BIOL 100: Laboratory skills: students will demonstrate their competency in a range of biological laboratory skills, use of scientific instruments, and safety in the laboratory.

BIOL 101: Communication skills: students will demonstrate their ability to communicate by writing in a clear and concise manner, through a combination of lab reports, lab review exercises, and written exams.

BIOL 102: Quantitative and analytical skills: students will demonstrate their ability to test hypotheses, collect scientific data, analyze those data, and interpret results using critical thinking.

BIOL 103: Writing science. Among the measures was a Cloze test used internationally to assess reading and writing skills, especially with regard to an exercise in writing a lab report.

BIOL 104: Communication skills: Graduates use scientific literature and diagrams as a source of information, properly cite sources and avoid plagiarism, and create text and graphics to communicate results effectively through print and oral presentations. They collect and assess evidence & use it to create effective arguments in writing scientific reports & proposals.

BIOL 105: Research/Laboratory skills: Graduates are competent in basic biology procedures & safety in the laboratory & the field; they formulate testable hypotheses & create effective experimental designs using their knowledge, understanding, & practical experience of scientific instruments.

BIOL 106: Critical thinking skills: Students apply relevant concepts from chemistry & physics to biology problems.

BIOL 107: Quantitative skills: Graduates apply numerical methods in research design, and use computers for analysis manipulating and modeling biological data.

BIOL 108: Research/Laboratory skills: Students are competent in basic biology procedures & safety in the laboratory & the field; they formulate testable hypotheses & create effective experimental designs using their knowledge, understanding, & practical experience of scientific instruments.

BIOL 109: Communication skills: Graduates use scientific literature and diagrams as a source of information, properly cite sources and avoid plagiarism, and create text and graphics to communicate results effectively through print and oral presentations. They collect and assess evidence & use it to create effective arguments in writing scientific reports & proposals.

BIOL 110: Digital Literacy: Graduates use & process information in multiple formats via computer. Graduates are competent in the following computer skills as related to their science work: desktop competencies, work processing, presentation, and data retrieval and manipulation. Graduates effectively judge the usefulness and accuracy of external sources of information.

BIOL 111: Professionalism: Graduates work effectively together in teams in a laboratory and field settings and follow ethical principles underling scientific research and publication. Graduates understand and apply the values and limitations of scientific research in addressing public policy issues.

RESULTS AND RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS

Assessment data used to focus instruction and exams on problem-solving and hypothesis testing.

BIOL 200: General Education Science: Various measures were used to assess student reading and writing skills, especially with regard to an exercise in writing a lab report, introduced to the course to meet Gen Ed goals.

BIOL 201: Understanding of foundational knowledge of the major fields of biology, through their focus on anatomy, physiology, and microbiology. They will be able to apply their knowledge as health care consumers or concerned citizens with regard to public health issues.

BIOL 202: Biometrics, Math faculty conducted pre-test of students at start of course to assess preparedness. The numbers are course SLO numbers that link the course to the program SLO (See UOG/CNAS/CNAS Assessment Website for detailed descriptors of these course SLOs by visiting: http://www.aug.edu/dynamicsdata/CNASAssessment.aspx/siteid=2&pg=20);

BIOL 203: Discipline knowledge and skills: Graduates use their knowledge & understanding of essential concepts to solve problems in ecology, genetics, molecular biology, and evolution. They can apply their biology knowledge & skills to locally important issues such as island biogeography, conservation, & endangered species problems.

BIOL 204: Ability to analyze and interpret scientific literature and interpret results, and write reports; understand the capabilities and limitations of scientific knowledge as it is applied to solve real-world problems, and make appropriate use of science in their choices as citizens.

BIOL 205: Characterize scientific knowledge as theories and principles that result from experimentation that are subject to revision based on new observations and discoveries.

BIOL 206: Use basic scientific principles and methods to explain the workings of the natural world, particularly in this region; able to apply their biology knowledge & skills to locally important issues such as island biogeography, conservation, & endangered species problems.

BIOL 207: Biometrics, Math faculty conducted pre-test of students at start of course to assess preparedness. The numbers are course SLO numbers that link the course to the program SLO (See UOG/CNAS/CNAS Assessment Website for detailed descriptors of these course SLOs by visiting: http://www.aug.edu/dynamicsdata/CNASAssessment.aspx/siteid=2&pg=20);

BIOL 208: Communication skills: students will demonstrate their ability to communicate by writing in a clear and concise manner, through a combination of lab reports, lab review exercises, and written exams.

BIOL 209: Quantitative and analytical skills: students will demonstrate their ability to test hypotheses, collect scientific data, analyze those data, and interpret results using critical thinking.

BIOL 210: Writing science. Among the measures was a Cloze test used internationally to assess reading and writing skills, especially with regard to an exercise in writing a lab report.

BIOL 211: Communication skills: students will demonstrate their ability to test hypotheses, collect scientific data, analyze those data, and interpret results using critical thinking.

BIOL 212: Quantitative and analytical skills: students will demonstrate their ability to test hypotheses, collect scientific data, analyze those data, and interpret results using critical thinking.

BIOL 213: Writing science. Among the measures was a Cloze test used internationally to assess reading and writing skills, especially with regard to an exercise in writing a lab report.

BIOL 214: Communication skills: students will demonstrate their ability to test hypotheses, collect scientific data, analyze those data, and interpret results using critical thinking.

ASSESSMENT ACTIVITY

1. Bi-majors: statistical ability. — Because of student difficulties in the required BI 412 Biometrics, Math faculty conducted pre-test of students at start of course to assess preparedness.

2. Bi-majors: communication ability. — BI 101 (Evolution). Students do a critical review of a research articles with the application of knowledge from the course and with the application of a sourcing tool.

3. Bi-majors: communication ability. — Various measures and anecdotal reports from science faculty revealed student need for increased skills in reading and writing science. Among the measures was a Cloze test used internationally to assess student reading difficulties; this test was also given to pre-nursing and gen-ed students (see example of Program Assessment on page 2).

4. General Education Science: Various measures were used to assess student reading and writing skills, especially with regard to an exercise in writing a lab report, introduced to the course to meet Gen Ed goals.

5. Pre-nursing service courses — BIHU 212/123 (Anatomy & Physiology): Evaluation of multiple-section lecture and lab classes in BI 124 and BI 124L - structure, content, and student evaluation / grading.

6. Pre-nursing service courses — BIHU 212/123 (A&P) Pre- and post-test assessments were conducted for 91 students in BI 124 in Fall 2007 and 147 in BI 124 in Fall 2008. Pre- and post-test assessments were conducted for 80 students in BI 124 in Fall 2009. In total, 200 students were assessed. In 2008, and 110 pre-test assessments were conducted in BIHU 212/213 Spring 2009.

7. Pre-nursing service courses — BIHU 212/123 (A&P) Pre- and post-test assessments were conducted for 91 students in BI 124 in Fall 2007 and 147 in BI 124 in Fall 2008. Pre- and post-test assessments were conducted for 80 students in BI 124 in Fall 2009. In total, 200 students were assessed. In 2008, and 110 pre-test assessments were conducted in BIHU 212/213 Spring 2009.

ASSESSMENT RESULTS AND RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS

Results showed that a statistics course tailored to biology would better prepare students for BIHU 1 than the present requirement of MA141A - College Algebra. Results were used to support a successful grant application; course development is largely complete and a new textbook for the course by Prof. Han Tower Chen is in draft form; course MA 394 (Biostatistics) is being placed into use in Spring 2009.

Results of the lab report test showed that there was little correlation between the student’s writing ability in the lab report, judged by a rubric that eliminated content, and their overall performance in the course. Results of the Cloze test showed that students in BI 100 had similar difficulties to pre-nursing and science majors.

Assessment data used to focus instruction and exams on problem-solving and hypothesis testing.

The numbers are course SLO numbers that link the course to the program SLO (See UOG/CNAS/CNAS Assessment Website for detailed descriptors of these course SLOs by visiting: http://www.aug.edu/dynamicsdata/CNASAssessment.aspx/siteid=2&pg=20);
Dr. O’Toole and Dr. Schefter used a test devised by O’Toole for which there exists a large database for students of various linguo-cultural backgrounds and school levels. The test utilized a Cluze procedure designed by Dr. O’Toole in which students read a passage from a scientific textbook and replaced deleted words. Students were evaluated on whether the words were replaced and whether the terms were replaced with nouns (i.e., the “conceptual” regime) or conceptually adequate (i.e., the “cognitive” regime). The deleted items were classified in both traditional and modern grammar categories. Student volunteers included Biology majors, and students taking G.E. Biology and service courses in Biology. For UOG students N = 290; the larger data set of students from elsewhere was N = 673.

O’Toole & Schefter analyzed findings for Guam students in various ethnic groups in general (O’Toole & Schefter 2008) and in various biology classes (O’Toole & Schefter unpublished) shows that students who spoke Micronesian or Filipino language at home had more difficulty than English speakers, but even for the latter nouns and cohesive devices caused significant problems. The text passage below the table illustrates the impact of such difficulties on the comprehensibility of the passage from Solomon, Berg and Martin (2005, p. 104) (the current introductory biology textbook) by replacing language features indicated by Table 1 with words from a Gaelic folksong. The impact of the difficulties increases as they accumulate. This passage has a lower Flesch-Kincaid reading level (11.2) than the base text (12.2) on which the cloze test used in this investigation was based. This randomly chosen passage is also noteworthy in that its purpose is clearly language-related: the passage explains the meaning of a number of technical terms.

Original passage: “Two solutions may be isotonic or one may be hypertonic and the other hypotonic to the cell. Because a hypertonic solution has a lower effective water concentration, a cell placed in such a solution shrinks as it loses water by osmosis. Human red blood cells placed in a solution of 1.3% sodium chloride shrivel and die (Fig. 5-12b). If the surrounding fluid has a concentration of dissolved substances greater than the concentration within the cell, it has a higher osmotic pressure than the cell; water then enters the cell and is said to be hypertonic to the cell. Because a hypotonic solution has a lower effective water concentration, a cell placed in such a solution swells. Red blood cells placed in a solution of 0.6% sodium chloride gain water, swell (Fig. 5-12c), and may eventually burst. Many cells that live in hypotonic environments have adaptations to prevent excessive water accumulation. For example, certain protists such as Paramecium have contractile vacuoles that expel excess water (see Fig. 24-7).” (Solomon, Berg, & Martin, 2005, p. 104)

Substituted passage: Two ‘bhaile may be isotonic or one may be hypertonic and the other hypotonic

If the surrounding fluid has a concentration of dissolved substances greater than the concentration within the cell, it has a higher osmotic pressure than the cell and is said to be hypertonic to the cell. Because a hypertonic solution has a lower effective water concentration, a cell placed in such a solution shrinks as it loses water by osmosis. Human red blood cells placed in a solution of 1.3% sodium chloride shrivel and die (Fig. 5-12b). If the surrounding fluid contains a lower concentration of dissolved minerals than does the cell, it has a lower osmotic pressure and is said to be hypotonic to the cell; water then enters the cell and causes it to swell. Red blood cells placed in a solution of 0.6% sodium chloride gain water, swell, (Fig. 5-12c), and may eventually burst. Many cells that live in hypotonic environments have adaptations to prevent excessive water accumulation. For example, certain protists such as Mhaoi have contractile vacuoles that expel excess water (see Fig. 24-7).”

Closing the Loop: Particular instruction in these language elements have been incorporated into Science Communication courses to improve skills in this area. No outcomes results are available yet.

References