ASSESSMENT OF THE UNDERGRADUATE PROGRAM IN BIOLOGY: IMPLICATIONS FOR NEXT-GENERATION ASSESSMENTS
Jeff Carmichael and Ike Schlosser, Biology

Introduction
It was nearly five years ago that the department of biology implemented a comprehensive assessment plan for its undergraduate program. It was not an easy task at first. To begin with, we had no explicit learning goals. We also were not sure of which assessment tools might be effective and yet easy to implement. Furthermore, some of us failed to appreciate the benefits of program assessment. Nevertheless, we knew assessment was an important component that was lacking from our undergraduate program and we needed a plan to correct this deficit. Interestingly, the more our department discussed these issues, the more we recognized the potential value of direct assessment. In the end, we developed several assessment activities and a robust plan of implementation that had strong departmental support. Although our assessment plan does have limitations, it has provided useful information about the status of our incoming students, what our students accomplish while at UND, and how the assessment activities themselves can be improved. Here, we describe the learning goals ultimately adopted in biology, development and implementation of our assessment activities, a summary of our findings and assessment-based curricular changes, as well as a brief discussion of lessons learned.

Learning Goals
The Biology Department recently adopted the following learning goals for the B.S. degree in Biology:

1. Students will possess a sound factual knowledge of the core concepts and techniques in modern biology associated with all levels of organization, from molecules to ecosystems.

   Our graduates should be able to demonstrate an understanding of:
   a. core factual concepts associated with all levels of biological organization,
   b. the primary techniques used to study biological processes, and
   c. the relationship(s) among core concepts from all levels of biological organization.

2. Students will possess a clear understanding of the creative nature of scientific inquiry, including how new knowledge is created and communicated, and the role critical thinking and ethical considerations play in scientific inquiry.

   Our graduates should be able to demonstrate an:
   a. understanding of key principles of scientific inquiry,
   b. ability to design simple experiments and descriptive studies to answer basic biological questions, including the ability to critically evaluate the appropriateness of experimental treatments and sampling strategies,
   c. ability to critically analyze and interpret data,
   d. ability to critically read and interpret scientific literature to solve problems and answer questions,
   e. ability to effectively and persuasively communicate biological information orally, visually and in writing, and
   f. understanding of key ethical considerations associated with scientific inquiry.

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Development and Implementation of Assessment Activities

Several assessment tools were developed in order to provide direct assessment of all departmental learning goals. Most learning goals (1a, b, c, and 2a, b, c) were addressed through two extensive multiple choice (MC) exams consisting of 170 questions linked to specific learning goals (85 questions per exam). Assessment questions were obtained through multiple sources including several faculty members in biology. These exams were modeled on AP, GRE and MCAT tests and were administered to first-year students to provide a baseline level of performance. Assessment exams were also administered to senior-level students as part of our newly developed capstone course which is now a required part of our undergraduate program. Our capstone also includes a major written communication component that emphasizes the role of revisions during the writing process. These activities are used, in part, to assess learning goal 2e.

While MC exam assess knowledge and comprehension, they do not effectively assess how well our students interpret data and draw conclusions nor do they indicate the effectiveness of communication skills (Shepard 2010). Therefore, a separate writing-based assessment tool was developed and modeled after the Collegiate Learning Assessment described by Hersch (2005) and used recently at UND (http://www.und.edu/dept/datacol/newsletter/clips/2009_10CLA.pdf). The theme for our Collegiate Learning Assessment Task (CLAT) was inspired by a case study for teaching in the sciences (Dinan and Bieron 2001) and focused on a highly controversial issue involving the use of DDT. The CLAT includes three separate tasks that ask students to: 1) answer questions based entirely on primary research articles; 2) make a recommendation to the Secretary General of the United Nations in the form of a written letter that outlines whether or not a global ban should be placed on DDT; and 3) identify unethical behaviors in a fictitious research scenario. CLATs were administered to first-year students as well as seniors enrolled in our capstone course. Student performance on CLATs was used to assess learning goals 2d, e, and f and was ranked according to an assessment rubric we developed.

Summary of Findings and Actions Taken

Assessment results have been remarkably consistent from year to year for both freshmen and seniors. Interestingly, freshmen have demonstrated a slight annual increase for virtually every departmental learning goal since the 2007-2008 academic year (AY), reflecting either better preparation and/or a higher quality of students entering our program.

Seniors scored significantly higher than freshmen for every departmental learning goal during each AY. Overall, seniors scored highest on questions addressing learning goal 2a (scientific inquiry). First-year students also performed well in this category indicating students entering our program are already equipped with these fundamental skills. First-year students performed lowest on questions related to goal 1b (techniques) while seniors performed quite well on these questions. Substantial learning gains also occurred for goals 1a and 1c. Thus, students appear to be gaining a thorough understanding of modern techniques, factual content, and hierarchal relationships by the time they graduate. Results from the 2006-2007 academic year (the time we first implemented our assessment activities) did reveal, however, that seniors struggled with important evolutionary concepts (included as a subcategory of goal 1a). As a result, we recently added an evolution recitation course as part of our core curriculum. Although not conclusive at this point, performance of our seniors on evolution-related questions seems to have increased since implementing the new course.

Unfortunately, seniors posted only marginal gains compared to freshmen on questions related to experimental design and data analysis (goals 2b and 2e), representing an area in need of improvement within our curriculum. We discussed the implications of these results at faculty meetings and have recently placed a higher priority on these activities within many of our courses. Time will tell if our attempt to “close the assessment loop” will have its desired effect.

Results from the CLAT are particularly interesting and indicate we underestimate the ability of many of our incoming students. Performance of freshmen students on the CLAT reveals many incoming students can already answer basic questions based on their reading of primary scientific literature. They were also able to effectively identify ethical problems associated with scientific research. They did, however, struggle with demonstrating effective writing skills. Overall, seniors performed higher than freshmen on all CLAT activities, but the gain in performance was not as substantial as one might hope.

Conclusions

Our assessment activities have provided a reasonable first attempt at gauging the extent to which we are meeting our departmental learning goals and have lead to shifts in teaching approaches. However, we recognize the limitations of our assessment plan. In particular, drawing conclusions from MC exams can be a challenge if you do not have explicit criteria for acceptable levels of achievement (and haven’t decided what matters more—the absolute level at which seniors perform, or the demonstrated performance gain compared with freshmen students?). Furthermore,
although MC exams are fairly easy to implement and are useful in measuring comprehension and knowledge, they are not particularly effective at demonstrating the complex levels of achievement we should expect of our students at the end of their university education (Shepard 2010). Our CLAT represents a step in the right direction, but it still needs to be refined and expanded to present a more challenging set of performance tasks that better reflect the priorities and high expectations of our undergraduate program (e.g., non-routine problem solving, data analysis, evidence-based reasoning, experimental design, and effective communication). The challenge will be deciding how to implement this next generation of assessment without undue burden on faculty or students.

References

Dinan, F.J. and J. Bieron. 2001. To spray or not to spray: A debate over malaria and DDT. National Center for Case Study Teaching in Science, University at Buffalo.


Assessment Consultants Available

During the first semester of teaching – or a first solo research project – it’s important to have mentors and advisors who can serve as sounding boards and resource people when questions arise. So also with assessment. Often the best help is that which comes through conversations with a colleague or mentor from outside your program who can help you work through issues. Several UND faculty, each of whom has significant experience with and expertise regarding assessment, are available to provide this kind of face-to-face assistance.

Darla Adams – Nursing
Mary Askim-Lovseth – Marketing
Elizabeth Bjerke – Aviation
Jeff Carmichael – Biology
Barb Combs – Teaching & Learning
Kirsten Dauphinais – Law
Mike Mann – Chemical Engineering
Daphne Pedersen – Sociology
Fred Remer – Atmospheric Sciences
Lori Robison – English
Joan Hawthorne, Director of Assessment and Regional Accreditation, is also available to work with faculty and program directors from across campus on assessment issues.

To request assistance, consultation, or conversation regarding assessment from any of the individuals identified, please contact Joan Hawthorne (7-4684 or joan.hawthorne@email.und.edu). Or to work with a specific faculty member, you may prefer to contact the consultant directly.

Faculty can receive feedback on teaching

It’s not too late to make plans to use the SGID (Small Group Instructional Diagnosis) method for receiving midterm feedback from students in your classes. The SGID process, facilitated by a trained faculty colleague, is a method of soliciting student perceptions about the progress of their learning. Since it is conducted by an outsider to your class, students are free to be direct, but since it is normally done around mid-semester, you receive the feedback at a time when there is still ample opportunity for you to consider any changes that might improve student learning. The SGID process is flexible enough to be used with both large and small classes, and yields information likely to be useful to both beginning and experienced faculty.

For more information about the SGID process or if you would like to request an SGID, contact Jana Lagro at 7-4998 or jana.lagro@und.edu.
Support Available to Develop and Lead High-Impact Experiences for New Students: Summer/Fall 2011

As part of ongoing efforts by the Undergraduate Learning Working Group (ULWG) to examine ways to enhance the learning experience we provide to our students, a need has been identified for a program that intentionally connects new students with the academic life of the campus, and that gets them engaged in ways that have been shown to lead to improved student learning. These types of programs are commonly referred to as first year experiences (FYEs), and the ULWG’s vision for an FYE program at UND would be that it exhibits the following two essential features: (i) an academic focus; and (ii) an intentionality in addressing issues that are important for new students who are in a college-level academic environment for the first time.

In many ways these dual goals are present in two programs that are already offered at UND for new students: The Honors Program and the Integrated Studies Program. These programs, then, are providing their cohorts of new students with the types of experiences the ULWG has concluded are important. The ULWG’s challenge has been to develop ideas for how UND might be able to expand the number of students who are impacted by an academic FYE beyond the approximately 10% who currently benefit from their participation in the Honors and Integrated Studies Programs.

To help address this challenge, the ULWG has recommended that pilot versions of certain types of FYEs be offered during the fall semester of 2011. By piloting some of the FYE options that the ULWG feels may be appropriate for UND, there will be an opportunity to assess how to move forward most productively. Through a deliberate approach to find what works best, the ULWG hopes that a variety of effective FYE options can be added to UND’s curriculum in order to serve a much larger number of new students.

To make all this happen, it will be necessary to find faculty who are interested in developing FYEs over the summer of 2011, and then offering these experiences to incoming students for the fall semester of 2011. If this sounds like something you might be interested in, there are two things to be looking for in the next few weeks in the University Letter and your campus mailbox:

A call for proposals to develop these pilot FYEs for Fall 2011. Included in the call will be more information about the types of FYE pilots that will supported, as well as about the nature of the summer and academic year support that will be provided.

A meeting on March 7 at 2:00 p.m. in the Badlands Room of the Memorial Union for anyone interested in hearing more about this FYE initiative. At this meeting representatives from the ULWG will discuss the role they see these pilot projects playing in helping to shape the future undergraduate learning experience at UND. There will also be plenty of time for questions and to begin thinking about how you might develop and lead one of these FYEs.

For more information, contact Ryan Zerr (ryan.zerr@und.edu) or Brett Goodwin (brett.goodwin@und.edu).

Curriculum development retreat funding available

The Office of Instructional Development is making grants available to academic programs and departments conducting curriculum development retreats. The most useful and productive program development occurs when there’s a mechanism for collective conversation around student learning goals, pedagogy and curriculum design. These retreats are intended to serve that purpose by providing opportunities to bring faculty together to analyze, discuss, and develop curriculum across their program or department. So, if you have a grad program in need of attention or are developing stronger linkages across the ES program and your majors, this funding can help advance those necessary conversations.

An academic department or program may request a maximum of $500. Funding will be available on a first-come, first-served basis for qualifying departments until the available funds are exhausted. Funds awarded may be used for operating expenses (consistent with University guidelines). The funding will expire June 30, 2011.

To apply for retreat funding, please submit a one- or two-page memo that includes a proposed retreat agenda and budget, as well as a narrative description of both. Also include a letter of support from the chair (unless the chair is submitting the proposal). Inquiries and applications should be directed to the Director at anne.kelsch@und.edu or 7-4233.
Summer 2011 Workshops

Teaching with Writing

If you are developing or revising a course this summer, and if you plan to incorporate writing in your course, consider taking part in the Teaching with Writing workshop. The 20-hour workshop takes place over 6 sessions in late May. At the end of the workshop, participants will have a final version of the syllabus, assignment handouts, and rubrics for one course. They will also have a plan for coaching and evaluating the assignments.

The workshop will take place May 16-19 and 23-24 from 8:30am to 12:00pm in the Memorial Union. Participants receive a $600 stipend (subject to standard deductions) and workshop materials.

The workshop is limited to 10 participants, and applications are due April 4. For questions and for information about the application process, contact Kathleen Vacek, coordinator of Writing Across the Curriculum, at 7-6381 or kathleen.vacek@und.edu.

Teaching with Technology

OID and CILT will offer two Teaching with Technology workshops this summer. The eight-session workshops are designed for faculty interested in using technology to enhance their teaching.

The first workshop, which will be focused on campus instructors, will be June 6-9 and 13-16.

The second workshop will be July 6-8 and 11-15 and will have an online focus.

Watch your mailbox for information or visit und.edu/cio/cilt/ or oid.und.edu.

Encourage your Students to Consider a Position in the Writing Center

In the last issue of On Teaching, peer writing consultant Cora Nasset wrote about what she has learned while working as a writing consultant at the UND Writing Center. Writing center alumni see many benefits from their consulting experience, including new writing strategies, improved listening skills, the ability to collaborate effectively, and critical reading skills. All of these traits are useful right now to students and later in any career.

You can help identify candidates now for undergraduate peer writing consultant positions for the 2011-2012 academic year.

In addition to students who have impressed you with their course papers, perhaps you’ve noticed a student who is especially effective in small group activities, or a student who comes to you for thoughtful conversations about improving his or her writing. Any of these students have potential to be effective writing consultants.

Please talk to the students you identify about the benefits of working as a consultant, and encourage them to stop by the Writing Center or to visit writingcenter.und.edu to learn more about the position and application process.

Contact Kathleen Vacek at 7-6381 or kathleen.vacek@und.edu for more information.
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<th>Confrences of Interest:</th>
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<tr>
<td>Individual faculty and faculty teams can apply to FIDC for support to attend teaching related conferences and institutes. Look under “funding” at oid.und.edu for more information.</td>
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<th>Upcoming On Teaching Lunch Seminars</th>
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<td>ESL Students’ Writing: An Open Conversation</td>
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<td><em>Monday, March 7, 12:30 - 1:30</em> <em>(register by Thursday, March 3 by noon)</em></td>
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| The Nitty Gritty of Managing Students in their Co-ops/Clinicals/Experiential Learning/Field Work |
| *Tuesday, April 12, 12:30 - 1:30* *(register by Friday, April 8 by noon)* |

| Course Design for Critical and Creative Thinking in the Major |
| *Wednesday, April 27, 12:00 - 1:00* *(register by Monday, April 25 by noon)* |

All sessions take place in the Badlands Room of the Union unless otherwise noted. Visit the Office of Instructional Development online (www.oid.und.edu) to register. For information contact Jana Lagro at 7-4998 or jana.lagro@und.edu.