

**Assessment Report for BGES Undergraduate Program in ENVIRONMENTAL SCIENCE:
26 May, 2006**

1. Goals

Environmental Science majors will possess a broad general knowledge of the fundamental facts and principles in all of the major areas of Environmental Science by the end of their senior year, as well as advanced knowledge in the major areas of Environmental Science, as defined by standard textbooks.

This goal was developed by the Department: initially by the chair and associate chairs, undergraduate program directors, and the Undergraduate Committee on Curriculum & Academic Standards [UCCAS], then discussed and approved by a formal vote at a faculty meeting. Because of the relatively small number of majors (less than 30) in a program that was initiated only in 2000, the Department decided to use standard textbook topics as the knowledge base. No changes in the goals have been made since that time.

2. Outcomes

The Department decided to define outcome measures as *satisfactory improvement in performance on a standardized test from entry to completion of the program*. This outcome measure was adopted by the Department in the same way and at the same time as the determination of the goals.

3. Research Methods

The current testing procedure (implemented only since Fall, 2003) uses an objective exam of 60 multiple-choice questions. The questions used in the pool were selected from faculty input and then subsequently approved by faculty that teach in this area.

The exam is administered at two time points in a student's career: at entry, operationally defined as the beginning of the first required course for majors (EVS 206, Introduction to Environmental Science), and just before graduation. The last point is administered by requiring all majors to complete before graduation a zero-credit course (EVS 499, Exit Evaluation) that consists solely of the assessment examination.

All of these direct measures are collected as aggregate values for the entire set of students writing the exam in each semester. No attempt is made to track the performance of individual students.

In addition to these direct outcome measures, indirect evidence sometimes comes in the course of informal exit interviews with the Environmental Science Undergraduate Program Director [in the BGES Department, all Environmental Science majors are advised by the same person]. The suggestion by the assessment review panel for us to consider *systematic* indirect measures (such as a simple student survey) now has been implemented. When students take the exit examination, they complete an anonymous 10-question survey; in addition, they are provided the

opportunity to write any comments they wish. The survey instrument is appended to this document.

4. Findings

A set of standard statistics are calculated for each set of data and appropriate comparisons are made. In particular, overall average scores always will be compared between the entry and exit categories as new data accumulate each semester. The only data (Fall, 2003 through the first Summer session, 2005) show an average score of 27.4% (based on data for N = 109 students). During the Academic Year 05-06, both the part-time instructor in Fall and the regular faculty member in Spring failed to administer the exam! Furthermore, only four students have completed the mandatory EVS exit evaluation that was introduced in Fall, 2003. Their average exit score was 69.1%. An additional EVS student took the Biology exit exam by mistake in Spring, 2006, and she tied the highest score so far on that exam! This student not only had a concentration in Environmental Biology, but also was the recipient of the Department's Tarun K. Mal Memorial Award for Outstanding Graduating Environmental Science Senior!

It is clear that students in the introductory course have poor initial knowledge of environmental science facts and principles. At least four graduating seniors have good objective knowledge of Environmental Science.

Only three students have completed the exit survey so far. They rated their instructors either "good" or "average," and they rated both their teaching assistants and the laboratory courses from "bad" to "good." Suggestions for improvement include having more hands-on research experience and better instructors. In written comments, one of the students would have liked internships that did not conflict with summer jobs.

5. Review

Results of the data analysis are reviewed each Fall by the Undergraduate Program Director, Associate Chairs, and Chair, as well as by members of the Department's undergraduate committee (UCCAS). Any significant findings are reported to the faculty generally for discussion and action. Furthermore, all faculty receive copies of this report annually.

6. Actions

There are too few results for this program to justify any actions at this time. However, it may be worthwhile to divide the exam into broad subject areas, so that future analyses may identify specific weaknesses in the objective knowledge of graduating Environmental Science seniors.

Anticipated difficulties in ensuring student compliance with taking the outcome assessment exam just before graduation resulted in the creation of the Exit Evaluation course requirement for the major, approved in Spring, 2003.

The advisor for Environmental Science majors changed in Fall 2006. This eventually may result in greater student compliance, as well as greater faculty involvement in essential assessment

activities.

No additional specific actions (other than the addition of an indirect assessment measure) were taken in Academic Year 2005-2006, in part because the Department still is awaiting the results, including the comments from two external reviewers, of our comprehensive Program Review that was undertaken during the year.

Assessment Report for BGES Undergraduate Programs in GEOLOGY: 26 May, 2006

1. Goals

Geology majors will possess a broad general knowledge of the fundamental facts and principles in all of the major areas of Geology by the end of their senior year, as well as advanced knowledge in the major areas of Geology, as defined by standard textbooks.

This goal was developed by the Department: initially by the chair and associate chairs, undergraduate program directors, and the Undergraduate Committee on Curriculum & Academic Standards [UCCAS], then discussed and approved by a formal vote at a faculty meeting. Because of the relatively small number of majors (less than 20) in the current program, the Department decided to use standard textbook topics as the knowledge base. No changes in the goals have been made since that time.

2. Outcomes

The Department decided to define outcome measures as *satisfactory improvement in performance on a standardized test from entry to completion of the program*. This outcome measure was adopted by the Department in the same way and at the same time as the determination of the goals.

3. Research Methods

The current testing procedure (implemented only since Fall, 2003) uses an objective exam of 65 multiple-choice questions. The questions used in the pool were selected from faculty input and then subsequently approved by faculty that teach in this area.

The exam is administered at two time points in a student's career: at entry, operationally defined as the beginning of the first required course for majors (GEO 100, Introductory Geology), and just before graduation. The last point is administered by requiring all majors to complete before graduation a zero-credit course (GEO 499, Exit Evaluation) that consists solely of the assessment examination.

All of these direct measures are collected as aggregate values for the entire set of students writing the exam in each semester. No attempt is made to track the performance of individual students.

In addition to these direct outcome measures, indirect evidence sometimes comes in the course of formal exit interviews with the Geology Undergraduate Program Director [in the BGES Department, all Geology majors are advised by the same person] and the other two faculty in the program. The suggestion by the assessment review panel for us to consider *systematic* indirect measures (such as a simple student survey) now has been implemented. When students take the exit examination, they complete an anonymous 10-question survey; in addition, they are provided the opportunity to write any comments they wish. The survey instrument is appended to this document.

4. Findings

A set of standard statistics are calculated for each set of data and appropriate comparisons are made. In particular, overall average scores always will be compared between the entry and exit categories as new data accumulate each semester. The data so far (Fall, 2003, through the first Summer session, 2006) show an average score of 34.3% correct answers at entry (based on data for N = 898 students). Unfortunately, only four students have completed the program who started after the mandatory exit evaluation was introduced (in Fall, 2003). Their average score was 74.2%.

It is clear that students in the introductory course have a poor initial knowledge of geological science facts and principles. At least four graduates have acquired a good knowledge of geology. However, two of these students were recipients of the Department's Thomas L. Lewis Memorial Award for Outstanding Graduating Geology Senior, so their scores necessarily are substantially above average!

Only two students completed the exit survey, and they rated their instructors highly ("very good" or "good"), their teaching assistants "adequate," and the laboratory courses "very good" or "good." Suggestions for improvement include having more research experience and more extracurricular activities. In written comments, one of the students would have liked more courses directly relevant to Northeast Ohio, and in the oral exit interviews with faculty, some students expressed an interest in having more field courses and better labs.

5. Review

Results of the data analysis are reviewed each Fall by the Undergraduate Program Director, Associate Chairs, and Chair, as well as by members of the Department's undergraduate committee (UCCAS). Any significant findings are reported to the faculty generally for discussion and action. Furthermore, all faculty receive copies of this report annually.

6. Actions

There are too few results at exit and too few majors in this program to justify any actions at this time. However, it may be worthwhile to divide the exam into broad subject areas, so that future analyses may identify specific weaknesses in the objective knowledge of graduating Geology seniors.

Anticipated difficulties in ensuring student compliance with taking the outcome assessment exam just before graduation resulted in the creation of the Exit Evaluation course requirement for the major, approved in Spring, 2003.

No additional specific actions (other than the addition of an indirect assessment measure) were taken in Academic Year 2005-2006, in part because the Department still is awaiting the results, including the comments from two external reviewers, of our comprehensive Program Review that was undertaken during the year.

Assessment Report for BGES Undergraduate Programs in BIOLOGY: 26 May, 2006

1. Goals

Biology majors will possess a broad general knowledge of the fundamental facts and principles in all of the major areas of Biology by the end of their senior year, as well as advanced knowledge in the major areas of Biology, as defined by the GRE Advanced Biology subject test.

This goal was developed by the Department: initially by the chair and associate chairs, undergraduate program directors, and the Undergraduate Committee on Curriculum & Academic Standards [UCCAS], then discussed and approved by a formal vote at a faculty meeting. The decision to use the subject areas based on the areas of the Graduate Record Examination was made in 1996, when the first steps in Departmental assessment evaluations were begun. No changes in the goals have been made since that time.

2. Outcomes

The Department decided to define outcome measures as *satisfactory improvement in performance on a standardized test from entry to completion of the program*. This outcome measure was adopted by the Department in the same way and at the same time as the determination of the goals.

3. Research Methods

The current testing procedure (since Fall, 2001) uses an objective exam of 100 multiple-choice questions (randomly sampled from a test bank of 900 questions), divided into 6 areas in the following proportions: 17% Biochemistry & Cell Structure/Function; 17% Genetics & Molecular Biology; 17% Evolution; 16% Ecology; 18% Botany; 15% Zoology. The first two areas were further subdivided. The questions used in the pool were selected from faculty input and then subsequently approved by faculty in each area.

In the first versions of the exam (administered through WebCT), the random sampling from the pool of questions for each category was done for each student. Severe problems with system backup/recovery in older versions of WebCT, which resulted in significant losses of data, forced us to adopt a simpler approach. We now perform the random sampling from the test bank only once each semester, so that all students in a given semester write the same exam.

The exam is administered at three time points (entry, early, and late) in a student's career: at entry, operationally defined as the beginning of the first required course for majors (BIO 200, Introductory Biology I), at the end of the introductory sequence (BIO 202, Introductory Biology II), and just before graduation. The last point is administered by requiring all majors to complete before graduation a zero-credit course (BIO 499, Exit Evaluation) that consists solely of the assessment examination. In the introductory biology sequence (BIO 200 & BIO 202), students are exposed to concepts in each of the six major areas into which the exam is subdivided. This allows us to attempt to assess both overall outcomes and performance in each of the subject

areas.

All of these direct measures are collected as aggregate values for the entire set of students writing the exam in each semester.

In addition to these direct outcome measures, indirect evidence sometimes comes in the course of informal exit interviews that arise during the last meeting before graduation that each major has with the Biology Undergraduate Program Director [in the BGES Department, all Biology majors are advised by the same person]. The suggestion by the assessment review panel for us to consider *systematic* indirect measures (such as a simple student survey) now has been implemented. When students take the exit examination, they also complete an anonymous 10-question survey; in addition, they are provided the opportunity to write any comments they wish. The survey instrument is attached to this document.

4. Findings

A set of standard statistics are calculated for each set of data and appropriate comparisons are made. In particular, overall average scores always are compared among the entry, early, and late categories as new data accumulate each semester. The latest data (from Fall, 2001, through Spring, 2006) show an appropriate increase in average (percentage) score from 27.3 at entry (based on data for N = 946 students), to 35.8 at the end of the introductory sequence (N = 551 students), and 48.4 at exit (N = 126). The distributions of scores are plotted in the attached graphs. Both the increase from the beginning to the end of the introductory sequence, and from then until exit are statistically significant (at a 95 % confidence level).

These results imply that there are measurable improvements in at least objective knowledge of biological facts and principles over the course of the introductory sequence, and that additional knowledge is acquired by Biology majors who graduate. Please note that the decrease in sample size at exit is a consequence of the fact that many students other than Biology majors *per se* take the introductory course sequence, while the exit exam is taken only by graduating Biology majors. Furthermore, there is non-trivial attrition of students from the first course in the introductory sequence to the second (a phenomenon that the Department is continuing to probe).

Summary results of the scores in each of eight subject areas (and also grouped by the six GRE categories as well as three broader categories) for the last three academic years are given in the attached spreadsheet. Exit test results for 105 Biology seniors who graduated in the last three academic years indicate that the lowest percentage scores (39.3 % correct) occur in questions related to Animal Biology [Zoology], and the next poorest performance (41.5 % correct) is in the area of Plant Biology [Botany]. In general, graduating seniors performed more poorly (42.0%) on questions related to Organismal Biology than on those related to Ecology & Evolution (49.1%) and Cell & Molecular Biology (54.3%).

Summary results of the ten questions on the anonymous exit surveys are attached. On the five questions that attempt to solicit performance ratings, the mean values indicate that 35 graduating Biology seniors give the best ratings (1.74 and 1.77, respectively — closer to “good” than “very good”) to their own perceived knowledge and to their instructors’ abilities. The lowest rating

(2.40 — between “good” and “adequate”) was given to the quality of laboratory exercises.

Anonymous comments ranged from observations about individual instructors (both good and bad) to the general comment that one student got “a better education at CSU than Ohio State.” Suggestions for improvement included having “more night courses,” “more summer classes,” “more laboratory courses,” and “independent study should be required.”

5. Review

Results of the data analysis are reviewed each Fall by the Undergraduate Program Director, Associate Chairs, and Chair, as well as by members of the Department’s undergraduate committee (UCCAS). Any significant findings are reported to the faculty generally for discussion and action. Furthermore, all faculty receive copies of this report annually.

6. Actions

The results of both the direct and indirect assessment of student outcomes initially (in the early years of the Department’s assessment program) suggested a general performance weakness in the area of genetics. After discussion within the UCCAS, the Department discussed and adopted a curricular change involving the creation of two new courses (BIO 310, Genetics, and BIO 311, Genetics Recitation) that now (since Fall, 2004) form part of the allowable core requirements for Biology majors.

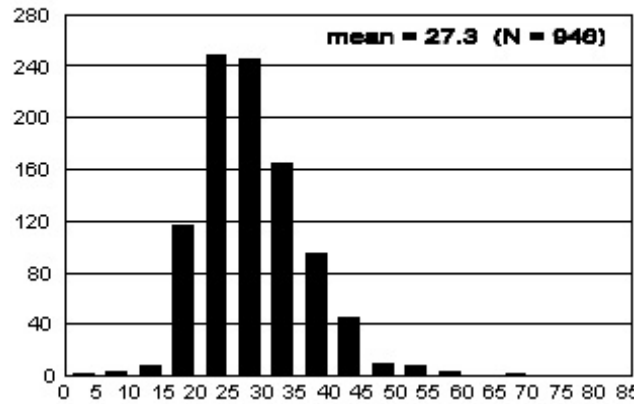
Anticipated difficulties in ensuring student compliance with taking the outcome assessment exam just before graduation resulted in the creation of the Exit Evaluation course requirement for the major, adopted in Fall, 2002 [after reluctant approval by the Arts & Sciences Curriculum Committee]. We now have very good compliance, and assessment instruments are administered routinely.

The newest finding, that of possible weaknesses in the areas of animal and plant biology, will become a subject for faculty review and discussion in the next academic year. Similarly, perhaps some attention should be devoted to a focused review of laboratory exercises.

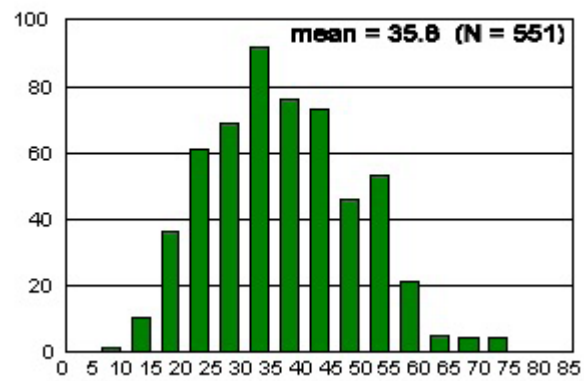
No additional specific actions (other than the addition of an indirect assessment measure) were taken in Academic Year 2005-2006, in part because the Department still is awaiting the results, including the comments from two external reviewers, of our comprehensive Program Review that was undertaken during the year.

Appendix

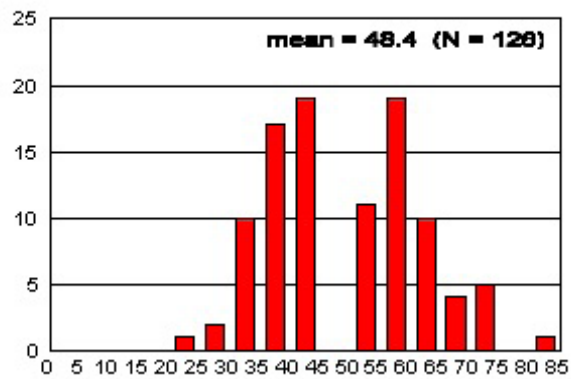
BIO 200 assessment test scores



BIO 202 assessment test scores



BIO 499 assessment test scores



Appendix

Assessment results update: 26 May 2006 area	cat #	AY04-current						Exit results			AY04-current				category	GRE areas	
		BIO 200	BIO 202	BIO 200	BIO 202	BIO 200	BIO 202	BIO 200	BIO 202	BIO 200	AY04	AY05	AY06	BIO 499			average
biochemistry	I	7	0.243	0.379	0.256	0.359	0.256	0.361	0.253	0.367	0.558	0.789	0.709	0.697	I		
cell biology	I	10	0.206	0.216	0.223	0.217	0.218	0.247	0.216	0.227	0.368	0.448	0.484	0.451	0.5524	I	biochemistry & cell biology
genetics	I	17	0.237	0.333	0.217	0.267	0.237	0.345	0.23	0.317	0.476	0.567	0.54	0.533	0.5328	I	genetics & molecular biology
evolutionary mechanisms	III	17	0.334	0.423	0.331	0.316	0.329	0.423	0.331	0.391	0.455	0.555	0.525	0.518		III	
evolutionary diversity	II	8	0.318	0.467	0.295	0.334	0.295	0.486	0.301	0.434	0.358	0.56	0.489	0.479	0.5051	II	evolution
plant form & function	II	10	0.267	0.472	0.259	0.314	0.249	0.442	0.257	0.414	0.418	0.42	0.412	0.415	0.4152	II	botany
animal form & function	II	15	0.269	0.346	0.272	0.255	0.273	0.385	0.272	0.332	0.464	0.384	0.37	0.393	0.393	II	zoology
ecology	III	16	0.303	0.34	0.283	0.24	0.283	0.312	0.289	0.301	0.398	0.443	0.497	0.463	0.4632	III	ecology
Cell & Molecular	I	34	0.229	0.308	0.227	0.271	0.236	0.32	0.231	0.301	0.461	0.578	0.558	0.543		I	Cell & Molecular
Organismal	II	33	0.28	0.414	0.274	0.292	0.271	0.427	0.275	0.381	0.424	0.438	0.412	0.42		II	Organismal
Ecology & Evolution	III	33	0.319	0.383	0.308	0.279	0.307	0.369	0.311	0.347	0.427	0.501	0.511	0.491		III	Ecology & Evolution

Appendix
BGES Exit Survey

1. What are your **plans after graduation**?
 - a) work at a job related to your degree program
 - b) work at some other kind of job, unrelated to your degree program
 - c) attend graduate or professional school
 - d) get another undergraduate degree
 - e) uncertain, or other plans

2. How would you rate your education in the BGES Department with respect to **improving your job or career prospects**?
 - a) very good
 - b) good
 - c) adequate
 - d) bad
 - e) very bad

3. How would you rate your education in the BGES Department with respect to **improving your knowledge of the subjects covered in your courses**?
 - a) very good
 - b) good
 - c) adequate
 - d) bad
 - e) very bad

4. What would be your overall rating of the **ability of the instructors in your BGES lecture courses** to teach the material and help you learn?
 - a) very good
 - b) good
 - c) adequate
 - d) bad
 - e) very bad

5. What would be your overall rating of the **ability of teaching assistants in your BGES laboratory courses** to explain the exercises and help you learn?
 - a) very good
 - b) good
 - c) adequate
 - d) bad
 - e) very bad

6. What would be your overall rating of the **quality of the exercises or experiments in your BGES laboratory courses?**
 - a) very good
 - b) good
 - c) adequate
 - d) bad
 - e) very bad

7. What do you think would be the **best way to improve the BGES degree program that you took?**
 - a) more modern or more exciting lecture courses
 - b) better instructors
 - c) better laboratory courses
 - d) more hands-on research experience
 - e) more extracurricular activities (student club, field trips, etc.)

8. What would be the **second most important change that would improve the BGES degree program that you took?**
 - a) more modern or more exciting lecture courses
 - b) better instructors
 - c) better laboratory courses
 - d) more hands-on research experience
 - e) more extracurricular activities (student club, field trips, etc.)

9. What would be the **third most important change that would improve the BGES degree program that you took?**
 - a) more modern or more exciting lecture courses
 - b) better instructors
 - c) better laboratory courses
 - d) more hands-on research experience
 - e) more extracurricular activities (student club, field trips, etc.)

10. **Where will you live** after you graduate?
 - a) northeast Ohio
 - b) elsewhere in Ohio
 - c) in a nearby state
 - d) somewhere else in the United States
 - e) in a different country

Anonymous Exit Comments for BGES Degree Program

Please write down any comments that you care to make about the program. These can be specific comments about particular courses or instructors, or they can be general comments. They can be positive or negative — whatever you feel is worth mentioning. We want to know whether or not you had good experiences, and we particularly want to know what might be done to improve the program. Thanks!

Appendix

Results

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
	Plans	Prospects	Knowledge	Instructors	TAs	Experiments	Improve-1	Improve-2	Improve-3	Residence
response										
a	14	7	14	11	6	3	4	8	10	16
b	0	18	16	21	13	18	3	0	3	1
c	17	9	5	3	15	11	11	11	8	1
d	0	1	0	0	1	3	16	8	4	17
e	4	0	0	0	0	0	0	7	9	0
N	35	35	35	35	35	35	34	34	34	35
Mean		2.114286	1.742857	1.771429	2.3	2.4				