

Assessment of Student Learning

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Assessing Student Learning Outside the Classroom

By Sara Axelson, Vice President for Student Affairs

The student affairs profession has embraced the assessment of student learning, recognizing that what students learn outside of the classroom (in the co-curriculum) can first, bolster what is being learned in class; and second, contribute in other meaningful ways to student growth and development. Evidence such as the National Survey of Student Engagement lends support to furthering student learning assessment within student affairs programs.



Sara Axelson

Here at UW, the Division of Student Affairs is also developing strategies to assess what students learn from its programs and services. Like the experiences of our academic colleagues, assessment of co-curricular programs is not simple. There is no magic assessment tool that captures what students have learned. Compounding that, we acknowledge that often students do not even recognize that they have learned until they piece something together many years down the road. But despite these challenges, it is important to put efforts in place to understand, to the best extent possible, how our programs influence student learning and development. Two years ago, our departmental directors met to identify the key ways that they believe our programs and services contribute to student learning. Eight learning outcomes were developed:

- ▶ Healthy lifestyle choices
- ▶ Appreciation of individual differences and similarities
- ▶ Critical thinking

- ▶ Personal responsibility
- ▶ Self-understanding
- ▶ Communication
- ▶ Citizenship
- ▶ Engagement, belonging, and loyalty

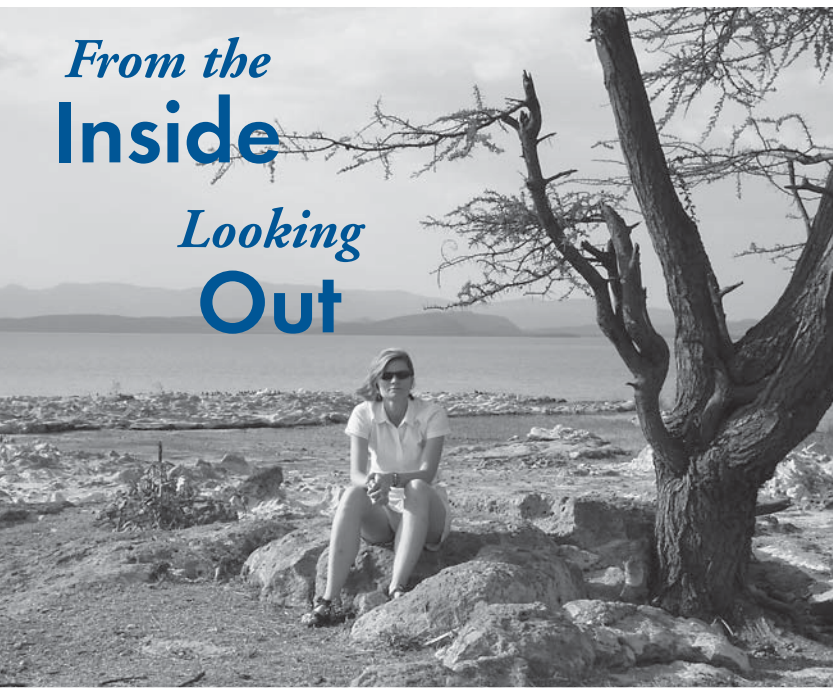
As the directors put together their annual reports last year, they were asked to consider to which of these learning outcomes their programs contributed, and to begin thinking how they might assess their contributions.

It is understood that not every department contributes equally to all divisional learning outcomes. It was also suggested that the directors think small for the first cycle—focusing on more depth than breadth. The goal of clearly articulated assessment strategies for one or two learning outcomes was the ideal for each department. Because the planning process is decentralized within the division, it was entirely possible that the process, with directors selecting a learning outcome or two, would have resulted in some of the learning outcomes not being included in the first round of assessment planning. However, when mapping each of the eight learning outcomes after the first planning cycle, we were happy to see that the directors collectively supported each of them this first time around.

For the next cycle of planning, a rubric was shared with the directors to demonstrate how planning efforts coordinate with the assessment cycle. The rubric can be applied to their assessment plans and has four stages that the directors can use to try to move their assessment

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From the Inside Looking Out



Erika at Lake Langano
(Bishangari eco-resort)
in Ethiopia this April.

Spring semester and summer certainly came and went! In addition to many of the normal tasks related to assessment of student learning issues that I am normally engaged with, I have also become involved with the university's self-study process. As many people already know, UW kicked off its official self-study for continued accreditation by the Higher Learning Commission. UW will be actively engaged in self-study until March 2010 at which time an evaluation team will arrive for the culminating visit. The university self-study process is perhaps the largest assessment process of them all. While it is a lot of hard work, I expect it will be a great opportunity for the university community to really dig deep into its institutional data. Also it will serve as an opportunity to critically analyze our assessment of student learning efforts to date and strategize future goals for those areas which need improvement. There will be much more information on the self-study process in the months to come. In the meantime, you can check out the progress to date on the self-study Web site at www.uwyo.edu/selfstudy. You will need to logon using your UW username and password.

This summer, the College Assessment Coordinators spent a considerable amount of time evaluating the assessment of student learning section in each department's annual report submitted by the department chairs. This is the fourth year this review

has taken place. A team of at least three readers evaluated each report in the context of progress from the previous year and in terms of characteristics and traits of a good assessment of student learning practice. Their comments were combined and summarized, then given to the College Assessment Coordinators to distribute back to their respective colleges. If you have never seen your department's report or the feedback we provide, I encourage you to read it. It provides a nice summary of our assessment activities each year, as well as ideas on how to improve what we are doing.

Beginning this July, the Ellbogen Center for Teaching and Learning, in conjunction with the College Assessment Coordinators made funding available for departmental assessment projects. In past years, we have sponsored more formal Assessment Assistance Grants. While the intent is still to support department and program assessment initiatives, the process for obtaining funding is much less formal. Instead of a hard application date, we are taking applications for up to \$750 per project on a continual basis until the money is gone. So far, the College Assessment Coordinators have agreed to fund five projects beginning this summer. This is a great way to jump start a project so I encourage faculty and APs to apply. More information is available on the Assessment of Student Learning Web site at www.uwyo.edu/AcadAffairs/assessment/.

This fall, the ECTL and College Assessment Coordinators are sponsoring another exciting fall forum. More information about the forum appears on page 4. We have hosted a number of forums in the past and really believe they are helpful in getting more people engaged with issues surrounding student learning. We try to offer a variety of session formats on various topics over multiple days. While your schedule may not allow you to attend the entire forum, I hope that one or two events resonate enough for you to attend. I am especially excited about the panel discussions. These were a big hit at last year's forum and I expect a lot of good conversation to come from them.

Thank you for giving me this opportunity to share my passion for student learning with you again. I look forward to another great semester. If you need help on your assessment of student learning projects, feel free to contact me at ekprager@uwyo.edu or 766-2897.

Erika K. Prager

University Assessment Specialist

IN THE spotlight: Interdisciplinary Capstone Design Program in the College of Engineering and Applied Science

By Charles Dolan, H.T. Person Chair, College of Engineering and Applied Science

In 2005, the College of Engineering and Applied Science developed a college wide, interdisciplinary senior design program to respond to the changing nature of the engineering discipline. Engineering projects are increasingly complex due to client needs, system integration efforts, advances in technology, and computer aided design tools. National advisory boards report that students must function better in team projects and improve communication skills. In addition, the Accrediting Board for Engineering and Technology (ABET) standards require multidisciplinary senior design activities.

The faculty members who designed the program addressed many elements: meeting various departmental senior design curricula criteria, determining flexible credit hours, identifying projects, recruiting students, engaging external professionals, developing class organization, and establishing a presentation forum for the work. Selecting relevant, adaptable projects became the key to success. In three years, two projects have been completed, yielding much data to help the college assess and revise this interdisciplinary design program.

The first project, conducted from 2005 to 2007, involved designing an automated transit project for UW. Students saw the relevance of this system to improving campus life, enhancing the campus image, and providing a long-term solution to campus access. The project faculty used the two years to fully develop the



Charles Dolan

concepts of interdisciplinary team work and design. Over the four semesters, interdisciplinary teams of students analyzed traffic patterns, selected routes, and completed designs for guideways, stations, and vehicles. The project concluded with the construction of a 1/5 scale proof-of-concept system.

The second project, conducted from 2007 to 2008, involved issues of environmental disruption in the Pinedale natural gas field. With three major gas fields and over 18 trillion cubic feet of gas to be extracted over the next thirty years, the students understood the sensitivity of the project and the impact on the state. For their design project, the students elected to participate in the Texas A&M Disappearing Roads Competition, which provided an external stimulus and added requirements to the project.

A key element of the interdisciplinary senior design is engaging the

students with other professionals. To complement professional engineers in Laramie, a series of field trips were arranged for both projects. For the transit project, students met with Denver International Airport staff to study the operation and maintenance of the airport automated transit system. They also met with Log Plan Consultants, a consulting firm working on the baggage handling system at the airport. At Six Flags, they met with the engineers to examine how safety of small systems is maintained. Rocky Mountain Prestress staff discussed issues of prefabrication, construction, and scheduling of complex projects. For the gas field project, students visited Halliburton, EnCana USA's Jonah Field, the Questar Visualization facility, and the BLM office overseeing development of two of the fields near Pinedale.

On campus, the class was organized to simulate a design office. Students were interviewed to determine their technical and career interests and their desire to

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UW Students discussing gas field drilling and production issues with EnCana USA engineers.

Assessment Project Support Funding Available

The College Assessment Coordinators Committee, in conjunction with the Ellbogen Center for Teaching and Learning, is pleased to announce that it is accepting applications from interested faculty or academic personnel seeking funds to assist with departmental assessment of student learning projects.

Requests are now being accepted. Applications will be reviewed within a month of being received.

Requests for up to \$750 may be made. Funds may be used for a variety of purposes including but not limited to the following: hiring of graduate student(s), technology development (software, programming, etc.), hosting outside speakers related to the project, and the purchase of standardized assessment instruments. The major restriction is that funds cannot be used for faculty summer salary or other direct compensation.

For more information or to download the application, go to the Assessment of Student Learning Web page at www.uwyo.edu/AcadAffairs/assessment.

Congratulations to the following faculty whose applications have already been approved:

Stephen Herbert
Plant Sciences

Tricia Johnson
Elementary and Early Childhood Education

Robert Mayes
Science-Math Teaching Center

Dee Pridgen
Law School

Jane Warren
Counselor Education

The Ellbogen CTL and the University Assessment Coordinators are pleased to announce the

2008 Fall Forum on Learning and Assessment

The Obligation of Knowledge

Monday, Oct. 20–Wednesday, Oct. 22

- Plenary with Karen Kashmanian Oates, Deputy Director of the Division of Undergraduate Education at NSF, Oct. 20, Noon: “The Obligation of Knowledge.” Family Room. Lunch provided.
- Panels, workshops, and discussions throughout the three days by UW presenters.
- Free registration.

Watch for a complete schedule in late September. Visit “The Obligation of Knowledge” page on the ECTL Web site: www.uwyo.edu/ctl/fallforum.asp or call 766-4847.

Assessing Information Literacy Taught Via Online TIP Tutorial

By Bryan Tronstad, Science Librarian, The University of Wyoming Libraries

A cost-effective method of teaching information literacy to students is through on-line, interactive tutorials. UW Libraries' Information Literacy Assessment Committee used funds awarded to them by the ECTL Assessment Assistance Grant to evaluate the Tutorial for Information Power (TIP). UW librarians created TIP and a related quiz to help teach students about information literacy and test student knowledge after taking the tutorial. All students enrolled in courses that have the University Studies Program's information literacy (L) component are required to take TIP and pass the associated quiz with a score of 70% or higher.

Our objective was to assess whether students learned information literacy by taking the TIP Tutorial. TIP is a 131 page tutorial with interactive questions to encourage student understanding, and covers the topics of investigating, searching, locating, evaluating, and using information. The study involved 1,070 students who took TIP during fall semester 2007 and was based on a pre- and post-quiz assessment.

The assessment was designed for students to take an online pre-quiz before working through the tutorial so we could measure prior knowledge of information literacy. After students took the tutorial, they were required to take a post-quiz. We recorded the amount of time each student spent on the tutorial, and each student's pre- and post-quiz scores. Students on average spent 43 minutes on the tutorial with 98% of students spending <200 minutes. Students earned 9% higher scores on the post-quiz compared to the pre-quiz (paired t-test, $p < 0.05$). Students who spent more time on the tutorial generally earned higher scores on the post-quiz. We divided students into two groups: those who spent <20 minutes reading the tutorial and those who spent 40–200 minutes reading the tutorial. We assumed that students in the <20 minute group gained little information from the tutorial compared to students who spent 40–200 minutes reading the tutorial. Prior student knowledge of information literacy was similar between the two groups (pre-quiz scores were statistically no different; t-test, $p > 0.05$). However, students in the 40–200 minute group earned 6% higher post-quiz scores compared to the <20 minute group (t-test, $p < 0.05$).

Therefore, students who took more time working through the tutorial had a significant improvement on the post-quiz in comparison to those students who spent less time or did not take the tutorial. We also found that a large number of students passed the pre-quiz prior to going through the tutorial. It is our belief that the quiz used to test student

understanding of the tutorial could be improved to more clearly address the unique information students learn from the tutorial. However, we conclude from our assessment that students are learning about information literacy from the TIP tutorial.

Good quantitative assessment of student learning is not an easy feat, although the adaptation of new technologies can help increase the ease and quality of assessment being done. As we strive to obtain larger samples and more detailed analysis of variables, we become more reliant on computer tabulation and the skills needed to manage and manipulate these technologies. Our assessment is an example where collaboration was necessary for effective evaluation. We could not have completed our assessment without the help of computer programmers who were instrumental in integrating the online quizzes with the tutorial; they created user logins for tracking students and provided access to recorded data. Also, hiring a statistician to analyze the data was essential. Thus, our study shows the results of successful collaboration between computer programmers, a statistician, and librarians. An article titled "The Demise of the Lone Author" in the December 20th 2007 issue of *Nature* magazine made a good point when stating that a single authored paper is a thing of the past, because of the expertise and collaboration needed to write a good paper. The need for collaboration is certainly apparent with scientific research, but I also firmly believe collaboration is needed for successful assessment of student learning.



Bryan with his daughter Tresize

Reflections

By Mark Stayton, Associate Professor and Department Chair, Molecular Biology

“There’s no data like more data.”

—Alex Franz and Thorsten Brants, Google, Inc.

When it comes to program assessment, university faculty members love to whine by expressing skepticism about efficacy and cynicism about motivations. Certainly, efforts to estimate program success are bedeviled by potential pitfalls. Biochemistry graduate students usually learn the hard way that “You get what you assay for.” The ostensible target of an assay is not always the true target. In other words, developing good predictors of program quality can be difficult. Or, we may unconsciously bias assessment towards an outcome in our own image. As an Athenian said in the 5th century BC, “If the ox could paint a picture, his god would look like an ox.”¹ Despite such caveats, my colleagues and I are motivated by data and the possibility that a database of student achievement can be used to make informed decisions about curricula and program issues. So, under the direction of Dr. Peter Thorsness, the department has chosen to establish an ongoing effort to assess programmatic outcomes.

The target is moving. Entire courses in our curriculum address topics that were unknown 20 years ago. Upon being forced to articulate our programmatic goals, the faculty realized that the “facts” of molecular biology are secondary to the thoughtful application of those facts. The learning outcomes for the molecular biology program attempt to capture that sentiment:

1. Graduates will be able to propose hypotheses that explain novel biological phenomena. Mastery of this skill will be demonstrated by:

- ▶ Basing the hypothesis upon precedence and/or logic
- ▶ Consideration of alternative hypotheses
- ▶ Appropriate application of fundamental principles
- ▶ Sub-discipline specific application of facts and principles

2. Graduates will be able to propose experimental tests of hypotheses. Mastery of this skill will be demonstrated by:

- ▶ Appropriate application of techniques
- ▶ Adequate description of experimental controls
- ▶ Logical and internally consistent application of scientific methods



Mark Stayton

3. Graduates will be able to effectively communicate the significance of classic biological principles and emerging biological developments to both expert and lay audiences. Mastery of this skill will be demonstrated by:

- ▶ Well organized and clearly written research notebooks, reports and grants
- ▶ Accurate and clear presentation of primary biological literature
- ▶ Appropriate use of visual and interpretive aids

How might we assess success based on these criteria? As a first step, we selected four courses from among the core requirements for the BS degree. The instructors write one or two essay questions that address our programmatic learning outcomes at a level appropriate for their course. These questions are administered and graded during the normal testing for each course. At the end of each semester, independent readers will score the assessment questions a second time using a defined rubric. The resulting database serves as our initial effort to track student progress through the degree program. Initially, our goal is simple. We also employ indirect measures of program efficacy such as exit interviews and tracking long-term career success among students. Other ideas have been discussed within the department. Graduates of our program could be required to take the GRE subject test in “Biochemistry, Cell, and Molecular Biology” as an independent evaluation of program outcomes, although the cost (\$130/student) is a barrier.

Faculty members have already suggested that we develop threads across our curriculum. For example, students are exposed to the mechanism of *lac* gene expression both early and late in their career. Thus, we can ask identical questions in various courses with differing expectations for student responses. The exercise of writing and discussing the assessment questions is driving changes in course syllabi as instructors see fruitful areas for cooperation. So assessment is not independent of program. Our approach also raises questions of academic freedom in the classroom. Should instructors be required to intellectually embed their courses within a curriculum? Although we can always deny deficiencies, assessment data makes denial a little more difficult and data can point towards a solution. Furthermore, assessment data may prove a useful tool as we petition the administration for resources.

¹ Quoted in E.R. Dodds, “The Greeks and the Irrational”, Berkeley, CA, 1959, p. 181. (Needless to say, the Athenian was charged with blasphemy.)

Assessing Student Learning Outside the Classroom Continued from page 1

efforts forward. For the most part, the first set of plans focused upon steps one and two of the rubric. The goal this year will be for plans to start moving into steps three and possibly even four:

- ▶ Plans discuss at least one learning outcome to which their department contributes.
- ▶ Plans discuss strategies to measure their department's contributions to learning outcomes.
- ▶ Plans discuss measuring their department's contributions to learning outcomes and analyze results.
- ▶ Plans discuss how they have improved their programs and contributions to student learning based upon assessment results.

The learning outcomes process has dovetailed nicely into existing assessment efforts. Programs such as the Alcohol, Wellness Alternatives, Research, and Evaluation Program

(AWARE) have a long history of assessing program impact through both direct and indirect measurement efforts. Through connecting program efforts to the divisional learning outcomes, AWARE can provide pieces of evidence to demonstrate that the division is contributing to its learning outcome of Healthy Lifestyle Choices, for example.

Our efforts to assess student learning in the Division of Student Affairs are moving into the second year. Besides moving forward with our rubric, we will also be focusing upon each learning outcome to identify the components for which we are already building assessment strategies, and where we are not. Determining "what's missing" will allow us to have even deeper levels of dialogue, and enable a focused approach to find new ways to assess our efforts. As we move forward, we invite our academic colleagues to join us in our efforts. Through working together to support student learning, we can make real differences in the lives of our students.

Interdisciplinary Capstone Design Program Continued from page 3

be a manager or development engineer. Time commitments of each assignment were discussed, a class organization chart was developed, and contact information assembled. Class objectives, developed in the first two weeks, included the global expectations of the class, the interaction requirements, and specifications for project completion criteria.

The class met twice a week regardless of the number of credit hours each student received. By the fourth week, students began presenting preliminary studies and design concepts and leading team discussions. Separate meetings with the professor equilibrated the required hours. The professor also met with the project managers weekly to keep the project on track, review individual performance, and discuss possible task assignments.

At the conclusion of each semester, the class presented their work in a public forum. The class selected their review panel and issued invitations. The second semester review panel for the transit system included the UW president, vice president for research, vice president for facilities, department heads, engineers from the field site visits, two state senators, city engineers, and a representative from the Wyoming DOT. The gas field development project invited members of BLM, six major oil and gas producing companies, and the director of the School of Energy Resources in addition to university administrators.

The success of the course has been monitored by three sources of data: student evaluations, review comments at the presentations, and feedback from professionals. Student

evaluations have been generally positive with the major criticism being the unanticipated amount of work required to wrap up the project. During the public presentations, each visitor completed an evaluation of the presentation. All responses were compiled using a grading rubric. The fall 2007 presentation rated a combined score of 3.06 out of 4 and individual scores ranged from 2.8 to 3.6. Lastly, discussions with the engineers that participated in the field trips or visits were solicited. All of the professional reviewers reported that the students work achieved professional levels. The five-student presentation team represented the University of Wyoming at the Texas A&M competition and won the \$20,000 grand prize for the class. Their performance validated that the concept is working. The team won bonus points for its interdisciplinary composition that included both engineering students and a student from the Environmental and Natural Resource Program.

The program also has challenges. After a three-year trial, the college is taking a year long break from sponsoring the interdisciplinary design project, with plans to start again in fall 2009. Major issues about funding for the field trips, faculty time, project leadership, and questions from the disciplines about the content and rigor of the projects are being reviewed. The involvement of the Dean's office and the H.T. Person Professor endowment in the College of Engineering helped with these issues for the first three years. Sustainability of this program will require ongoing conversation and collaboration from the interested disciplines.



Mark Your Calendar

2008 Fall Forum on Learning and Assessment: "The Obligation of Knowledge"

Monday, October 20 through Wednesday, October 22, 2008

Watch for a complete schedule in late September. For more information go to www.uwyo.edu/ctl/fallforum.asp or call 766-4847.

Making Sense of Your Assessment Data Workshop

Wednesday, October 22, 2008 from 1:45 to 4 p.m. in EN 1062

Collecting data to assess student learning is just half the task at hand. What happens after your data are collected? Ever have difficulties trying to make sense of your data? Are you trying to figure out new ways to engage your colleagues in meaningful discussion about your results? Come join the College Assessment Coordinators for a lively discussion of these questions and more! To register, go to www.uwyo.edu/ctl/fallforum.asp.

The University of Wyoming assessment newsletter is published each semester (Erika Prager, university assessment specialist, editor). Any editorial comments reflect the view of the editor and not necessarily the university. Send comments, questions, and/or suggestions to Erika @ 766-2897 or ekprager@uwyo.edu. Past issues are available at <http://uwadmnweb.uwyo.edu/acadaffairs/assessment/Pages/News.asp>. • Persons seeking admission, employment, or access to programs of the University of Wyoming shall be considered without regard to race, color, religion, sex, national origin, disability, age, veteran status, sexual orientation, or political belief. • If you would like more information about support for students with disabilities at UW or to receive this publication in alternative formats, please call University Disability Support Services at (307) 766-6189 or TTY (307) 766-3073. • Graphic design by Elizabeth Ono Rahel • 2008/2.8M/BG

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