

These minutes are a composite of three Reinvention Center regional network meetings: Mid-Atlantic-DC area (April 4, 2003), West Coast-Berkeley (April 25, 2003), and Midwest-Chicago (June 6, 2003).

### **Goals of the meeting**

The Reinvention Center is now three years old, and the regional networks have been meeting for two years. This was the fourth round of meetings. While the first three rounds consisted mostly of discussion of broad issues central to undergraduate education at research universities and the various roles the Reinvention Center and participating universities could play in promoting change, there was a general sense that it was now time to begin translating some of the ideas that had been set forth into meaningful action. To begin this process, we organized this last group of meetings around three areas that are integral to research universities and in which the Center and interested campuses might undertake experimental projects.

- Linking graduate and undergraduate education
- Taking advantage of research universities' wealth of resources and forming partnerships among key campus units; and
- Transforming large lecture courses.

The goals were to enable campuses to share what they have been doing with regard to these elements and to learn from their colleagues, to use this information to discern patterns that may help individual campuses with their own efforts, and finally, to go beyond the individual campus level and consider multi-campus approaches to these topics in order to foster collaboration and collective action and leverage resources and funding.

Funding agencies, which are increasingly moving to consortial patterns of funding, are encouraging the Center to take the lead in organizing multi-campus projects that address the interests and priorities of the Center's constituents. They would like to see different campuses tackling the same issue or working to achieve the same broad goals, but tackling those goals in their own ways and informing one another. Dr. Katkin asked the group to think about what is common on their campuses and how the challenges might be collectively addressed.

The meetings began with a brief summary of current Center activities, including the outcomes and recommendations from the conference.

### **1. Conference Outcomes and Recommendations**

- The Center's November 2002 conference on "Undergraduate Research and Scholarship and the Mission of the Research University" was attended by close to 400 people from over 100 institutions. The proceedings are posted on the Center's Web site ([www.sunysb.edu/Reinventioncenter](http://www.sunysb.edu/Reinventioncenter)) and a printed volume has been mailed to all attendees. Individuals who wish to purchase this volume may do so for \$10.00. Check the Web site for further information.
- Attendees indicated that they would like the Center to follow up the conference with initiatives in the following areas: programs focusing on the humanities (this was the single greatest request we received); promoting interdisciplinarity; developing a common definition of "undergraduate research" that universities can use to establish their own programs and policies; integrating graduate and undergraduate education; creating a continuum of experiences that promote the development of broad competencies and disciplinary skills and prepare students to engage in research/scholarship; and scaling up. The agenda of this round of regional network meetings reflects these interests. We are following up on the interest in interdisciplinarity in two ways. First, the Spotlight feature on the Web site currently has an essay and models on interdisciplinarity in general education; it will be followed by a second Spotlight which will focus on the minor as a good vehicle to promote interdisciplinarity. We plan to feature the University of Southern California here and are looking for other models as well, so please let me know if your campus uses the minor effectively in this way. Second, the next Center conference, in Oct/Nov. 2004 will have interdisciplinarity as a central theme. Stay tuned for more info.

- In response to the call for the Center to lead an effort to develop a definition of “undergraduate research” a sub-committee made up of members of the DC network has been formed to work on this issue. The members are: Cheryl Beil, George Washington University; Lisa Kiely, U of Maryland College Park; Karen Laughlin, Florida State; and Beth Pennington, U of Maryland Baltimore County. The committee seeks to come up with a definition that will be broad enough to accommodate different campus interests yet able to serve as a point of reference for campuses that are endeavoring to develop undergraduate research programs and/or standards. The VPs for Undergraduate Education of the UC universities are addressing this issue within a system-wide forum. At the DC meeting, Jodi Wesemann of the American Chemical Society (ACS) distributed a handout from the ACS Committee on Professional Training that provides guidelines for the undergraduate research experience in chemistry, including the desired goals and outcomes for students. The document, the ACS-CPT Supplement on Undergraduate Research, is available online: <http://www.chemistry.org/portal/resources?id=ebf9359c432811d6fb3c4fd8fe800100> . \*If your campus has a definition of undergraduate research or other guidelines or benchmarks, please send them to us ([reinvention@sunysb.edu](mailto:reinvention@sunysb.edu)) for forwarding to the sub-committee.
- The Center Web site has added many new references and links to programs described at the conference, and it has incorporated a search engine into its Web site, making it much more user-friendly.

## 2. Current Center Initiatives

- A pervasive theme of many of the conference sessions was the need to engage departments in undergraduate reform efforts since they are the units that are responsible for designing and delivering the undergraduate curriculum. The Center is endeavoring to do this through the formation of disciplinary networks, made up of faculty working in collaboration with professional associations on discipline-specific curricular and professional issues. A proposal to establish the first disciplinary network-- in Literary Studies-- is currently pending with the National Endowment for the Humanities (NEH). Interest in forming similar networks has been expressed by colleagues in History, Political Science and Management/Business. If you would like to be involved in organizing such a network, please contact Wendy ([reinventioncenter@sunysb.edu](mailto:reinventioncenter@sunysb.edu)).

Jodi Wesemann of the ACS noted that the best way to tap into disciplinary societies in any discipline is to involve the faculty who govern them and constitute their membership. Members of a society’s education committee may be able to initiate discussion and action on a topic. Several faculty suggested that the best approach might be to start with content and do things within the venue of the society’s education committee or program, bringing in larger groups of faculty from research universities. Faculty want to hear about things that are working in environments that are similar to the one in which they work. Together, the Center and faculty, can help associations figure out how to talk about education beyond the syllabus level. They might address such questions as: how do you bring research generally and your research in particular into the classroom? how do you institutionalize undergraduate research? what does it mean to do undergraduate research 1) within your discipline; 2) across disciplines? how can your own research benefit from having undergraduates participate? how do you mentor undergraduates so that they develop “life” skills as well as skills specific to their area of research. Having such discussions within the context of disciplinary association forums also has the potential to promote strong networking.

- A proposal to conduct a multi-campus assessment of undergraduate research, is currently pending with the NSF. Participating institutions are Case Western Reserve, U of Connecticut, U of North Carolina at Chapel Hill, and West Virginia University. This project is the first multi-campus project the Center has undertaken; we plan several others and welcome your suggestions for possible subjects.
- A proposal to conduct a survey and interviews on bio/math connections is pending with the NSF. This project is being carried out in collaboration with the MAA, AAAS and the ASM.

### 3. Potential Funding Opportunities

#### *For the Center*

- Initiatives that aim to strengthen connections between graduate and undergraduate education, including broadening the preparation of graduate students to include undergraduate instruction in its fullest sense. Possible partners for such initiatives include The Re-envisioning the PhD project at the University of Washington and the Woodrow Wilson National Fellowship Foundation.
- Initiatives directed at transforming the curriculum, especially multi-campus projects that seek to create a continuum of educational experiences from the first through the senior year. Some institutions (such as Duke) are way ahead of others in creating this continuum. One specific question to be considered is how best to lay out the elements of the continuum; should one specify the elements year-by-year, or give certain long-range goals? The NSF has expressed an interest in supporting a multi-campus project with this focus, so again, if you have ideas for projects with this focus, contact Wendy.
- Service and community-based learning: Participants in a recent NSF workshop described good examples of service learning experiences that led to research projects in chemistry; the Imagining America consortium at the University of Michigan promotes community-based projects that can be carried out by undergraduates in the humanities and the arts.
- Interdisciplinarity: The NSF is soliciting proposals for initiatives that focus on the intersections between math and biology (see the Joint Announcement of Opportunities for FY 2003: Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences [http://www.nsf.gov/pubsys/ods/getpub.cfm?ods\\_key=nsf03037](http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf03037)).
- A second follow-up to the Boyer survey, this one *six* years after.
- Catalyst grants to assist universities interested in applying for funds to establish a Science of Learning Center. This is a new initiative sponsored by the NSF. The Reinvention Center is seeking a grant from the NSF, to be used to help campuses to design and implement the educational activities that are a critical component of these SL Centers and to design and implement assessment, dissemination and outreach activities.

#### *For Your Campus*

- The Chemistry program at the NSF recently held a workshop to consider the creation of a program to support the development of Undergraduate Research Centers or consortium (URC) in chemistry. The goals in establishing such centers are to improve undergraduate education in chemistry by increasing student involvement in real research (as opposed to lab exercises) and increasing the chemistry workforce. Although a formal solicitation for URCs has not yet been issued, the workshop participants recommended that the URCs have the following characteristics:
  - Focus on 1<sup>st</sup> and 2<sup>nd</sup> year undergraduates but ideally embrace an extended community from K-12 through post-graduate
  - Be multi-institutional, with diversity in institutional types, and represent genuine partnerships
  - Have an impact on capacity; increase the number of students going into chemistry
  - Support curricular reform that integrates research and education
  - Have ongoing faculty development
  - Include ongoing assessment
  - Have an independent administrative staff
  - Be sustainable

It was recommended that the URCs be funded at \$100,000-\$500,000 per year, preferably up to five years. Proposals from allied areas such as molecular biology and materials science will be welcomed. A handout summarizing the main points of the initiative was distributed. Check the NSF Web site for more information on this initiative.

- The NSF is soliciting proposals to establish Science of Learning Centers (SLCs). These will be interdisciplinary centers similar to the STCs organized around a unifying research focus on learning—what it is and “how it is affected at all levels, ranging from the digital to the societal.” “Learning” is broadly conceived and the research may involve such diverse areas as psychological, social and pedagogical aspects of learning; the biological basis of learning, machine learning; learning technologies; and mathematical analyses and modeling of all of these. The SLCs will be expected to emphasize the application and translation of research findings into educational settings. For information on the SLC solicitation, see: <http://www.nsf.gov/home/crssprgm/slc>.

The Reinvention encourages campuses to consider ways in which the Center can help them to develop and implement educational outreach, assessment, and dissemination activities in conjunction with grant-funded programs. The NSF, for instance, requires all proposals to explicitly address the “Broader Impact” of the funded activity, including the integration of research and education. The Reinvention Center can:

- Serve as a resource by providing information on effective educational outreach activities and research findings and assisting campuses in drawing them as they plan new efforts;
- Carry out assessment of specific activities, including placing those activities in a larger context; and
- Serve as an agent for dissemination of outreach activities and project findings by circulating information through its regional and disciplinary networks, Web site, listservs, conferences, and other activities.

If you are interested in involving the Center in your next grant proposal, let Wendy know.

## CAMPUS REPORTS AND BREAKOUT SESSIONS

Each campus was asked to briefly describe one or two initiatives related to the topics around which the meeting was organized: integrating graduate and undergraduate education; forming partnerships with key campus units and taking advantage of the wealth of resources; and transforming large lecture courses. Following the reports, participants divided into breakout groups to address these issues in greater depth. Each breakout group was asked to identify one or two promising practices that can be used and built upon, and to identify areas on which further initiatives -- that go beyond what is currently done and move existing practices to the next level -- should focus, especially with an eye toward multi-campus projects.

A number of common themes were raised in the group discussion. Expanded enrollments have put pressures on virtually all the campuses, as have diminished resources. As faculty at all three network meetings pointed out, campuses are trying to build a culture that values undergraduate education, but it cannot be done for free and resource issues always come to the fore.

Summaries combining the reports of the breakout sessions at all three network meetings, are described below, along with a small number of especially innovative practices. Many other noteworthy initiatives however were also presented. *We would also like to include links to these initiatives, as well as other effective programs on your campuses, on the Reinvention Center Web site. We invite you to send us the following information on all initiatives you would like referenced on the Web site:*

- Name and brief description (1-3 sentences)
- Contact person’s name, title, email address and phone no.
- Web site address

### I. Integrating Graduate and Undergraduate Education

Linking graduate and undergraduate education is a new priority on several campuses, in part because campuses are increasingly aware that many of their doctoral students will go on to careers at primarily undergraduate institutions and therefore need teaching experiences and training to help develop them as “future faculty.” Promoting this linkage requires a partnership between a central authority (i.e. the Graduate School, the Office

for Undergraduate Education) and the discipline. On more and more campuses, teaching resource centers, schools of education, and individual departments are working together to provide teaching practica for graduate students. Many campuses now hold “learning” forums in which graduate students and faculty share best practices within and across disciplines.

Several institutions offer certificates in college teaching to graduate students who complete a training program. Some institutions participate in the Preparing Future Faculty program in which their students also receive experience teaching at institutions other than research universities. In addition to classroom experiences, graduate students – especially in the sciences -- often mentor undergraduates informally in vertically-integrated lab teams that include faculty, post-docs, graduate students, and undergraduates and in summer REU programs. Service learning offers new opportunities as well. Campuses hope to expand and formalize these opportunities.

### *Promising Practices*

The breakout groups identified a number of promising practices, though noted that in many cases they are easier to implement in the sciences than in the humanities, and in some cases science graduate directors are not willing to give up their graduate students to let them teach. The practices described here fall into four broad areas:

#### Graduate Students as Research Mentors

- Stony Brook University’s Women in Science and Engineering program (WISE) offers a two-course sequence for graduate students: “Designing and Supervising Undergraduate Research” and “Introduction to Research.” In the first course, offered in the fall semester, graduate students design research projects that are carried out under their supervision by small teams of undergraduates. These projects are of three-week duration. See <http://www.wise.sunysb.edu/Wise%20College/WISE%20187%20Intro%20to%20Research%20Summary.htm>.
- Many campuses are involving graduate students in all phases of research, not simply supervision of a project. The University of North Carolina at Chapel Hill’s Office of Undergraduate Research funds Graduate Mentors to work with undergraduates who are completing research projects, in all disciplines. In Social Psychology, for example, Graduate Consultants help students turn a class final project into a research project; the graduate students are hired on a short-term basis and may teach research techniques, accompany student teams to do field work, critique proposals, and help students prepare the final document.
- At the University of Maryland, College Park, Research Internships in Science and Engineering (RISE), an NSF-funded program to attract and retain women in science, matches groups of four incoming students with a faculty member, a graduate student, and an advanced undergraduate to work as a team on a project. Graduate students involved in this project reported that as a result they had a better idea of what they might be expected to do as faculty.

#### Graduate Students as Peers in Courses and in Informal Settings

- A Classics seminar on Ovid at the University of Maryland, intended as both preparation for those intending to teach K-12 and as a continuing-education credit for those already teaching, includes secondary school teachers enrolled at the graduate level, who serve as potential mentors to the undergraduates (who produced some of the best papers).
- In UC-Davis’s newly-created College of LaRue, graduate and undergraduate students reside together and participate in a variety of activities such as films series and foreign language tables designed to enhance their educational experiences. The graduate students lead programs, hosted discussions arising from these activities in order to meet eligibility requirements to live in the College.
- Colloquia and talks offer an excellent opportunity for collective engagement of graduate and undergraduate students.

### Professional Training

- Duke has a teaching fellow program (Mellon-funded) to prepare graduate students for their future instructional roles; it provides special funding to allow advanced graduate students to prepare and teach a seminar in their area of specialization to undergraduates. Graduate students volunteer to participate and receive a certificate on completion.
- Bryn Mawr College offers Teaching Fellowships funded by the Keck Foundation to graduate students in their last two years of graduate study.
- NYU's Teaching Partner Program provides workshops for graduate students who are trained to develop workshops in teaching for other graduate students.
- The University of Kentucky offers a Graduate Teaching Certificate which requires students to do internships at a small liberal arts college.
- Stanford University's Center for Teaching and Learning trains graduate students to work with departments to develop discipline-specific training.
- The University of Minnesota's Research Site for Educators in Chemistry brings together faculty from universities and four-year colleges to develop and deliver better and more authentic research experiences to students.

### Graduate Students as Advisors on Career and Graduate School Choices:

- Graduate students in Psychology at the University of Maryland host a graduate school fair with workshops for undergraduates on career choices and the graduate school applications process.
- Many campuses/departments have established forums in which graduate students "pass on tools" and speak informally to undergraduates about their experiences as graduate students and their professional goals.

An unusual example of a collaborative project in the humanities that involves both graduates and undergraduates is the University at Buffalo's 'LiTgloss' project (<http://wings.buffalo.edu/litgloss/>), designed to facilitate English speakers' reading of texts in other languages with which they have some familiarity. 'LiTgloss' is an online collection of texts from languages ranging from Arabic to Vietnamese (with most texts drawn from French, German, and Spanish), presented in their original language with annotations, translations, and (in some cases) sound recordings that are revealed by clicking on the word or phrase in question. The project draws on the expertise of foreign-speaking graduate students as well as on that of advanced undergraduates who are majoring in a foreign language.

### *Areas for Future Development*

The DC group was asked to develop areas for a proposal to the NSF for an assessable multi-campus 'intervention' aimed at integrating graduate and undergraduate education. The following ideas were put forth, ranked in order of their feasibility and assessability on multiple campuses:

1. Educating graduate students (and their disciplinary directors) on the value of undergraduate education so they can be enticed out of the lab.
2. Raising awareness among graduate students of relevant research on learning, including cognitive science and applications to teaching.
3. Connecting science to other disciplines, including training both graduate and undergraduate students in the sciences to be able to communicate their discipline to others.
4. Educating faculty about the value of mentoring undergraduates, so they will support graduate students doing so.

### *Recommendations*

- Graduate student training requires a partnership between a central authority and the discipline. There should be "learning" forums, in which graduate students and faculty participate, for sharing best practices within and across disciplines.

- Colloquia and talks Graduate and undergraduate students.

## II. Forming Partnerships with Key Campus Units and External Organizations

Partnerships with units such as the university libraries, academic support and instructional technology departments, teaching resource centers, offices that coordinate undergraduate research, writing centers, service learning units, academic advising centers, and student groups, can promote and enhance undergraduate education. There are a number of good examples of such partnerships.

### *Promising Practices*

- North Carolina State University's Learning and Research Center for the Digital Age (<http://www.lib.ncsu.edu/administration/lrcda/>) offers media and digital labs, instructional technology teaching labs, presentation space, and a resource center to provide guidance to faculty and students on copyright matters for both digital and print forms of scholarly publishing.
- Duke University librarians provide 'just in time' course-specific training to students on how to access and evaluate material from the library collections and online databases.
- University of Maryland, College Park's Gemstone program (<http://gemstone.umd.edu>), a four-year multidisciplinary learning community, has a librarian on every team from start to finish.
- The University of Washington imposed a tax on all departments in order to create a fund to support "weed" or "seed" grants. These grants, which are awarded on a competitive basis, aim to get faculty to use new resources in order to expand research opportunities for undergraduates and to assist faculty to customize a template to help fund student research.
- UWill at the University of Washington (<http://www.lib.washington.edu/uwill/index.html>) provides support for teaching information competencies in course contexts. It offers online instructional templates addressing a range of concepts related to information-seeking, as well as other strategies, to deliver instruction and generate assignments and course activities that help students develop mastery of information-seeking strategies.

Some universities draw on resources unique to their location:

- NYU's Center for Teaching developed a fund to allow faculty to take students to do research or service at locations in the city.
- George Washington University received a grant from the Hewlett Foundation to "bring Washington, DC into the classroom" through archival research, courtroom visits, and other experiences.
- The University at Buffalo's Community-Linked Interdisciplinary Research (CLIR) program (<http://www.clir.buffalo.edu/>) consists of courses designed around community research needs. Current course topics include the African refugee population, the Underground Railroad, Web design for public service clients, and environmental chemistry.
- The University of South Dakota has two innovative interdisciplinary REU programs that take advantage of their location. One involves a collaboration with a local museum and is organized around an archeological site in the region and involves students in Anthropology, History, Education and Museum Studies. The second REU program retraces the Lewis and Clark expedition. Undergraduates do research on a wide range of topics ranging from history, to studies of policy decisions to laboratory-based work. This REU is open to undergraduates in all disciplines with the University providing funds for those who are not eligible for REU support.
- Dennis Jacobs at Notre Dame has created an innovative multi-faceted, multi-disciplinary community-based research project in which students canvas neighborhoods, first to locate houses that have high lead levels and then to investigate a range of related factors. Student projects vary from biochemistry studies to policy development when for example blood results are positive, to family studies, to social impact studies, to engineering projects.

Universities are increasingly endeavoring to coordinate activities among the multiple units on their campus that have responsibility for aspects of undergraduate education.

- UC-Berkeley's Council of Academic Partners (CAP; <http://education.berkeley.edu/cap/>), an advisory group to the Vice Provost for Undergraduate Education, is a collaboration of varied campus units that encourage, support and enhance excellence in teaching at the undergraduate and graduate levels. All levels of teaching staff participate.
- The Mellon Faculty Institute on Undergraduate Research at UC-Berkeley (<http://library.berkeley.edu/Mellon>), comprised of the GSI Teaching and Resource Center, Educational Technology Services and the Library, brings together resident expertise in course design, assessment and other critical areas to assist faculty in redesigning their courses to make students delve.
- UC-Davis has created an Advising Forum made up of colleges across the campus. Each year one college is the focus. The purpose is to bring the campus up to date on what all the colleges are doing and to create links where appropriate in implementing activities.

#### *Areas for Future Development: Recommendations*

- Community-based research is an overlooked way of involving both students and faculty that also helps land-grant institutions fulfill the service component of their mission. The Reinvention Center should involve community-based research and service learning practitioners programs in its discussions. One suggestion was to invite the Director of the Georgetown University-based Community Research and Learning Network (<http://www.coralnetwork.org>), which promotes collaborative community-based work that involves both local organizations and the faculty and students of DC-area colleges and universities, to give a presentation at a future regional meeting.
- Develop a set of "best practices" for the Web pages of offices that coordinate undergraduate research, with the goal of making it easy for students and faculty to find out about undergraduate research at their institution. Provide guidance on the essential elements of such a page and some good models. One very specific practical suggestion is that all undergraduate research offices should add "UROP" (Undergraduate Research Opportunities Program) to their meta-tags, whether or not the office goes by that acronym, because it is one of the most common terms by which both faculty and students will search for such an office.

*The Center would like to follow up on this recommendation immediately and is looking for good models. If your campus has one, please send us the Web address.*

### **III. Transforming Large Lecture Courses**

The large lecture format is a given at research universities, particularly in lower-division courses, but there are ways to re-conceive these courses to emphasize experiential and inquiry-based learning and engage the full range of students. Faculty need to re-think the goals of these courses, to determine what students should take away from them, rather than focus on "what should I teach." On many campuses, teaching research centers offer services -- such as grants for innovation, workshops, and technological support -- to both faculty and graduate teaching assistants in order to improve the quality of instruction in large lecture (and other) courses.

#### *Promising Practices*

- Creating small group experiences within a large-group setting, potentially creating opportunities for inquiry- or problem-based learning. One good way of doing this is to use peer-to-peer learning in which students are divided into small groups to discuss a question or problem posed by the instructor, and report back their answers.
  - This small-group approach can often be facilitated by the use of advanced undergraduates. In the University of Pittsburgh's Peer-Led Teaching model, upper-level undergraduates serve as

team leaders in discussion sections. The University of South Florida's Introductory Chemistry classes incorporate a peer-led Problem-Based Learning component in which breakout groups are led by junior or senior Chemistry majors. A similar component at the University at Buffalo uses students who are preparing for the MCATs as group leaders; they get one academic credit for their participation, along with a good review of general chemistry.

- Using technology (thoughtfully and appropriately) to enrich both content and delivery.
  - Technology such as "Personal Response Systems" can enable instructors to quickly compile the responses of individuals and/or small groups to questions posed in class and see what percentage of students understand the material and where the difficulties are.
  - Computer-based tutorials and supplements can help address the problem of delivering the same content to students of varying ability. At Duke University, self-paced tutorials for students have enabled Economics classes to integrate more quantitative material.
- Substituting or adding practical experiences to existing courses. Bryn Mawr College experimented with eliminating lectures in its Neuroscience courses; instead groups of 4-8 students met in lab groups, in which they had to construct hypotheses and ask questions to test them. This proved to be a difficult and undefined way for undergraduates to learn science, and the students evaluated it very negatively. A more successful approach was taken by departments that incorporated a praxis experience. Students in Sociology, for example, were required to work at a social services agency in Philadelphia, writing in detail about the experience, putting it in theoretical context.
- Allowing advanced graduate students to teach their own sections of introductory courses reduces class size. The University of South Florida's Sociology department offers the Introduction to Sociology both in the fall semester, in one large class taught by a faculty member with the assistance of graduate teaching assistants, and in the spring as a series of smaller classes taught independently by graduate students who have served as TAs in the fall. Students can opt for either the large or the small version.

### *Challenges*

We cannot assume that all large lectures are bad and all courses taught in small sections are good. We need to know what we are doing now, articulate what we want to do, and compare them, to determine the extent to which we are achieving our goals. But what are the measures of success? How can we measure what we are currently doing? How do we know what we are assessing? How can we measure new innovations?

We have to consider large lecture courses for themselves as well as in the context of the larger educational package.

Instead of the traditional model whereby freshmen enroll in enormous lecture courses and upper-division students attend small seminars, campuses should consider capping first-year courses at a low number, especially in order to address the variations in entering students' preparation. It was noted, however, that upper-division courses in popular majors such as psychology and the life sciences are often quite large as well.