

## **REPORT OF THE 2006-2007 COMMITTEE ON ACADEMIC PROGRAMS AND TEACHING (May, 2007)**

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## Executive Summary

The Committee was jointly appointed by the Provost's Office and the Academic Senate and charged to accomplish the following:

- Building on the inventory of learner-centered courses and programs assembled by the Learner-Centered Task Force during the past year, consider how to determine the educational effectiveness of the learner-centered curriculum.
- In response to the Task Force's emphasis on the need for "realistic appraisal of student learning," examine, and bring to the attention of the campus community in the form of a report to the Provost:
  - (a) the components of effective assessment at the departmental or disciplinary level;
  - (b) ways in which how the faculty uses that evidence to improve instruction
  - (c) how to gain more systematic engagement of faculty and students with improving the learning process.

In considering the components of effective assessment, the committee focused on former Provost Lloyd Armstrong's question, "How do we know our students are learning what we think we are teaching them?" This draws attention to the central purpose underlying diverse types of assessment. While we acknowledge that there may be as many answers to the question of "how we know" as there are majors and minors in the University, the committee believes that the process of assessment is basically the same across domains. We present one general model of the components of assessment discussed by Barbara Wright, Associate Director of WASC (Wright, April 14, 2006), and analyze how it applies to USC at the course, program and institutional level.

Our discussion of ways in which USC faculty uses evidence of learning led us to examine several programs at the University that have explicitly addressed the use of evidence of student learning in the process of improving instruction. We present two case studies as examples of the range of programs already in place at USC, one from Chemical Engineering and one based on the USC Writing Program.

Finally, we make a series of recommendations for ways in which USC can engender more systematic engagement of faculty and students with the improvement of the learning process. These recommendations are organized at three levels:

- Cluster of Faculty Level (e.g., faculty who teach similar courses in a program)
- Academic Departments/Units Level
- Campuswide/Institutional Capacity Level

### Clusters of Faculty Level

1. USC should launch a set of at least 20 competitively funded innovation/demonstration projects that focus on better assessment and related faculty collaboration in learner-centered education. Projects need to propose appropriate clarity about learning

outcomes, significant advances in assessment, and creative strategies for reflection and improvement based on the assessments.

2. USC should create support strategies that will allow many faculty to work in informal clusters to promote clarification of intended learning, better use of assessment, and better faculty collaboration in using the assessment to promote student learning. These support mechanisms can be housed in a number of places at USC, such as the Provost's Office, the School of Education, etc.

#### Department/School Level

1. USC should ask the Associate Deans' Council to coordinate the development of plans at the individual department/academic unit that are designed to enhance a stronger focus on learning processes and outcomes, better assessment, and better collaborative use of this information for instructional improvement. The plans at the academic unit/department level should commit funds from the academic unit to improve teaching, learning and assessment, as well as collaboration.
2. USC should promote enhanced coordination between the Academic Unit/Department and the APR review process so that the review includes a focus on the ways the specific academic unit has focused on learning and learning outcomes, assessment, linkage of institutional and program data to learning, etc.
3. USC should create and fund 3 academic unit/department demonstrations of extensive assessment and collaboration regarding learning. The goal is to have institutional leadership, linkage across major programs, deeper impact on learning, and greater sustainability of the demonstrations. The 3 demonstrations would be expected to play a key role in the WASC accreditation, and have plans for sharing their innovation with others across campus.

#### Campuswide/Institutional Capacity for Improvement of Assessment and Collaboration in Learner-Center Education

1. USC should have an ongoing task force to coordinate the gathering and utilization of information/data that will support assessment and collaboration in learner-centered education. The task force will need to prepare recommendations for the two levels of the WASC report, and help academic units complete their plans. The task force would be chaired jointly by senior academic programs and innovation/technology leadership.
2. USC should launch a robust look for external strategic partners and funding. Become a national model of such work. The partnerships should deeply influence and be connected with the demonstration projects and technical support efforts described above. Partners should link assessment/reflection tools, use of distance-learning and the web, institutional data and follow-up studies with graduates and employers of our graduates, and a robust collaborative evaluation of the entire learner-centered effort.

## Report

### Overview

USC's central mission is "the development of human beings and society as a whole through the cultivation and enrichment of the mind and spirit." The University community cares deeply about young people – their dreams, hopes and potential; and the University believes in the pivotal importance of educated citizens to the world's stability, prosperity, and progress.

Spurred by the 1994 Strategic Initiative on Undergraduate Education, USC has assembled a rich and multi-faceted set of learning opportunities, including orientation programs, Freshman Seminars, Thematic Option, Renaissance Scholarships, the USC Core curriculum, Honors Program in Multimedia Literacy, multimedia literacy in the core curriculum, diversity in the curriculum, the Arts and Humanities Initiative, the Festival of Scholarly and Creative Work, Undergraduate Research Opportunities, JEP and community service opportunities, Global Outreach, and International Fellowships. USC continues to enhance undergraduate education through research opportunities in communications, the life sciences, the arts, and the urban paradigm. These critical pathways touch many of our academic programs and provide an academically rich coherence that makes undergraduate education at USC truly distinctive.

In the midst of this extraordinary richness of opportunities for students, the Learner-Centered Task Force of 2005-2006 encouraged the Committee on Academic Programs and Teaching (CAPT) to conduct a "realistic appraisal of student learning." The special charge to CAPT this year has been to think about means by which faculty and students could improve the learning process and explore the ways of determining the results of students' learning. CAPT has:

1. **Considered** strategies for enhancing the effectiveness of undergraduate learning which have been built into USC's rich programs and might usefully be shared and expanded; and
2. Suggests that it would be useful to share with the USC community ways of investigating the results of an effective education.

It is the committee's hope that faculty and students will use these insights to enrich discussion of educational effectiveness at several levels, including individual courses, degree programs in departments and/or schools, and campus-wide initiatives.

### Purpose of The CAPT Report

**The Charge to CAPT.** The Committee was jointly appointed by the Provost's Office and the Academic Senate and charged to accomplish the following:

- Building on the inventory of learner-centered courses and programs assembled by the Learner-Centered Task Force during the past year, consider how to determine the educational effectiveness of the learner-centered curriculum.

- In response to the Task Force's emphasis on the need for "realistic appraisal of student learning," CAPT will examine, and bring to the attention of the campus community in the form of a report to the Provost:
  - (a) the components of effective assessment at the departmental or disciplinary level;
  - (b) ways in which how the faculty uses that evidence to improve instruction
  - (c) how to gain more systematic engagement of faculty and students with improving the learning process.

### **Organization of this Report**

We have had many productive discussions within the committee and with other colleagues about the charge given us, and have organized our report as follows:

- A view of curriculum, teaching and learning for USC where we emphasize some themes about examining the educational effectiveness of the learner-centered curriculum and explore the components of effective assessment at the departmental or disciplinary level
- Two scenarios that illustrate the range of program contexts in which the assessment model can apply and illuminates what the components of the Learning Assessment Model would look like in widely varying program contexts at USC.
- How to gain more systematic engagement of faculty and students with improving the learning process. We address this important topic by proposing a set of recommendations to encourage faculty and programs to enhance learning and the assessment of learning at USC.

Our report emphasizes respect for the substantial work done to date and for USC's talented and hard-working faculty as key players in a better approach to assessing student learning.

### **The Context for the Report**

In a learner-centered university, the faculty's role is to help each student foster his or her intellectual curiosity and self-directed creativity, expand inquiry skills of investigation, analysis, and problem-solving, experience and treasure the diversity of the local and the global neighborhood, examine one's own values and build core skills of linguistic and technological literacy, teamwork, and leadership.

A year ago, the Provost's Office and the Academic Senate appointed a special task force on Learner-Centered Education. The task force, chaired by professor Lawford Anderson, developed an important report that made several major contributions:

- clarified the meaning of "learner centered"
- identified positive examples at USC
- proposed a focus on assessment of learner-centered education
- emphasized the value of collaboration among faculty

The work of our Committee was also influenced by several external forces in higher education. The first is the forthcoming WASC inspection of USC. It is clear that WASC has shifted its focus to student learning as the core of its focus on accreditation. For USC, the WASC accreditation site visit will happen in two stages:

- Focus on institutional capacity for assessing student learning in 2008
- Focus on student learning outcomes & evidence of assessment and faculty collaboration in 2010

Within the CAPT Committee, we saw the WASC accreditation as an enhancement of the directions USC had already established.

The upcoming accreditation prompted us to remember several things: evidence of student learning is important and likely to attract increasing attention from the public and the federal government. At USC we have an opportunity to create important changes in teaching and learning while also “staying ahead of the curve” vis a vis any external pressure to describe and assess student learning.

The first charge to the CAPT committee was to analyze the components of effective assessment at the departmental or disciplinary level.

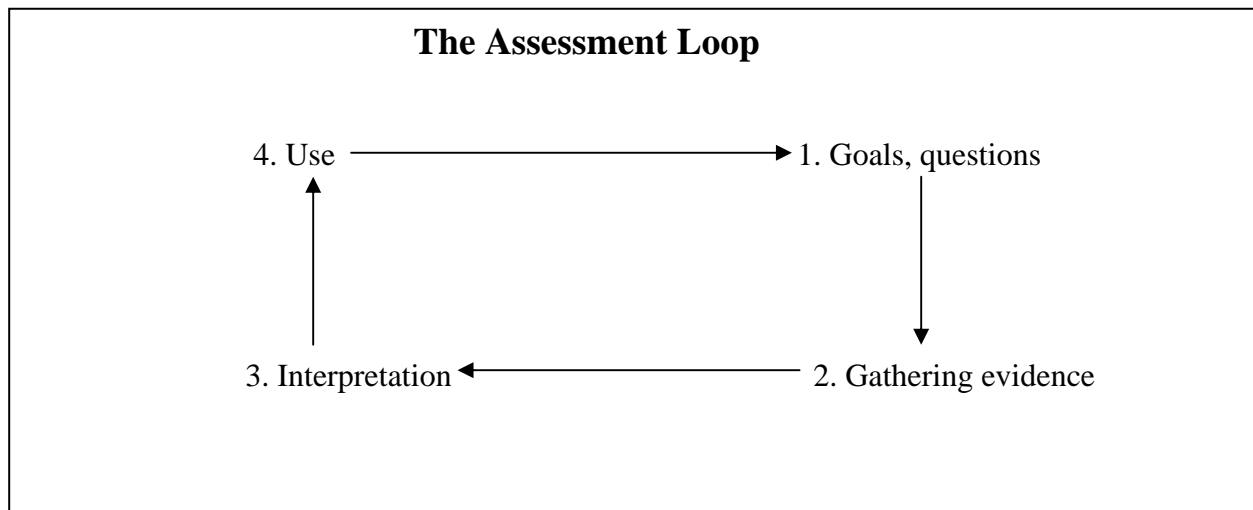
### **Assessing Educational Effectiveness at USC**

The extraordinary diversity and richness of the learning community at USC makes it challenging to propose a single model for how educational effectiveness can be gauged. The Report of the Learner-Centered Task Force in 2006 warned against overly simplistic schemes of assessing learning, and pointed out that even a very widely agreed-upon assessment model might fail to capture the complexity of learning at USC. A partial list of the types of assessments typically used in classrooms and programs at USC makes this complexity obvious:

- objective examination
- essay examination
- oral examination
- individual oral presentation
- team or group presentation
- individual written project
- team or group written project
- evaluation of community service by community experts (e.g., teachers)
- evaluation of internship experiences by supervisors
- peer evaluation, critique and review (of written work, performance, etc.)
- written responses on readings or case studies
- oral or written reports of field projects
- senior thesis
- portfolio of writing or other creative work
- judgement by experts of a performance
- self-directed computer assignments

- multimedia presentation
- -in-class debates

The 2005-2006 Task Force reached a consensus that former Provost Lloyd Armstrong's question, "How do we know our students are learning what we think we are teaching them?" hits upon the central purpose underlying these diverse types of assessment. While we acknowledge that there may be as many answers to the question of "how we know" as there are majors and minors in the University, the committee believes that the process of assessment is basically the same across domains. We found one general model of the components of assessment discussed by Barbara Wright, Associate Director of WASC (Wright, April 14, 2006) to be quite useful. It is depicted in the diagram below.



The process is easily recognizable to faculty, program directors and administrators who have evaluated a teaching and learning experience more than once.

Let's illustrate it with the familiar example of an instructor revamping his or her course for the nth time. The course we envision here might be a typical humanities, social science, communications, business, or general education course. The instructor has goals or questions that frame the inquiry in the class. These goals may be explicit in the syllabus, or they may be set out as principles to be fleshed out by student-initiated learning. The students and faculty member set out on their passionate exploration of these goals or questions. Along the way, certain evidence of student explorations collects (in portfolios, presentations, papers, etc.). Many courses at USC employ a mid-semester evaluation, and USC instructors and administrators generally have a great deal of respect for the usefulness of this evaluation. The faculty member interprets the evidence (student products and student evaluations) and decides whether the course of learning needs to be altered. For example, the instructor may change the format of assignments, or introduce new readings or points for discussion. This process continues to iterate until the course is over. Final evidence is collected in the form of overall metrics of student performance, student evaluations, student comments about the course, and possibly

reactions of faculty colleagues to the course. When the instructor teaches the course again, this evidence is sifted, interpreted and put to use in revamping the course, even if only slightly.

There are many variations on the types of goals and questions, methods of gathering evidence and interpretations and implementations of that evidence. Consider for example, how different the forms of the questions and evidence would be for an artistic performance class and a physical science class. However, the basic steps in the process are similar across disciplines.

The model of assessment also applies quite well at the level of the program or major, and even at the school and institutional level. For example, when choosing to make changes to a major, or introducing a new sub-specialty within that discipline, faculty, administrators and supervisory committees such as the Committee on Academic Policies and Procedures (CAPP) will enter into the process of assessment at various points, and will rely on it to monitor the effectiveness of the changes. It is also the case that outside pressures, such as the job market facing their students, may lead a program to pose new goals for learning, as illustrated in one of the scenarios we include later in this report, from Chemical Engineering. Outside accrediting agencies, such as ABET (the accreditor for college and university programs in applied science, computing, engineering, and technology), AACSB (the accrediting agency for bachelor's, master's and doctoral degree programs in business administration and accounting), or the California Commission on Teacher Credentialing, may demand that the evidence and interpretation of evidence be made quite explicit.

The elements of the assessment cycle are not always made explicit, but one can argue that they are always there in any effective teaching and learning process. The committee has a great deal of respect for our talented, passionate and hard-working faculty. We believe that they, individually as well as collectively, are the best arbiters of the assessment process. Likewise, we have a great deal of respect for USC's highly motivated and talented student body. They are the eager and ambitious learners who provide the basic evidence of their learning that drives the entire assessment process.

Thus, one answer to the question of how we know that our students are learning what we think they are learning, is that the knowledge lies in what we can discern about the process of assessment and refinement at all levels of the university. One clear way to answer the "how do we know" question is to look at examples of this process at USC.

### **Ways in Which Faculty Use Evidence to Improve Instruction**

The second charge to the CAPT committee was to consider how the faculty uses the evidence of prior assessments of learning and teaching to improve instruction.

We focused our lens at the level of teams of faculty, or disciplines, rather than at the individual course level. Some programs have been through the assessment cycle many times and some only a single time. Some have been very explicit about each step in the process, and some have engaged implicitly in the assessment process. But it is clear there are many examples of outstanding programs at USC. In our committee deliberations, several such programs were discussed, including the Dentistry program, the revision of medical teaching at the Keck school, the teacher credentialing program at the Rossier School of Education, the College's Language Center Program, the Professoriate program of the Center for Excellence in Teaching, Multimedia Literacy Assessment in the Core Multimedia Program, the evaluation of distance learning in the school of Engineering, the utilization of teams of faculty and business professionals to evaluate

student capstone projects in the Marshall and Viterbi Schools, and the use of faculty and industry professionals to evaluate student final performances in the Schools of Music, Fine Arts and Cinema-Television. In the end, we chose two examples to describe in depth, illustrating some of the diversity that exists at USC.

These examples were chosen because they were familiar to committee members, or committee members had participated actively in these programs, and because they represent some of the diversity in assessment and evaluation that exists at USC.

Appendices 1-2 are brief descriptions of each of two projects. Our purpose in describing these projects is that this will hopefully initiate a process of reflection among faculty about their own programs.

### **Example 1: A Degree-Project Approach to Engineering Education (by Richard Lee) (see Appendix No. 1)**

Chemical Engineering (ChE) education is at a crossroads. There is a disconnect between the *curriculum* (which is largely focused on macroscopic “unit operations”, e.g., heat exchangers and distillation columns) and faculty *research* (which has recently emphasized nano- and bio-technology). At USC, Chemical Engineering has developed a unique approach to this challenge, namely the use of laboratory research experiences as an integral part of the undergraduate experience. We have recently begun modernizing our curriculum by including bio and nano laboratories in each ChE course, with the goal of creating cohesive 4-year “*degree projects*” (see Appendix 1).

As the name implies, degree projects span the entire four years of a student’s undergraduate education, consisting of *research/laboratory module associated with each undergraduate course*. The chemical engineering approach is boldly experimental, and it is uncertain how it will turn out. However, it is a good example of the assessment process for several reasons, most notably the clarity in the statement of goals, the use of multiple kinds of evidence to assess student learning, and the openness of the program to using evidence of student learning to evaluate the experiment. This type of assessment process may be particularly relevant to more technically oriented professional programs, and possibly to physical and life sciences programs within the College.

### **Example 2: The General Education Critical Thinking Assessment Project (by Richard Fliegel and John Holland) (see Appendix No. 2)**

The General Education Critical Thinking Project was designed to use the critical thinking skills discernible in student writing to assess change over their time at USC. The project assumes that the entire college experience, in the classroom and out of it, contributes to a student’s development of critical thinking, so that the value added is not a result specifically of their General Education classes or their curriculum in its entirety. Instead, it compares the critical thinking skills demonstrated in student papers written by students at various points in their college careers (see appendix 2 for details).

The Critical Thinking Assessment Project is an excellent illustration of how the goals of an academic program lead logically to an assessment method. The assessment method has

validity as a means of examining critical thinking and can be adapted by other institutions. As the project moves into its next phase, it will be interesting to determine whether the judgements of experienced faculty correlate with the Facione scoring criteria. This is an important step, as it will indicate that the goals of the course and the standard assessment practices embedded in the course are closely aligned. In this case, the interpretation of the assessment evidence (the third step in the assessment process) would be that no changes need to be made in the writing program. However, if the faculty scoring criteria differ from the Facione scoring criteria, the Writing program faculty might want to discuss whether changes need to be made to standard instructional or assessment practices.

To conclude this section of the report, the committee was impressed by the variety and depth of thinking about assessment at USC. Many of our colleagues are obviously thinking deeply about how to evaluate the effectiveness of student learning. It is important to disseminate the efforts of faculty and administrators in one discipline to people in other disciplines as a catalyst for thinking about student learning and assessment.

In the final section of the report we address the third charge to CAPT, how to gain more systematic engagement of faculty and students with improving the learning process.

### **Recommendations for Next Steps**

Although many groups of faculty and many disciplines are actively engaged in the process of improving and assessing student learning, there is a great deal of untapped potential. Faculty members are busy with research, teaching and service, and they sometimes need incentives to initiate change. We propose several incentives in the section below.

Our recommendations are organized under three organizational levels. We list each of the levels along with a rationale for having this focus in our report:

- The Cluster of Faculty Level recognizes faculty who teach similar courses in a program. At the cluster level, the assessment could most clearly build on prior work of innovative teams. These teams might have come together for many possible reasons; multiple faculty teach a common course or set of related courses within a department or within a general education requirement, for example. The Cluster of Faculty approach is highly respectful of faculty initiative and leadership in curriculum improvement, and is the most flexible and “natural” of the three levels. The Cluster of Faculty approach is also closest to the classroom, where the real teaching and learning occurs.
- The Academic Departments/Unit Level recognizes the ongoing strategic planning, the formal organizational structure for academic leadership, and the link of resources to instructional improvement. For many academic units, accreditation requires a strong focus on student learning and assessment of professional competence for licensure. We want to encourage improvements at this level as well.

- The Campuswide/Institutional Capacity Level. The WASC accreditation recognizes an essential truth: institution wide capacity and the enhancement of student learning are two dimensions of the same imperative to improve both our instruction and our reflective collaboration for instructional improvement.

### **Clusters of Faculty Level**

#### Recommendations:

1. USC should launch a set of at least 20 innovation/demonstration projects that focus on better assessment and related faculty collaboration in learner-centered education. The Provost's Office should coordinate solicitation, funding and networking between these projects. Projects should be awarded by competitive bid at approximately 5-20k per year for two years, with half the funding coming from the relevant academic unit. Projects should be awarded with concern about a range of disciplines and a range of types of learning being facilitated. Projects need to propose appropriate clarity about learning outcomes, significant advances in assessment, and creative strategies for reflection and improvement based on the assessments.
1. USC should create support strategies that will allow many other faculty to work in informal clusters to promote clarification of intended learning, better use of assessment, and better faculty collaboration in using the assessment to promote student learning. These support mechanisms can be housed in a number of places at USC, such as the Provost's Office (i.e., under the auspices of the Center for Excellence in Teaching), the School of Education, etc.

### **Department/Academic Unit Level**

#### Recommendations:

1. Ask the Associate Deans' Council to coordinate the development of plans at the individual department/academic unit that are designed to enhance a stronger focus on learning processes and outcomes, better assessment, and better collaborative use of this information for instructional improvement. Academic units in professional schools are often working on these topics as part of professional accreditation, and their extensive work to date should be shared widely across campus as facilitated by the Associate Dean's Council. The plans at the academic unit/department level should commit funds from the academic unit to improve teaching, learning and assessment, as well as collaboration.
2. Coordinate between the Academic Unit/Department and the APR review process so that the review includes a focus on the ways the specific academic unit has focused on learning and learning outcomes, assessment, linkage of institutional and program data to learning, etc.

3. Create and fund 3 academic unit/department demonstrations of extensive assessment and collaboration regarding learning. The goal is to have institutional leadership, linkage across major programs, deeper impact on learning, and greater sustainability of the demonstrations. The 3 demonstrations would be expected to play a key role in the WASC accreditation, and have plans for sharing their innovation with others across campus.

### **Campuswide/Institutional Capacity for Improvement of Assessment and Collaboration in Learner-Center Education**

#### Recommendations:

1. Create an ongoing task force to coordinate the gathering and utilization of information/data that will support assessment and collaboration in learner-centered education. The task force will need to prepare recommendations for the two levels of the WASC report, and help academic units complete their plans. The task force would be chaired jointly by senior academic programs and innovation/technology leadership.
2. Launch a robust look for external strategic partners and funding. Become a national model of such work. The partnerships should deeply influence and be connected with the demonstration projects and technical support efforts described above. Partners should link assessment/reflection tools, use of distance-learning and the web, institutional data and follow-up studies with graduates and employers of our graduates, and a robust collaborative evaluation of the entire learner-centered effort.

## Appendix 1

### Example 1: A Degree-Project Approach to Engineering Education Department: Chemical Engineering and Materials Science

#### Goals/Questions

Chemical Engineering (ChE) education is at a crossroads. There is a disconnect between the *curriculum* (which is largely focused on macroscopic “unit operations”, e.g., heat exchangers and distillation columns) and faculty *research* (which has recently emphasized nano- and biotechnology). Furthermore, there is a disparity between the courses students take and the diversity of industries they will serve (only about 25% of graduates go to work in the chemical industry, while the biotech, food, fuels, and electronics industries continue to aggressively hire ChE graduates. So how then can faculty continue to prepare highly-qualified students for today’s rapidly changing workplace?

This question was posed by a NSF-sponsored, cross-departmental *Frontiers in Chemical Engineering Education* initiative, recommending a paradigm shift in ChE education by moving away from the macroscopic, unit-operations approach to instead teach from the molecular point of view in a bottom-up fashion. While this will allow our students to be uniquely prepared for 21<sup>st</sup> century jobs in emerging bionano fields, the challenge is to continue to prepare students for the more conventional chemical and petroleum industries.

At USC we have developed a unique approach to this challenge, namely the use laboratory research experiences as an integral part of the undergraduate experience. We have recently begun modernizing our curriculum by including bio and nano laboratories in each ChE course, with the goal of creating cohesive 4-year “*degree projects*”, as shown in Figure 1.

#### Gathering Evidence

As the name implies, degree projects span the entire four years of a student’s undergraduate education, consisting of *research/laboratory module associated with each undergraduate course*. As seen in Figure 1, two possible degree-project tracks exist depending on a student’s interest: biotechnology and nanotechnology. Each of these degree projects is discussed briefly below.

#### *Degree Project #1: “Nanoparticles”*

Beginning in their freshman year *CHE 120 Introduction to Chemical Engineering* course (i.e., mass & energy balances), the students will synthesize nanoparticles in the Undergraduate Research Laboratory and investigate whether a mass balance indeed holds, namely if “mass of raw materials in” = “mass of nanoparticles out”. In the sophomore year *CHE 330 Thermodynamics* course, the students will work with the nanoparticles they produced in *CHE 120* to investigate nanoparticle interactions via packing of a monolayer of nanoparticles on a surface. Here the students will find that the polydisperse size distribution of the nanoparticles they created will prevent regular packing (just as a collection of golf balls will form more regularly packed structures than a mixture of golf balls and baseballs. This will then lead them to *CHE 350 Separations*, where they will fractionate nanoparticles based on size in order to obtain monodisperse samples. Then in *CHE 442 Kinetics*, the students will use these fractions of monodisperse samples (i.e., a single radius for all nanoparticles) as nanoparticle catalyst in order

to investigate the effect of particle size on surface reaction rate (surface area =  $4\pi R^2$ , where  $R$  is the nanoparticle radius). The final application will be in *CHE 443 Heat Transfer*, where students will add metal nanoparticles to antifreeze (i.e., ethylene glycol) as a means of increasing the thermal conductivity and with this antifreeze efficiency, while not clogging engine parts.

*Degree Project #2: “Cellular processes”*

The students in the bio option augment the traditional chemical-process-diagram approach utilized in the *Material Balance* course by performing a mass balance as they grow *E. coli* cells and demonstrate that *glucose fed ~ new cells produced*. Then in the following *Thermodynamics* course, in parallel with learning about gas and liquid interactions in the classroom, the students examine protein-protein interactions common amongst overexpressed proteins (resulting in the formation of “inclusion bodies”, i.e., unfolded protein aggregates). Similarly, while examining chemical purifications in the *Separations* course, students remove the (unfolded) inclusion bodies from *E. coli*, followed by refolding and the recovery of enzyme activity in the *Kinetics* course. The final module occurs in *Heat Transfer*, where the students examine the thermal unfolding of proteins.

Key Metrics of Assessment

In order to quantitatively track the learning gained as a result of this overhaul of the ChE curriculum, we will examine several key metrics as the program develops, as shown in Table 1. Chief among these will be retention (*Will the immediate connection of ChE to real-world applications keep students in the major?*), grades (*As a result, will this increased motivation lead to better performance relative to historical data?*), early interest (*Will this effect first year retention rates?*), perceived success (*Will this effect retention rates?*), laboratory learning outcomes (*Will this demonstrate increased learning as judged by ABET outcomes?*), and degree project success. In addition to the overall numbers in Table 1, we will also classify the students who leave the program to assess whether this project-based learning approach more effectively targets underrepresented groups. These metrics will be used to measure overall learning as a result of the degree-project overhaul of ChE education.

Figure 1. The degree project approach to modernize ChE education.

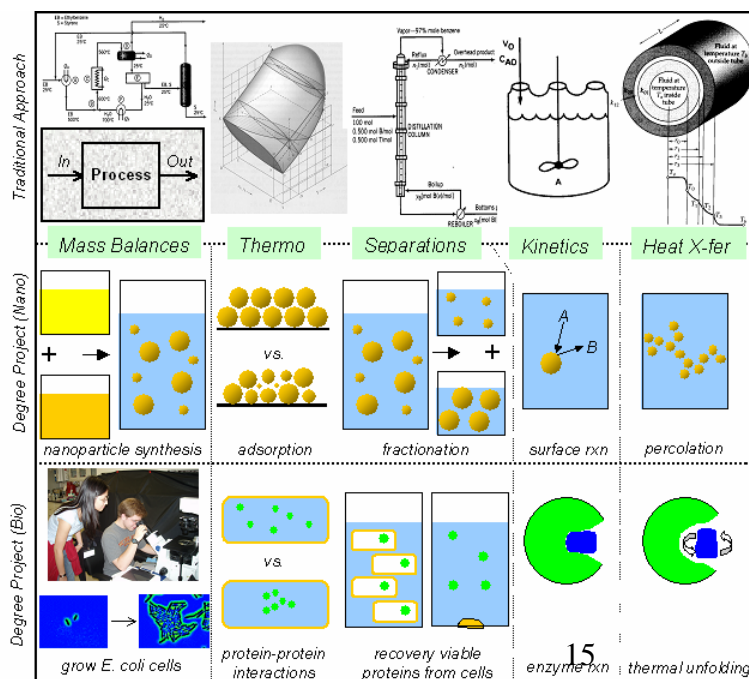


Table 1. Metrics to be tracked during degree-project implementation.

Metric	Example
	CHE 120 → CHE 330
Early	2003 17/18 (94%)*
Interest	2004 13/16 (81%)
	2005 21/26 (81%)
	2006 28/33 (85%)
	Year 1 → 4
Retention	2000 11/18 (61%)
	2001 11/19 (58%)
	2002 9/15 (60%)
	2003 12/18 (67%)
	Avg. GPA ('01-'06)
GPA	ChE 3.32
	ChE-bio 3.25
	ChE-eco 3.17
	ChE-petro 3.25
	ChE-polym 3.30
Rubric Scored	new metric,
Degree Project	no examples
Success	new metric
Perception Scale	
Collaborative	new metric
Observation Rubric	

\*numbers do not include transfer students

## Appendix 2

Example 2: The USC General Education Critical Thinking Assessment Project  
--by Richard Fliegel, Director of General Education, and  
John Holland, Director of the Writing Program, both of USC College --

The first learning objective of the USC General Education Program is “to teach students the skills needed for critical thinking, writing and reading.” This is an objective shared in similar terms by any liberal arts college or university that promises to prepare generally well educated graduates. However, assessing the effectiveness of an educational program designed to accomplish this goal has proven to be challenging, particularly at an AAU research university, where faculty support and student engagement are essential elements in any meaningful evaluation of intellectual growth. Students take their cues from the faculty: for students to take an assessment seriously and do their best work, faculty must believe that the method of assessment in fact measures what they teach, i.e., that the assessment of critical thinking reflects their academic values and accurately quantifies the right set of skills.

The literature on “embedded” assessment reveals in its metaphor one problem: that assessment is understood as something external to the class material that needs to be carefully inserted into the curriculum. It responds to a perception that assessment is intrusive of class time and the pedagogic relationship that prevails between students and their faculty. The literature also implies that faculty judgments concerning their students’ progress are unreliable, since, from the perspective of program effectiveness, the faculty are assessing their own performance as educators.

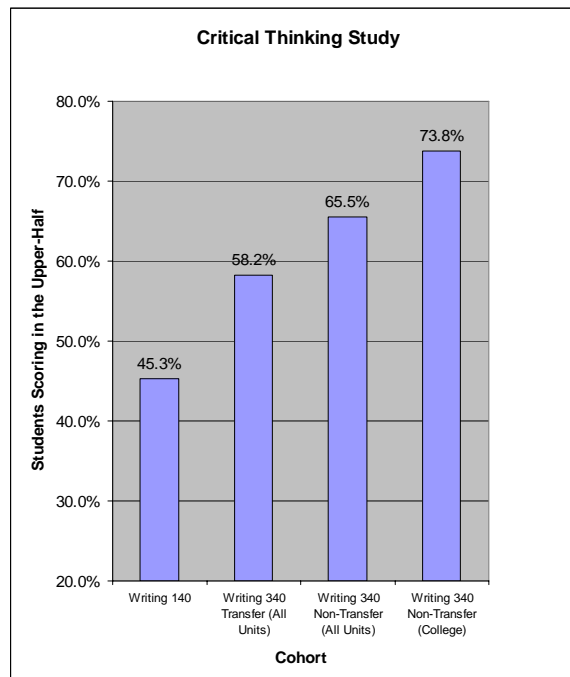
The General Education Critical Thinking Project was designed to address these issues, by using the critical thinking skills discernible in student writing to assess change over their time at USC. The project assumes that the entire college experience, in the classroom and out of it, contributes to a student’s development of critical thinking, so that the value added is not a result specifically of their General Education classes or their curriculum in its entirety. Instead, it compares the critical thinking skills demonstrated in student papers written by students at various points in their college careers.

To do so, samples of student writing were evaluated by trained readers, using a Holistic Critical Thinking Rubric developed by Peter and Noreen Facione. Peter Facione, currently Professor of Philosophy and Provost of Loyola University in Chicago, has had a long career in the field of critical thinking, including the design of a standardized fill-in-the-blanks test of critical thinking skills. Tests of that kind were once popular, but they are viewed as extrinsic if not intrusive to the classroom learning experience; they do not elicit a student’s best thinking; and they are often resisted by faculty as testing something accessible to testing but different from what the faculty “mean to teach.”

A group of writing instructors at USC were trained to use the Faciones’ holistic scoring rubric with samples of student writing taken from a freshman class (Writing 140, Writing and Critical Reasoning) and an upper-division class (Writing 340, Advanced Writing). These papers were written in response to one of two specified prompts, in a timed-writing context. The source

of each paper was recorded and then the papers were mixed together, so that a reader could not know the class level of its author. Each reader was asked to assign a score on a four-point scale, reflecting only the critical thinking content evident in the paper, using the Facione rubric. This was often a different score than the reader might have given the same sample as a grade on a writing assignment. A reader was told to scan the paper briefly and to decide whether it fell into the upper half of the pool or the lower half, and then the top or bottom quartile.

When 475 papers had been scored three times each, the results were matched against their authors. The chart below shows the upper-half versus lower-half differentiation: Students in the freshman course, Writing 140, scored significantly lower than students in the junior and senior level course, Writing 340: only 45.3 percent of the Writing 140 students scored in the upper half of the scale, compared to 58.2 percent of all students in Writing 340. Those students in Writing 340 who had also taken Writing 140 at USC scored higher (65.5) than those who had transferred in an equivalent freshman course; and those in the College's Writing 340 courses who had also taken Writing 140 at USC scored highest of all, with 73.8 percent scoring in the upper half.



The two next steps in the project will be 1) a comparable study, using samples written in response to different prompts, designed by the individual instructors using guidelines established by the Writing Program; and 2) a study in which experienced faculty members who have not been trained in the Facione rubric are asked to rank-order six writing samples scored in the original reading. The intent of the first follow-up study is to determine if the rubric can be used as effectively with samples that were not written in a timed-writing environment with specified prompts. The intent of the second follow-up study is to determine whether the results produced by trained readers using the Facione rubric in fact replicate what experienced faculty member view as critical thinking in their own usage and judgment. Positive results in each of these

studies would help us move closer to the use of actual class assignments to assess critical thinking as part of a method recognized by faculty as measuring what they teach.

One assumption underlying our approach to the assessment of critical thinking is that faculty members are in fact the best evaluators of their students' intellectual progress, when trained in a method that allows impartial assessment. A second assumption is that work assigned as part of the faculty's curriculum will elicit the best efforts of students engaged in their own learning. The structure of the USC undergraduate curriculum, with required writing classes at two different points in a student's academic career, enables the method we have developed for assessing the change over time in their critical thinking skills. However, the use we have made of the Facione rubric should be adaptable by any institution focused on developing those skills through student writing.

Example 3: Assessment of Portfolios in Cinema-Television (adapted from an e-mail by Gary Goldsmith)

In Cinema-Television the faculty has had many discussions of better ways to assess student performance than the blunt letter grade system, which seems so questionable when we're trying to nurture creativity. If we consider the total assessment system in most production classes, the grade is the least important part. The constant oral and written critiques from peers and faculty give each student a stream of feedback which is an essential part of the learning. We switched CATV 507 from a letter- grade to a credit- no credit course when we started the all-division version, because we worried about the conflict between urging students to experiment and then grading them down if the experiment failed.

We've been intrigued for some time by the Harvard School of Education research, under Project Zero, in terms of their assessment in the arts. Unfortunately for us, the project concentrated on elementary and middle school classes, but the principles are much the same at any level of arts education. At their website, [www.pz.harvard.edu/Research/APPLE.htm](http://www.pz.harvard.edu/Research/APPLE.htm), they describe their project as:

"The APPLE (Assessing Projects and Portfolios for LEarning) Project was a research and development effort focused on answering three key questions: 1) What are effective ways of assessing student performances and project work? 2) How can a child's work on a series of projects be documented and assessed fairly? 3) What is required to implement portfolio assessment in a school so that it will "take root" and serve as an ongoing tool for the evaluation of programs as well as children?"

Their term, "portfolio assessment" is a good description of what we do in classes such as 290, 310, and 480, only the portfolio consists of movies. I think it would be fascinating to convene a small group of faculty from USC's arts schools to investigate the same 3 questions that APPLE did, but at our level.

To conclude this section of the report, the committee was impressed by the variety and depth of thinking about assessment at USC. Many of our colleagues are obviously thinking deeply about how to evaluate the effectiveness of student learning. It is important to disseminate the efforts of faculty and administrators in one discipline to people in other disciplines as a catalyst for thinking about student learning and assessment.

As an illustration of what the dissemination of this information can engender, one of the CAPT committee chairs (Frank Manis) will chair the Undergraduate Committee in the Psychology department next year. The psychology faculty has begun to think about how to revise the major to enhance student learning. Dr. Manis plans to engage the psychology faculty and psychology undergraduate students in a discussion of what psychology students ought to learn, how to more actively engage them in that learning process, how to assess their learning, and how to use the results of the assessment for ongoing fine-tuning of the major. Elements of what other programs are doing will undoubtedly be examined in an effort to improve student learning, most notably, the reliance on laboratory experience in the Chemical Engineering program, the collection of portfolios of written work, a technique used in several programs at the University, and methods of evaluating capstone assignments, also found in several disciplines at USC.

### **Recommendations for Next Steps**

Although many groups of faculty and many disciplines are actively engaged in the process of improving and assessing student learning, there is a great deal of untapped potential. Faculty members are busy with research, teaching and service, and they sometimes need incentives to initiate change. We propose several incentives in the section below.

Our Recommendations are organized under three organizational levels. We list each of the levels along with a rationale for having this focus in our report:

- The Cluster of Faculty Level recognizes faculty who teach similar courses in a program. At the cluster level, the assessment could most clearly build on prior work of innovative teams. These teams might have come together for many possible reasons; multiple faculty teach a common course or set of related courses within a department or within a general education requirement, for example. The Cluster of Faculty approach is highly respectful of faculty initiative and leadership in curriculum improvement, and is the most flexible and “natural” of the three levels. The Cluster of Faculty approach is also closest to the classroom, where the real teaching and learning occurs.
- The Academic Departments/Unit Level recognizes the ongoing strategic planning, the formal organizational structure for academic leadership, and the link of resources to instructional improvement. For many academic units, accreditation requires a strong focus on student learning and assessment of professional competence for licensure. We want to encourage improvements at this level as well.

- The Campuswide/Institutional Capacity Level. The WASC accreditation recognizes an essential truth: institution wide capacity and the enhancement of student learning are two dimensions of the same imperative to improve both our instruction and our reflective collaboration for instructional improvement.

### **Clusters of Faculty Level**

#### Recommendations:

1. USC should launch a set of at least 20 innovation/demonstration projects that focus on better assessment and related faculty collaboration in learner-centered education. The Provost's Office should coordinate solicitation, funding and networking between these projects. Projects should be awarded by competitive bid at approximately 5-20k per year for two years, with half the funding coming from the relevant academic unit. Projects should be awarded with concern about a range of disciplines and a range of types of learning being facilitated. Projects need to propose appropriate clarity about learning outcomes, significant advances in assessment, and creative strategies for reflection and improvement based on the assessments.
2. USC should create support strategies that will allow many other faculty to work in informal clusters to promote clarification of intended learning, better use of assessment, and better faculty collaboration in using the assessment to promote student learning. These support mechanisms should be added to the portfolio of CET, which already provides workshops, web-based links and support, and models/tools for enhancing assessment and collaboration. Since the agenda of the CET with a learner outcomes/assessment component will be demanding, funding at the level of a hundred thousand per year will be required for that new aspect of the CET. The CET will need an assessment advisory committee, and several graduate assistants capable of supporting assessment efforts.

3.

### **Department/Academic Unit Level**

#### Recommendations:

3. Ask the Associate Deans' Council to coordinate the development of plans at the individual department/academic unit that are designed to enhance a stronger focus on learning processes and outcomes, better assessment, and better collaborative use of this information for instructional improvement. Academic units in professional schools are often working on these topics as part of professional accreditation, and their extensive

work to date should be shared widely across campus as facilitated by the Associate Dean's Council. The plans at the academic unit/department level should commit funds from the academic unit to improve teaching, learning and assessment, as well as collaboration.

4. Coordinate between the Academic Unit/Department and the APR review process so that the review includes a focus on the ways the specific academic unit has focused on learning and learning outcomes, assessment, linkage of institutional and program data to learning, etc.
5. Create and fund 3 academic unit/department demonstrations of extensive assessment and collaboration regarding learning. The goal is to have institutional leadership, linkage across major programs, deeper impact on learning, and greater sustainability of the demonstrations. The 3 demonstrations would be expected to play a key role in the WASC accreditation, and have plans for sharing their innovation with others across campus.

### **Campuswide/Institutional Capacity for Improvement of Assessment and Collaboration in Learner-Center Education**

Recommendations:

6. Create an ongoing task force to coordinate the gathering and utilization of information/data that will support assessment and collaboration in learner-centered education. The task force will need to prepare recommendations for the two levels of the WASC report, and help academic units complete their plans. The task force would be chaired jointly by senior academic programs and innovation/technology leadership.
7. Launch a robust look for external strategic partners and funding. USC itself is unlikely to have sufficient expertise/tools and funding. Become a national model of such work. The partnerships should deeply influence and be connected with the demonstration projects and technical support efforts described above. Partners should link assessment/reflection tools, use of distance-learning and the web, institutional data and follow-up studies with graduates and employers of our graduates, and a robust collaborative evaluation of the entire learner-centered effort.