and one additional faculty reviewer). It is expected that this group of reviewers could review about 150 samples of student work demonstrating math problem-solving skills.

E. The Committee plans to develop the first full-scale institutional portfolio to evaluate students' critical thinking skills. The Committee recommends that two portfolio-scoring groups, consisting of six faculty members, evaluate the critical thinking portfolio (two Committee members and four additional faculty reviewers). It is expected that this group of reviewers could review about 150 samples of student work demonstrating critical thinking skills.

F. The Committee plans to present an information session for faculty to describe the process and results of assessment of students' achievement of general education learning goals since the committee began its work in 2000.