2008-2009 Assessment Report
Department of Natural Sciences

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a) **Principal Goals**

As part of the approved Department of Natural Science's Strategic Plan, our department has identified four primary goals relating to students and student achievement for BA and BS degree programs in our department:

Goal 1: Conduct activities to recruit, retain and place students
- Objective 1: Recruit quality students (first-time freshmen, community college transfers, non-traditional and local mid-career personnel)
- Objective 2: Retain high percentage of students to graduation
- Objective 3: Assist students in placement activities

Goal 2: Promote the understanding of a broad range of scientific concepts, within each of the major subdisciplines (biology, geology, chemistry, etc.) in our department.

Goal 3: Develop critical thinking skills and execute scientific investigations using the scientific method.

Goal 4: Demonstrate the ability to communicate the results of scientific investigations.

b) **Summary of Methods**

Assessment of General Education Courses

The Natural Sciences Department offers a wide variety of general education courses, and we currently working to ensure that each of these courses addresses the core competencies developed by the New Mexico Higher Education Department (HED). Likewise, we have developed assessment protocol to ensure that students in these courses are mastering these core competencies.

Major Field Test (ETS) Scores

Competency in scientific fields involves gestation of much factual information and understanding of important biological concepts and processes. Students can not develop questions nor conduct relevant studies without this basic understanding. In order to assess how well students are grasping basic biological information (Goal 2), the department has administered the Major Field Test in

Biology (ETS) to graduating seniors in the biology discipline. Scores have been used to identify weaknesses within the department and to evaluate how WNMU's biology graduates compare to their peers at a national level. Current plans are to administer the Major Field Test in Chemistry to (ETS) to graduating seniors in this subdiscipline beginning this year.

Senior Project

Senior projects are required of all Biology, Botany, Cell and Molecular Biology, Chemistry and Zoology majors. These are capstone courses for these majors in that they requires students to design, develop, execute, report, and present an independent scientific study. The ability to successfully achieve this goal is contingent upon an understanding of scientific concepts and controversies, the scientific method, hypothesis testing, and critical thinking (Goals 2, 3 and 4). Evaluation of the Senior Project is conducted by all departmental faculty in the life sciences.

GRE/MCAT Scores

The success of graduates can be monitored using placement tests required for admission into several post-graduate programs (i.e., graduate, medical and veterinary schools). Although these nationally-normed tests can be used to evaluate broad-based biological knowledge (Goal 2), not all students pursue careers requiring these tests. However, test scores can be used to evaluate how well WNMU prepares its students for entry into post-graduate programs (Goal 1). Proportions of students attempting admission to such programs and the proportion that is successful can provide useful information about the quality of our program.

Job Placement

Ultimately, a graduate's ability to obtain a position in a related biological field, whether after post-graduate education or not, is the test of our undergraduate program (Goal 1). By tracking students after graduation we can assess how well our program prepares students to deal with challenges obtaining a job and their subsequent success in this job.

Table 1 summarizes assessment procedures currently implemented by all subdisciplines within the Natural Sciences Department.

Table 1. Procedures for Assessment

Activity	When	Who	Accountability	Related Goal
Assessment of General Education Courses	Every Semester	All Enrolled Students	All Department Faculty	Goal 2, 3 and 4
Major Field Test in Biology and Chemistry (ETS) Scores—Comparison of standing of graduates among national peer group	Every Semester	Graduating Seniors	Departmental Designee	Goal 2
Evaluation of Written Senior Project and Oral Presentation	Every Semester	Seniors	All Department Faculty	Goals 2, 3, 4
GRE / MCAT scores – Comparison of graduates seeking admission to post-graduate programs with national peers	Every Semester	Seniors Graduates seeking post-grad education	Major Advisors	Goals 1, 2
Success in Admission to post-graduate programs (Grad, Vet, Med and other)	Annually	Relevant Graduates	Major Advisors	Goals 1, 2
Success of obtaining jobs in related field	Annually	Graduates	Major Advisors	Goals 1, 2

c) **Evaluation**

Assessment of General Education Courses.

Assessment protocols for most General Education courses offered in the Natural Sciences Department were developed during spring 2008 and are being implemented this semester (attached). The status of Gen Ed assessment in courses taught in our department is summarized in Table 2. Note that the assessment protocol for PHYS 152/154 is not on hand because it is not yet due. Note also that data have been collected via use of these assessment protocols for most of the courses listed in Table 2. For those courses in which results of Gen Ed assessments are not reported, these are mostly in classes that meet every other year; Gen Ed Assessment will be conducted in these courses when these courses are next offered.

Table 2. Status of General Education assessment practices in course offered in the Natural Sciences Department.

Course Abbreviation	Course Name	Instructor	Procedures	Results	Improve.	Recommend.
BIOL 101/103	Biology for Gen Ed I	Jost	Y	Y	Y	
BIOL 102/104	Biology for Gen Ed II	Jost	Y	Y	Y	
BIOL 202/203	Majors I Plant Form, Function and Diversity	Norris	Y	Y	Y	
BIOL 204/205	Majors II Animal Form, Function and Diversity	Jennings	Y	Y	Y	
BIOL 206/207	Majors III Introduction to Cell Biology	Camacho	Y	Y	Y	
CHEM 121/123	Chemistry for Life	Pattabiraman	Y	Y	Y	Y
CHEM 151/153	General Chemistry I	White	Y	Y	Y	Y
CHEM 152/154	General Chemistry II	White	Y	Y	Y	Y
GEOL 101/103	General Geology I	Dowse	Y	Y		
GEOL 102/104	General Geology II	Dowse	Y			
GEOL 201/203	Environmental Science	Hill	Y			
PHSC 101/103	Physical Science for Gen Ed I	White	Y	Y	Y	Y
PHSC 102/104	Physical Science for Gen Ed II	White	Y			
PHYS 151/153	General Physics I	White				
PHYS 152/154	General Physics II	White	Y	Y	Y	Y
PHYS 171/173	Principles of Physics I	White	Y	Y	Y	Y
PHYS 172/174	Principles of Physics II	White	Y	Y	Y	Y

Major Field Test in Biology (ETS) Scores

The Natural Sciences Department administered the ETS Major Field Test in Biology to all graduating seniors in the biology discipline (Biology, Botany, Cell/Molecular Biology, Forestry/Wildlife, Forestry/Wildlife Law Enforcement,

Zoology) during the spring of 2004, 2005, 2006, 2008 and 2009. Table 2 summarizes scores in four major areas of biology: a) cell biology, b) molecular biology and genetics, c) organismal biology and d) population biology-evolution-ecology. Table 3 summarizes scores in nine assessment indicators defined by ETS. [The Biology Field Test was administered to ten graduating students during late spring of the 2008-2009 school year; results from ETS are pending].

Table 3. Biology Field Test scores in four major areas of biology administered to graduating seniors in the biology discipline at Western New Mexico University in 2004-2006 and 2008. Scores are out of 100. Scores represent percent of questions correct; numbers in parentheses represent standard deviations.

All Students	Cell Biology	Molecular Biology and Genetics	Organismal Biology	Population Biology / Evolution / Ecology
2003-2004 (n= 6): Mean (Std. Error)	49.2 (4.9)	50.9 (2.2)	55.9 (4.3)	57.6 (5.1)
2004-2005 (n= 11): Mean (Std. Error)	45.9 (3.2)	49.5 (3.2)	51.6 (3.4)	54.1 (3.3)
2005-2006 (n = 8): Mean (Std. Error)	47.1 (5.0)	44.5 (2.7)	47.6 (4.5)	55.5 (5.5)
2006-2007 (not administered)	(not given)	(not given)	(not given)	(not given)
2007-2008 (n = 5)	46 (8)	43 (6)	51 (15)	49 (21)
2008-2009	(results pending)	(results pending)	(results pending)	(results pending)

Scores in two major areas of biology, 1) Molecular Biology and Genetics and 2) Population Biology / Ecology / Evolution, have declined slightly between 2004 and 2008 (Table 3). Scores in the other two major areas of biology, cell biology and organismal biology, have fluctuated over this same time frame (Table 3).

Table 4. Biology Field Test scores in nine different assessment indicators administered to graduating seniors in the biology discipline at Western New Mexico University in 2004, 2005 and 2006. Scores represent percent correct; numbers in parentheses represent standard deviations.

	Biochem/Cell Energetics	Cell Structur / Organiz / Function	Molecular Biology / Genetics	Diversity of Organisms	Animal Structure / Function	Plant Structure / Function	Population Genetics / Evolution	Ecology: Pop / Comm / Ecosystem	Analy Skills
2003-2004 (n=6): Mean (Std. Error)	35.9 (5.6)	53.2 (7.6)	41.9 (3.7)	50 (4.2)	60.4 (6.8)	54.2 (5.4)	54.9 (6.3)	51.7 (6.0)	46.8 (5.7)
2004-2005 (n=11): Mean (Std. Error)	31.1 (3.2)	49.5 (5.8)	39.8 (3.3)	56.6 (5.7)	53.3 (3.8)	47.6 (3.0)	45.8 (4.2)	51.4 (4.4)	45.6 (3.2)
2005-2006 (n= 8): Mean (Std. Error)	42.0 (7.7)	42.9 (6.2)	33.4 (5.1)	50.1 (7.3)	47.0 (3.7)	39.9 (5.6)	62.5 (6.6)	54.5 (6.8)	50.0 (4.9)
2006-2007 (not given)	(not given)	(not given)	(not given)	(not given)	(not given)	(not given)	(not given)	(not given)	(not given)
2007-2008 (n = 5)	33	49	34	49	47	51	48	56	45
2008-2009	(pending)	(pending)	(pending)	(pending)	(pending)	(pending)	(pending)	(pending)	(pending)

Looking at scores in the nine assessment indicators (Table 4), a slight increasing trend is noted for Ecology: Population/Community/Ecosystems, and a slight declining trend is noted for Animal Structure/Function. Scores for the other seven assessment indicators fluctuated over this time period (Table 4).

Senior Project

Grade distributions for senior projects submitted by graduating seniors in the biology subdiscipline appear in Table 5. Data are presented for three school years: 2004-2005; 2005-2006, and 2007-2008. The 2006-2007 data set is incomplete because the faculty member responsible for evaluating senior projects during spring 2007 has retired; his grades are not available. Although it is difficult to comment on trends based on three years of data, continued collection of these data on a yearly basis will allow us to monitor how well our students are able to carry out independent research.

Table 5. Grade distributions for senior projects of graduating seniors in the biology discipline of the Natural Sciences Department. Percents were calculated for grades in a give year.

Calendar Year	A	B	C	I	Total
2004-2005	3 (23%)	5 (38%)	5 (38%)		13
2005-2006	3 (38%)	2 (25%)	3 (38%)		8
2006-2007	(not available)	(not available)	(not available)		(not available)
2007-2008	3 (23%)	3 (23%)	1 (8%)	6 (46%	13
2008-2009		3 (60%)	2 (40%)		5

GRE / MCAT scores and Job Placement

These data were unavailable for inclusion in this report.

d) **Actions Taken Based on Assessment**

The Natural Sciences Department has responded to the above results in several ways over the past five years. Most of these changes occurred prior to the 2007-2008 school year, but are noteworthy to mention here as a reminder of how assessment has benefited the Natural Sciences Department at WNMU.

- We have added a fifth biology faculty member (Dr. Zenaido Camacho) with expertise in cell molecular biology in response to initial low scores in genetics and cell biology.

- We have restructured the core curricula in our biology programs so that all students majoring in Biology, Botany, Forestry-Wildlife, Forestry-Wildlife-Law Enforcement, and Zoology take a 4-credit course, “Majors Biology III: Intro to Cell Biology” (BIOL 206/207), which will focus on cell biology concepts.

- We have developed and taught two new courses, “Cell Physiology” (BIOL 360) and “Molecular Genetics” (BIOL 465/467), to address the above biology content areas in which our students are deficient, as based on the first two year’s

assessment data. These new courses form the basis for a new degree program we have developed within the biology discipline: Cell Molecular Biology.

e) <u>Concluding Comments</u>

The Natural Science Department has recently expanded its assessment program. We have collected assessment data from disciplines other than biology in the department (i.e., chemistry, geology) for the first time in memory, and have begun to routinely assess how well our general education courses meet core competencies as established by HED.