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# Lessons Learned in Developing and Implementing a Program Assessment Plan*

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*Although there is certainly no single, correct way to develop and implement an assessment plan, this paper presents a case study using a proven process for constructing an effective plan. The process described allows for a wide variety of approaches to assessment, while at the same time providing guidelines so that no important component of a successful plan is overlooked. The paper also includes a number of lessons learned in developing a plan for a specific program in chemical engineering at the Colorado School of Mines. We believe that the process we followed and the lessons we learned can be adapted to a variety of contexts and programs.*

## INTRODUCTION

IN THIS PAPER we will describe the lessons learned during the process of developing and then implementing a comprehensive program-level assessment plan to meet the needs of our constituencies as well as ABET (the US Accreditation Board for Engineering and Technology) accreditation requirements. Beginning in 1998, faculty from the chemical engineering department at the Colorado School of Mines (CSM) spent nearly two years consulting with key internal and external stakeholders (e.g. students, faculty, employers, alumni) and using this input to draft an assessment plan which would provide sufficiently detailed information for improving the curricular and pedagogical processes in the program. Tasks completed during this effort included:

- Setting general goals and specific, measurable objectives based on the institutional mission statement and the needs of employers and other constituencies.
- Determining performance criteria which describe expected levels of student performance towards meeting the goals and objectives.
- Revising our curriculum and pedagogical methods to ensure that students are being given sufficient opportunities to meet the objectives.
- Selecting assessment tools and evaluation methods which would indicate which objectives are being met at satisfactory levels and which are not.
- Developing a process for implementing and sustaining the assessment plan including strategies for providing feedback to all important stakeholders, enhancing the educational experience for our students, and improving the assessment plan itself.

In the following sections, we briefly discuss how each of the tasks listed above was completed and the lessons we learned along the way. We also briefly discuss program improvements that have come about as a result of our assessment efforts, how the assessment plan itself continues to evolve, and the challenges that remain part of sustaining rigorous assessment activities in the chemical engineering department. Our goal is not to present a *prescription* for developing an effective assessment plan, but rather to describe a *process* that others may find helpful in planning program assessment.

## ASSESSMENT HISTORY

At CSM we have been assessing student outcomes since the late 1980s in response to a mandate from the Colorado legislature for each higher education institution to develop an accountability policy and report annually on its implementation. Because of the school's small size and focused engineering and science programs, we chose to implement a portfolio assessment plan [1] rather than rely heavily upon other assessment methods such as standardized tests or surveys. Institutional-level portfolio assessment of first- and second-year core courses in mathematics, physics, chemistry, engineering practices, geology, and humanities was implemented in 1988; subsequently several departments including chemical engineering built upon the institutional assessment effort by extending portfolio assessment into junior and senior-level courses beginning in 1990. Thus, we had many years of assessment experience in the department as we embarked upon the design of an outcomes assessment process in response to ABET's EC 2000 criterion 2 which requires that 'programs must have in place a process based on

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the needs of the program's various constituencies in which the objectives are determined and periodically evaluated' [2].

## DEVELOPING AN ASSESSMENT PROCESS

Perhaps the most important lesson we have learned in nearly 15 years of assessment work at the course, program, and institutional levels is that *it is extremely important to develop and use an assessment process with clearly delineated steps.* Several helpful guides to developing an assessment plan exist, most notably those by Rogers and Sando [3] and the National Science Foundation [4], but we have found the process based on answering the questions summarized in Table 1 most helpful for our needs.

By answering these questions iteratively, we can be assured that we have not overlooked any important components of our assessment plan. Such a process does not dictate that a particular assessment method is used, but it does help faculty to decide which methods are most appropriate for measuring certain objectives.

*We also learned early in the process that periodic and active participation of the department faculty and support from the department head are crucial.* After some initial but unsuccessful attempts at departmental-level decision-making for each of the questions shown in Table 1, we created a pyramid management structure with one faculty member designated as the 'assessment coordinator' responsible for day-to-day monitoring of the process and a four-member assessment committee consisting of the assessment coordinator, the department head, and two faculty members responsible for assessing student work, interpreting the results, and reporting to all relevant constituencies. Major decisions about potential curricular and pedagogical changes and improvements in the assessment process itself are still discussed and decided upon by the entire department faculty. This management structure has been successful so far and seems to provide a reasonable balance between the need for actively managing the assessment process and keeping busy faculty members in the assessment loop.

## DEVELOPING PROGRAM GOALS AND OBJECTIVES

The first and perhaps most crucial step in developing an effective and sustainable program assessment plan must include an open and comprehensive discussion of program goals based on input from all relevant stakeholders (e.g. faculty, students, parents, employers, research sponsors, alumni, advisory committees, the Colorado legislature) and aligned with the institutional mission. At CSM, we are fortunate to have had in place for nearly 30 years a detailed statement of institutional objectives cast as the 'Profile of the CSM Graduate' in which five attributes of our BS graduates are listed (see Appendix A) [6]. Based on these global attributes and the ABET EC2000 outcomes listed in Criterion 3 [2], the department faculty began creating draft program goals (termed 'program educational objectives' in ABET language) using a series of retreats, workshops, and discussions in departmental staff meetings. Over the course of one academic year, the goals were written and rewritten approximately five times and shown to our industrial advisory committee for input and feedback twice. The final version of the goals resulting from this exercise is shown below:

- Goal 1: Instill in ChE students a high-quality basic education in chemical engineering fundamentals.
- Goal 2: Develop in ChE students the skills required to apply chemical engineering fundamentals to the analysis, synthesis, and evaluation of chemical engineering processes and systems.
- Goal 3: Foster in ChE students personal development to ensure a lifetime of professional success and an appreciation for the ethical and societal responsibilities of a chemical engineer.

At various points during this process, the number of goals under consideration varied from 2 to 5, but we finally decided that minimizing the number of goals was best as long as we thoroughly addressed each of the ABET outcomes and our institutional mission.

Once the program goals were agreed upon,

Table 1. Program assessment matrix [5]

| | |
|---|---|
| Goals | What are the overall goals of the program? How do they complement institutional and accreditation expectations? |
| Educational Objectives | What are the program's educational objectives? What should our students know and be able to do? |
| Performance Criteria | How will we know the objectives have been met? What level of performance meets each objective? |
| Implementation Strategies | How will the objectives be met? What program activities (curricular and co-curricular) help our students to meet each objective? |
| Evaluation Methods | What assessment methods will we use to collect data? How will we interpret and evaluate the data? |
| Timeline | When will we measure? |
| Feedback | Who needs to know the results? How can we convince them the objectives were met? How can we improve our program and our assessment process? |

we began the task of writing 3–6 measurable objectives for each goal. This ended up becoming a straightforward task, suggesting that once the goals were correctly aligned with the institutional and departmental missions, writing measurable objectives closely aligned with ABET EC 2000 student outcomes was not controversial. The objectives were written using measurable active verbs so that assessment activities could be directed towards determining if students had achieved each objective [7]. We then assumed that students who have demonstrated mastery of the objectives for each goal have automatically achieved the goal. As an example, Table 2 lists the five objectives created for our first goal listed above.

To help link these objectives to course-level work, we also articulated a series of attributes (specific skills and knowledge) which students who have achieved each objective should demonstrate in their academic work. Finally, the faculty agreed upon 10–15 measurable course learning objectives for each undergraduate chemical engineering course and made sure the course objectives and attributes aligned with the program goals and objectives already agreed upon. Many useful and interesting discussions among the faculty occurred during this process and after completing this task, we all agreed the exercise helped us better understand the strengths and weaknesses of the curriculum we were offering students. The entire set of program goals, objectives, attributes, and course learning objectives is available at the CSM chemical engineering department website [8].

*Lessons learned while creating program goals and objectives*

As program goals and objectives were developed, we learned the following lessons:

- Time spent developing goals and objectives is well worth the effort later in the process. Too often we find faculty who are developing assessment plans want to jump immediately to selecting measures (usually surveys) before deciding what they wish to measure.
- The discussion of goals and objectives can serve as a valuable faculty development tool as faculty work towards consensus on the goals of the program. It is surprising how often faculty who believe that they have common goals find that they do not. The opposite discovery is also made with some frequency.
- Fewer goals and objectives are better since each objective must be assessed. Resist the temptation to develop large numbers of goals.

## ESTABLISHING PERFORMANCE CRITERIA

Once the list of objectives to be assessed was finalized, we had to determine levels of acceptable performance for students to achieve each objective. Although this decision sounds straightforward, it is not. Our original plan called for each student assessed to achieve all objectives at a high level of performance. We quickly learned that this was neither possible nor necessary to be able to obtain useful and reliable assessment data for program improvement. Instead, we revised the criteria to reflect a more realistic multi-tier set of student expectations, particularly for assessment data collected on portfolio samples of student work (see 'Selecting Assessment Methods'). The faculty agreed upon the minimum level of acceptable performance (usually deemed 'apprentice engineer') at which we expected to see all student work and then extended the criteria to indicate our goal that a subset of the students (usually 50%) would achieve a higher level of performance ('proficient' or 'exemplary'). We continue to review the criteria in an attempt to set student performance at the correct level for our stakeholders' needs.

*Lessons learned while setting performance criteria*

As we worked towards establishing realistic performance criteria for program objectives, we learned the following lessons:

- Calibration is important—what is a realistic level of performance for students?
- Setting performance expectations can become a high-stakes, political process because this is the step at which value judgments enter the discussion. However, the discussions involved can lead to very valuable consensus-building among the faculty.

Table 2. Chemical Engineering Department assessment objectives for Goal 1: Instill in ChE students a high-quality basic education in chemical engineering fundamentals

| Program Objectives | Reference ABET EC2000 Criteria |
|---|---|
| ChE graduates will be able to apply knowledge of math, chemistry, and physics to identify, formulate, and solve chemical engineering problems | 3a, 3c |
| ChE graduates will be able to apply knowledge of rate and equilibrium processes to identify, formulate, and solve chemical engineering problems | 3a, 3c |
| ChE graduates will be able to apply knowledge of unit operations to identify, formulate, and solve chemical engineering problems | 3a, 3c |
| ChE graduates will demonstrate an ability to use the computational techniques, skills, and tools necessary for chemical engineering practice | 3k |
| ChE graduates will be able to analyze the economic profitability of a chemical engineering process or system | — |

Table 3. A portion of the chemical engineering curriculum implementation matrix

| Objective | Mass & Energy Balances | Fluid Mechanics | Unit Operations Lab | Senior Design |
|---|---|---|---|---|
| Apply knowledge of rate and equilibrium processes | × | × | × | × |
| Apply knowledge of unit operations | | × | × | × |
| Design a process or system | | | × | × |
| Function on a team | | | × | × |
| Effectively communicate orally and in writing | | | × | × |
| Use engineering tools | × | × | × | × |

## ALIGNING THE CURRICULUM TO MEET OBJECTIVES

Once the faculty agreed upon program goals and objectives, we began to identify curricular and co-curricular opportunities to help students achieve each objective. As part of this work, we developed an implementation matrix indicating which objectives were addressed in each course in the chemical engineering curriculum. Table 3 includes a small portion of the matrix as an example. Working together to complete the entire matrix, the faculty were able to identify overlaps and areas of little or no coverage and to begin the discussion about how to enhance weak areas in course coverage.

In Table 3, an 'X' denotes that one or more of the learning objectives in a particular course addresses the indicated program objective. The completed matrix for the entire curriculum indicated that achieving many of the objectives (e.g. communication skills, team skills, life-long learning skills) requires work over several courses and semesters and that many courses address multiple objectives.

### *Lessons learned while developing the implementation matrix*

As we developed the implementation matrix for our curriculum, we learned the following lessons:

- The curriculum may not completely cover all relevant program objectives and a discussion about how to fill in the gaps is a worthy program-level activity.
- Some faculty tend to overstate the number of program objectives addressed in their courses. An honest appraisal of the contribution of each course to program goals and objectives must be conducted. For this reason, some programs have found it helpful to indicate the level at which each objective is addressed in each course, e.g. using 'E' for 'extensive coverage' or 'M' for 'moderate coverage'.
- Co-curricular activities (participation in student professional societies, etc.) are important facets of each student's educational experience but are harder to assess and include in the assessment process.
- Faculty should realize that covering a topic in multiple courses is not a fault in a program, but rather that many skills require extensive practice in order to achieve proficiency.

## SELECTING ASSESSMENT METHODS

Once goals and objectives were drafted and the implementation matrix indicated that all of the objectives were addressed within the curriculum, we began to consider assessment methods that would be appropriate for measuring each objective. During the selection process, we searched for methods that could assess multiple objectives and several ways to assess each objective (triangulation). The results of this task are summarized in Table 4.

Although a variety of assessment methods is available [9], we chose to collect portfolios of student work to assess as many objectives as possible [10] since the department faculty felt more comfortable directly reviewing how well students were able to complete academic tasks (e.g. exams, projects, lab reports, design reports) rather than relying strictly on survey instruments or other self-reported data. However as Table 4 indicates, we found that assessing several of the objectives such as life-long learning, the global and societal impact of engineering, and awareness of contemporary issues, did require reliance on survey reports from graduating seniors, alumni, and/or corporate recruiters.

Since the assessment process is designed to help improve the overall education experience of our students but not to certify individual students for graduation (the traditional grading system still determines credit hours earned and completion of graduation requirements), we chose to collect and assess student work for a representative sample (approximately 20%) of chemical engineering majors. We also chose to selectively sample student work from several but certainly not all junior-level and senior-level chemical engineering courses.

As indicated in Table 4, final exams are collected from thermodynamics (CR 357), mass transfer (CR 375), and reactor design (CR 418) courses and a computer project is collected from the heat transfer course (CR 308). In addition, written reports are collected from the unit operations laboratory and senior process design courses. These items were very carefully chosen to maximize the number of objectives that could be assessed using each student work product. For example, students' ability to design and conduct experiments, apply knowledge of chemical engineering fundamentals to solve problems, analyze and interpret data, and effectively communicate

Table 4. Assessment methods used to assess each program objective

| Measure / Objective | CR 357, 375, and 418 final exams (rubric) | CR 308 project (rubric) | Unit .O. lab written reports (rubric) | Unit Operations lab and senior design oral reports (rubric) | Senior design final reports (rubric) | FE exam results | Defining Issues Test results | Senior exit survey, alumni survey, recruiter survey | Teamwork evaluation forms (peer and professor) |
|---|---|---|---|---|---|---|---|---|---|
| 1.1—math, chemistry, physics | × | × | | | | × | | × | |
| 1.2—rate/equilibrium processes | × | × | | | | × | | × | |
| 1.3—unit operations | | | | × | | | | × | |
| 1.4—computational tools | | × | | | | | | × | |
| 1.5—engineering economics | | | | | × | × | | × | |
| 2.1—design/conduct experiments | | | × | | | | | × | |
| 2.2—analyze/interpret experimental data | | | × | | | | | × | |
| 2.3—design process/ system | | | | | × | | | × | × |
| 2.4—multidisciplinary teams | | | | | | | | × | × |
| 3.1—professional/ ethical responsibility | | | | | | | × | × | |
| 3.2—oral/written communications | | | × | × | × | | | × | |
| 3.3—global/societal impact | | | | | | | | × | |
| 3.4—self-education and life-long learning | | | | | | | | × | |
| 3.5—contemporary issues | | | | | | | | × | |

in writing can all be assessed using unit operations laboratory written reports.

Once student materials are collected, they must be rigorously assessed to determine how well objectives are being met. We chose to use holistic scoring rubrics as the assessment instrument for our portfolio materials because we could create rubrics aligned to the student attributes and performance levels we had already established. To help avoid any criticism that portfolio assessment is a subjective 'touchy-feely' process, we followed the following rubric development process proposed by Greene [11]:

- Determine what objectives will be assessed.
- Determine an appropriate number of performance levels (3, 5 or 10 levels are common).
- For each objective, draft descriptions of student work at each level of performance using examples of student work which illustrate a range of low to high quality work.
- Use the draft rubric on additional work samples; use multiple raters to assess the rubric's reliability.
- Revise the rubric and assess additional work samples to improve agreement among raters.
- Continue revising the rubric until multiple rater scores agree within acceptable limits.

Examples of the scoring rubics we have developed and used are available at the CSM chemical engineering department assessment website [8]. Most of the rubrics are designed with only three or four levels of student performance ranging from novice to exemplary, which we determined to be sufficiently detailed for the purpose of program assessment.

*Lessons learned while selecting assessment methods*

As we decided which assessment methods to use, we learned the following lessons:

- Multiple methods need to be selected to assess as many of the objectives as possible. This is known as 'triangulation.' Over-reliance on one method can be misleading.
- Rely on sampling techniques particularly if the program has many students; not every student must be assessed.
- Faculty should participate in the discussion to determine what student work or other data will constitute evidence that objectives are being achieved.
- Developing and calibrating scoring rubrics is a time-intensive activity that must be completed to ensure data validity and reliability. Rubrics must be specifically designed for the objectives, attributes, and performance criteria included in the assessment plan. Once they have been developed, however, rubrics make the task of evaluating student work relatively easy.
- The choice of methods can be improved each time student work is assessed. If something doesn't work, it should be discarded, and not everything will work.

## IMPLEMENTATION OF THE PROCESS

Once we determined how we would measure each program objective, we began to discuss how the plan would be implemented and sustained and in what ways we would report results to our stakeholders. Although several methods of implementation were discussed (e.g. assigning each faculty member one or more assessment tasks, hiring a part-time assessment professional to do all the work), we chose to assign all assessment tasks to the department assessment committee headed by the assessment coordinator. This approach allowed day-to-day assessment work (e.g. data collection and interpretation) to be completed by one individual with frequent analysis and interpretation of the results by a subset of the department faculty. Important findings and recommendations for program improvement can then be reported at least annually to the entire faculty for consideration and input. The assessment process itself is also reviewed and improved at least annually as part of this dialogue.

Periodically reporting the results and conclusions from the assessment and evaluation process to all program stakeholders is very important. Initially these efforts have involved:

- posting results on the department assessment website;
- making short presentations to the student chapter of the American Institute of Chemical Engineers and to meetings of our external visiting committee;
- including assessment updates in alumni newsletters;
- updating industrial recruiters of our students.

However, we continue to search for additional ways to get the 'news' to all relevant stakeholders of our program.

### *Lessons learned during implementation and feedback*

As we developed our implementation and feedback plans for the assessment process, we learned the following lessons:

- Don't measure an objective if you don't want to know the results.
- Be sure to use the assessment data to make program improvements when necessary. If others don't see changes resulting from your assessment activities, they are likely to lose interest quickly.
- Make sure all relevant data are reported to stakeholders and used to improve the program.
- Develop an assessment phase-in plan; not all the objectives have to be measured at the same time.
- Develop a long-range plan to measure objectives periodically but not necessarily every semester or academic year.
- Try to avoid overburdening faculty and other stakeholders with too much data. A few, well-chosen pieces of information may be much more effective than a 'data dump'.

## EXAMPLES OF PROGRAM IMPROVEMENTS

Although our assessment process is still under development, we have already used assessment results to identify several areas in the curriculum that required strengthening. For example, we added laboratory components to two courses (Mass & Energy Balances and Thermodynamics) after assessment of unit operations laboratory and senior design reports indicated that the students were not analyzing experimental results in sufficient depth. Graduating senior exit survey data also indicated that students desired more hands-on experience in chemical engineering courses prior to the unit operations laboratory, which is taken between the junior and senior years. The lab components have been piloted for two semesters and assessment data will be used to decide if this response has improved the data analysis abilities of our students.

We have also included more writing instruction and practice in chemical engineering courses as part of a campus-wide 'writing across the curriculum' initiative in response to students' need to improve their technical writing skills. Once again, we are monitoring the impact of this intervention by continuing to assess student written work collected in the portfolio assessment process.

### *Lessons learned while using assessment data to make program improvements*

As program improvements have been discussed as a result of assessment results, we learned the following lessons:

- Be sure to use assessment results to guide program improvements and try to avoid intermingling these results with the ever-present anecdotal comments from faculty members.
- Understand that proposing program changes based on assessment data will meet with resistance from some faculty; try to focus the discussion on program improvement rather than changes in individual courses 'owned' by faculty.
- Don't try to 'fix' everything at once. Focus on making the most dramatic changes first. Solid examples of ways in which assessment leads to improvements in the curriculum and student outcomes will help convince skeptics that the effort is worthwhile.

## SUMMARY

In addition to the descriptions of 'lessons learned' throughout this paper, we have also learned other important and relevant lessons about implementing outcomes assessment. These include the following:

- Avoid the temptation to start collecting assessment data before developing clear goals, objectives, and an assessment process. Before decisions are made about which materials to collect and assess, be sure to answer questions about what is being assessed, how the data will be analyzed, when materials will be collected, and who will receive the results.

- Be sure to promote stakeholder buy-in by involving as many constituencies as possible in the assessment development and implementation process.
- Include as many faculty as feasible in the process. If one lone faculty or staff member is assigned the assessment task, the plan will almost assuredly fail. Develop a management structure that balances day-to-day assessment activities with periodic input from the program faculty.
- Look for campus resources to help faculty get started with assessment and provide faculty development opportunities. Most schools have some level of assessment expertise on campus—do not be afraid to search for help in training engineering faculty to become good assessors.
- Remember that the quality of results is more important than quantity. Assessment does not have to measure every learning objective in every course in the curriculum. Collect and interpret results that will be of the most value to improving the learning and teaching process and use sampling techniques to collect a snapshot of student achievement.
- Find ways to reward the efforts that faculty put into assessment. Rewards may be monetary, but they can also include release time, publication possibilities, recognition during annual faculty evaluations, and support for attending assessment-related conferences.

We believe the assessment process described in this paper has allowed us to improve our students' educational experience by providing us with valuable data on program strengths and weaknesses. The process also allows us to monitor the impact of curricular interventions to be sure the changes actually improve learning and teaching in our program. However, designing and implementing an effective assessment plan with limited time and other resources is not an easy task as the lessons learned in this paper illustrate. The key is to keep communications open among important stakeholders as program goals and objectives are established; performance criteria are set; the curriculum and co-curriculum are examined to be sure students can be expected to meet the objectives; assessment data are collected and evaluated; results are reported to stakeholders; and program improvements are implemented.

## GLOSSARY OF TERMS

**Assessment**—collecting and analyzing data on student academic performance [3].

**Attribute**—detailed characteristic demonstrated by a student.

**Course learning objective**—detailed statement that describes a specific unit of knowledge or skill that a student should be able to demonstrate in a course.

**Evaluation**—interpreting assessment data to draw conclusions about how well program goals and objectives are being met [3].

**Feedback**—providing stakeholders and other interested parties with the results of the assessment and evaluation process.

**Goal**—broad statement of desired program outcomes [3].

**Method**—process or instrument used to collect assessment data.

**Objective**—detailed statement that describes under what circumstances it will be known that the goal has been achieved [3].

**Performance criteria**—statement that defines the level of performance required to meet an objective [3].

**Reliability**—repeatability of measurements with a specific assessment method.

**Rubric**—scoring guide that provides descriptions of student work of varying quality.

**Stakeholders**—individuals or groups who have an interest in the quality of an educational program.

**Validity**—the accuracy with which a method measures what it is supposed to measure.

**Triangulation**—using more than one method to assess a program objective.

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## APPENDIX

*Profile of the CSM graduate*

- All CSM graduates must have depth in an area of specialization, enhanced by hands-on experiential learning, and breadth in allied fields. They must have the knowledge and skills to be able to recognize, define and solve problems by applying sound scientific and engineering principles. These attributes uniquely distinguish our graduates to better function in increasingly competitive and diverse technical professional environments.
- Graduates must have the skills to communicate information, concepts and ideas effectively orally, in writing, and graphically. They must be skilled in the retrieval, interpretation and development of technical information by various means, including the use of computer-aided techniques.
- Graduates should have the flexibility to adjust to the ever-changing professional environment and appreciate diverse approaches to understanding and solving society's problems. They should have the creativity, resourcefulness, receptivity and breadth of interests to think critically about a wide range of cross-disciplinary issues. They should be prepared to assume leadership roles and possess the skills and attitudes which promote teamwork and cooperation and to continue their own growth through life-long learning.
- Graduates should be capable of working effectively in an international environment, and be able to succeed in an increasingly interdependent world where borders between cultures and economies are becoming less distinct. They should appreciate the traditions and languages of other cultures, and value diversity in their own society.
- Graduates should exhibit ethical behavior and integrity. They should also demonstrate perseverance and have pride in accomplishment. They should assume a responsibility to enhance their professions through service and leadership and should be responsible citizens who serve society, particularly through stewardship of the environment.

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**Barbara M. Olds** is Associate Vice President for Academic Affairs and Professor of Liberal Arts and International Studies at the Colorado School of Mines where she has been a member of the faculty for the past seventeen years. She has also served as Principal Tutor of the McBride Honors Program in Public Affairs for Engineers and as chair of CSM's Assessment Committee. She has given numerous workshops and presentations on assessment in engineering education. Dr. Olds has received the Brown Innovative Teaching Grant and Amoco Outstanding Teaching Award at CSM and was the CSM Faculty Senate Distinguished Lecturer for 1993–94. She also received the Helen Plants Award for Best Workshop at the 1992 Frontiers in Education national conference and was awarded a Fulbright fellowship to teach and conduct research in Sweden during the 1998–99 academic year.