

TO : Professor Wei Zhao, Rector, UM
FROM : Kam Hou Vat, FST – DCIS
SUBJECT : Undergraduate Research Program Development
DATE : April 14, 2010
CC : Professor Simon Ho, Vice Rector (Academic Affairs)
Professor Rui Martins, Vice Rector (Research)

Thanks for the Town Hall Meeting on 2010APR08, sharing with the university community the latest revisions in our UM charter and the UM Personnel Statute. Please accept, in advance, my sincere appreciations for allowing my feedback through this follow-up e-mail, concerning different suggestions from my personal perception in regard to how best to improve our University's commitment in serving our students' educational needs.

Regarding Undergraduate Research

- 1) I am deeply grateful for this initiative of yours announced in your first Town Hall Meeting in 2008, which has to do with introducing research experience for undergraduate students in as many disciplines as possible, serving as one of many plausible means to stimulate and enhance student learning in our Bachelor degree programs, which are meant to be programs of quality to empower students to learn, not just to receive instructions.
- 2) I still remember the questions I put forth in that first Town Hall Meeting in 2008 as to what mechanisms we should have in mind to put in place such an initiative to enable our students to appreciate the value of this idea (or arrangement, say in curricular or co-curricular activities) and to perceive the significance of this research experience in their studies. The answer to this question, as I am deeply convinced, should have consequences in the following inquiries:
 - a) What enhances the ability of our university to recruit and retain highly capable student members to participate in the visions and missions of UM?
 - b) What are the essential elements of UM's academic body and learning environments that will help ensure students to find their studies satisfying and meaningful so as to enable them to fully realize their talents and potentials throughout their endeavors to accomplish their learning here?
 - c) How can our university fully recognize and build on the intellectual capital that we faculty represent, and on the talents and abilities of each member of the student body?

It is still my belief that the answer lies not just in money, but in how best UM positions and manages the holistic interaction among our teaching, learning, assessing, and researching activities. It is a topic of tremendous significance that surely deserves our deep thinking. Indeed, an office is needed at UM, to ensure our institutional effectiveness in terms of quality and commitment in exercising our visions and missions to be constantly assessed and reviewed. Namely, developing and

maintaining the expertise, commitment, energy, and creativity of our faculty members, directly shapes the experiences of students, the nature of research, and the impact of the institution on the broader community.

- 3) Nonetheless, in view of any new policy to upgrade our student academic experience or to involve our faculty members to perform the specific services related to undergraduate research, if seen as a constituent component of our academic programs, are we liable to provide a more articulated academic vision of student learning as perceived in such an initiative (undergraduate research) in the context of institutional policies and practices that, if adopted, could attract quality faculty commitment to fulfill the missions of our university as they perform their regular work? In this light, it is important to provide an overall framework that outlines the fundamental elements of the undergraduate research experience for all student members, regardless of the nature of their selected disciplines of studies. Thereby, I would like to share with you some of my humble suggestions for such a framework to actualize the potential of undergraduate research:

- a) *Research as a way to learn*: I am a supporter of John Dewey in terms of his view of teaching and learning, “True learning is based on discovery guided by mentoring rather than the transmission of knowledge.” To me, this is an expression of what undergraduate research is all about. If we could design or redesign our undergraduate education (course delivery to be more precise) using this paradigm of teaching and learning, we are indeed implementing a quality program of undergraduate research. The next question is how to realize this philosophy of undergraduate research in concrete terms, compatible with our undergraduate curriculum reform.

- b) *Teach students a deep approach to learn*: Undergraduates who enter UM should understand the unique quality of our institutions and the concomitant opportunities to enter a world of discovery in which they are active participants, not passive receivers. Teachers must realize that although shared knowledge is an important component of a university education, no simple formula of courses can serve all students in our time. Instead, teachers must design collaborative learning experiences that provide alternative means to share in the learning experiences, as do the multitudinous resources available through the computer (or the Web, to be exact). The skills of analysis, evaluation, and synthesis must become the hallmarks of a good education, just as absorption of a body of knowledge once was. Use of pedagogies such as problem-based learning, coupled with group-based project work, followed by an experience of learning in communities, must be rendered as part of course experiences to help student to develop a deep approach to learning (by doing rather than largely by listening). Institutional practices in teaching, learning and assessment must strive to enhance individual faculty members’ (and thus their departmental) effectiveness by focusing on courses, the curriculum, and student learning. Instructors serve as members of a design or redesign team, working with instructional design and evaluation specialists, to identify course or curriculum strategies or processes appropriate to achieving stated outcome goals for student learning.

c) *Make sense of student-centered research experience*: The phrase *research experience* must make sense of itself through a synergistic system in which faculty and undergraduate students are learners and researchers, whose interactions make for a healthy and flourishing intellectual atmosphere. Indeed, for some time since 2007, we have been tackling the idea of providing a student-centered education in FST. The student-centered context focuses attention on learning: what the student is learning, how the student is learning, conditions under which the student is learning, whether the student is retaining and applying the learning, and how current learning positions the student for future learning. The student is an important part of the equation. Indeed, we make the distinction between student-centered instruction and teacher-centered instruction as a way of indicating that the spotlight has moved from teacher teaching to student learning. When instruction is student-centered, the action focuses on what students (not teachers) are doing. Since the instructional action now features students, the student-centered orientation accepts, cultivates, and builds on the ultimate responsibility students have for learning. Teachers cannot do it for students. They may set the stage, so to speak, and help out during rehearsals, but then it is up to students to perform, and when they do learn, it is the student, not the teacher, who should receive accolades. This is the essence in a quality undergraduate research experience.

d) *Avoid being University Inc.*: We cannot afford the commercialization of higher education to use undergraduate research experience as a slogan to attract promising students. We must provide the substance. The term *student-centered* must not become an oxymoron; so, I prefer the term *learner-centered* instead, although both terms imply a focus on student needs. Yet, being student-centered carries the connotation that might give rise to the idea of education as a product, with the student as the customer and the role of the faculty as one of serving and satisfying the customer. Faculty members resist the student-as-customer metaphor for some very good reasons. When the product is education, especially in a four-year undergraduate degree program, the customer cannot always be right; there is no money-back guarantee, and tuition dollars do not "buy" the desired grades. Nonetheless, the learner-centered approach orients to the idea of "product quality" constructively. Being learner-centered is not about cowering in the competitive academic marketplace. It is not about kowtowing to student demands for easy options and is not about an ethically irresponsible diminution of academic standards in an attempt to placate "shoppers" who may opt to purchase educational products elsewhere. It is about creating climates in classes and on campus that advance learning outcomes. It is an orientation that advocates for more, not less learning. It is about offering a quality learning experience through our undergraduate research program. We should focus on the organizational structures and processes of an institution and its subunits, adaptable for such an initiative. It seeks to help the organization function in an effective and efficient way to support the work of teachers and students. Leadership training for department chairpersons; effective use of group processes; review, revision, and active use of the mission statement; implementing organizational change processes; and institutional governance are representative topics that fall within the purview of organizational development, to support a quality undergraduate research program.

- 4) Put it more simply, I believe we could implement an effective undergraduate research program for our students by resorting to the following core ideas adapted from the Boyer Commission Report released in 1998 on *Re-inventing Undergraduate Education* in an incremental manner:

URL of the Report:

[http://naples.cc.sunysb.edu/Pres/boyer.nsf/673918d46fbf653e852565ec0056ff3e/d955b61ffddd590a852565ec005717ae/\\$FILE/boyer.pdf](http://naples.cc.sunysb.edu/Pres/boyer.nsf/673918d46fbf653e852565ec0056ff3e/d955b61ffddd590a852565ec005717ae/$FILE/boyer.pdf)

- a) Install an academic Bill of Rights for Undergraduate Research Experience: Consult Boyer's Report (pp. 12-13) for an example from this URL.
- b) Make research-based learning the standard:
- At the University of Delaware, problem-based learning (PBL) was adopted in all basic science classes to promote active learning and connect concepts to applications. Students are not given all the information they need to solve the open-ended real-world problems, but are responsible for finding and using appropriate sources. They work in teams with access to an instructor; trained graduate or undergraduate students help lead some groups.
 - At the Rensselaer Polytechnic Institute (PRI) in New York, science courses have been largely redesigned for more effective presentation; the traditional format, in which lecture, recitation, and laboratory sections were completely separate, were replaced by a studio format, which integrates the three into one unified program taught in a single facility designed for the purpose. Students are divided into 12-15 studio-workshops, each taught by a single faculty member, with assistance from a graduate student and several undergraduates. Problem-solving, teamwork, and co-operative learning are emphasized.
 - At the State University of New York at Stony Brook, any interested undergraduate may enter the URECA (Undergraduate Research and Creative Activities) Program, in which students submit written proposals and are interviewed by professors willing to lead the projects. The program helps students who propose their own projects find faculty sponsorship. Students may receive either hourly wages or academic credit. The program also could link students beginning on a project with experienced students.
- c) Construct an inquiry-based freshman year:
- At Duke University in the US, first-semester freshmen may enroll in one of about 14 interdisciplinary thematically-designed programs, in which they take two Focus seminars, a writing course, and a non-Focus elective. Enrollment in each is limited to 30; students in a program live together in a residence hall and meet weekly for dinner.
 - At the University of Utah, entering freshmen enroll in a year-long semester led by one instructor and in quarterly Liberal Education Accelerated Program (LEAP) courses linked to the themes of the seminars. Some of these courses meet graduation requirements and some meet core or distribution

requirements. LEAP students also enroll in a first-quarter study and computer skills course. Current and past LEAP students are members of the LEAP club, which provides organized social and academic activities such as study groups and guest speakers.

d) Build on the freshman foundation:

- At Stanford University, sophomores who choose to enroll in a Sophomore College Program are housed together in student residences and enroll in small-group classes of approximately 10, led by one professor and two upper-class students. Participants earn 1 or 2 academic credits; examples of topics include Constitutionalism, Comparative American Urban Cultures, and The Process of Discovery in Psychology. Workshops in Use of University Libraries, Research Opportunities, and Academic Decision-Making are held.
- At Princeton University, all undergraduates must conduct independent research or creative work during the junior year and submit a Junior Paper, which then becomes the basis for the required Senior Thesis.

e) Remove barriers to interdisciplinary education:

- At the University of Maryland, College Park, “World courses” are team-taught lecture courses for core distribution credit: many integrate science with humanities or social science perspectives. Topics include “To stem the flow: the Nile, technology, politics, and the environment,” taught by faculty from Civil Engineering, Microbiology, and Government and Politics, and “The creative drive: Creativity in music, architecture, and science,” taught by Mathematics, Music, and Architecture faculty, focusing on the creative process as seen in jazz, modern buildings, and scientific chaos theory.

f) Link communication skills and course work:

- At the University of Chicago, the Little Red Schoolhouse program is a one-quarter writing course taken each year by about 200 undergraduates. It is faculty taught, with assistance from doctoral-student writing interns. In the Schoolhouse, the students learn how to adapt their writing to evoke the responses they want and how to work effectively with other writers on revisions.

g) Use information technology creatively:

- At the University of California (UC), Berkeley, a state-of-the-art center for video conferencing and inter-campus instruction allows courses to be offered in collaboration not only with other UC campuses but with other universities both in the United States and abroad; they allow students anywhere to interact with faculty and classmates in real time.

h) Culminate with a capstone experience:

- At the University of Wisconsin, a College of Agriculture requirement is a problem-solving exercise, in which students under faculty supervision and mentorship must solve a real-world problem and address societal, economic,

ethical, scientific, and professional factors in their solutions. The capstone learning experience must involve more than one department or several areas within a single department. Final work is presented in written, oral, and visual reports.

- At the University of Missouri-Columbia, the General Education Program, mandatory for all students, includes a capstone experience, a senior seminar, thesis, project, performance, internship, or field work, on a topic appropriate to the student's major. The capstone experience is evaluated on both the quality of the product of the student's investigation and the process of presentation.

i) Cultivate a sense of community:

- A sense of community is an essential element in providing students a strong undergraduate education, especially in a university who values research-based learning. At Syracuse University (SU), starting from the late 1990s, the strategy of learning communities has been intentionally embraced. Committed to promoting learning and the academic, professional, and personal growth of her students through the responsible collaboration of all campus constituencies, SU arrives at the conclusion that learning communities has the potential to promote holistic student success (after sifting through the available national data for analysis). SU is convinced that any institution that deliberately characterizes itself as student-centered should certainly be judged on its capacity to facilitate student success, including through its undergraduate research program.

5) Meanwhile, I very much identify with the late Ernest Boyer's ideas published in his 1990 book *Scholarship Reconsidered: Priorities of the Professoriate*. Boyer's work has stimulated discussion throughout higher education about the nature of scholarship. It is suggested that teachers who devise better ways to help students learn, or who do research on teaching and student learning, are engaged in scholarly work. The outgrowth of this notion was the now famous research on *Scholarship of Teaching and Learning* (SoTL) movement initiated through the Carnegie Foundation for the Advancement of Teaching and AAHE (American Association of Higher Education, now renamed as AAHEA, American Association of Higher Education and Accreditation). Today, as we may have already been aware, a national network of institutions in the States, participate in SoTL. It has engaged colleges, universities, and teaching and learning centers in supporting classroom research, peer review of teaching, the use of course, teaching, and student portfolios, and publications presenting the scholarship of teaching and learning. In the context of our University of Macau, it is believed that the following practical steps in installing a meaningful undergraduate research program should make sense for our strategic planning in the immediate future:

Make research-based learning the standard

- a. Beginning in the freshman year, students should be able to engage in research in as many courses as possible.

- b. Beginning with the freshman year, students must learn how to convey the results of their work effectively both orally and in writing.
- c. Undergraduates must explore diverse fields to complement and contrast with their major fields, so as to reveal the relationships among sciences, social sciences, and humanities.
- d. Inquiry-based courses must be further encouraged and planned into the curriculum, and should allow for joint projects and collaborative efforts.

Construct an inquiry-based freshman year

- a. All first-year students should have a freshman seminar, whether or not limited in size, taught by experienced faculty, and requiring extensive writing (such as journaling through Web blogging), as a normal part of their experience.
- b. Every freshman experience needs to include opportunities for learning through collaborative efforts, such as joint projects and mutual critiques of oral and written work.
- c. The freshman program should be carefully constructed as an integrated, interdisciplinary, inquiry-based experience by design such as:
 - Combining a group of students with a combination of faculty and graduate assistants for a semester or a year of study of a single complicated subject or problem.
 - Block scheduling students into two or three first-semester courses and integrating those courses so that the professors plan together and offer assignments together.
 - If possible, integrating those courses with the freshman seminar, so that there is a sense of wholeness and of freshness to the first year.

Build on the freshman foundation

- a. The inquiry-based learning, collaborative efforts, and expectations for writing and speaking that are part of the freshman experience need to be carried throughout the program.
- b. Thoughtful and attentive advising and mentoring should integrate major fields with supporting courses so that programs become integrated wholes rather than collections of disparate courses.
- c. New transfer students need to be integrated into the research experience with special seminars or similar courses comparable to the freshman seminar.

Remove barriers to interdisciplinary education

- a. Lower division courses should introduce students to inter-disciplinary study.
- b. Academic majors must reflect students' needs rather than departmental interests or convenience.
- c. Customizing inter-disciplinary majors should not only be possible, but also be readily welcomed and achievable.

Link communication skills and course work

- a. All student grades (assessment) should reflect both mastery of content and ability to convey content. Both expectations should be made clear to students.

- b. The freshman writing course should relate to other classes taken simultaneously and be given serious intellectual content. The course should emphasize explanation, analysis, and persuasion, and should develop the skills of brevity and clarity.
- c. Writing courses need to emphasize writing down to an audience who needs information, to prepare students directly for professional work.
- d. Courses throughout the curriculum should reinforce communication skills by routinely asking for written and oral exercises.

Use information technology creatively

- a. Faculty should be alert to the need to help students discover how to frame meaningful questions thoughtfully rather than merely seeking answers because computers can always provide them. The thought processes to identify problems should be emphasized from the first year, along with the readiness to use technology to fullest advantage.
- b. Students should be challenged to evaluate the presentation of materials through technology even as they develop an increasing familiarity with technological possibilities.
- c. Faculties should be challenged to continue to create new and innovative teaching processes and materials, and they should be rewarded for significant contributions to the technological enrichment of their courses.
- d. Planning for academic units, such as block-scheduled course for freshmen or required courses for individual majors, should include conscientious preparations for exercises that expand computer skills.

Culminate with a capstone experience

- a. Senior seminars or other capstone course appropriate to the discipline need to be part of every undergraduate program. Ideally, the capstone course should bring together faculty member, graduate students, and senior undergraduates in shared or mutually reinforcing projects.
- b. The capstone course should prepare undergraduates for the expectations and standards of graduate work and the professional workplace.
- c. The capstone course should be the culmination of the inquiry-based learning of earlier course work, broadening, deepening, and integrating the total experience of the major.
- d. The major project may well develop from a previous research experience or internship.
- e. Whenever possible, capstone courses need to allow for collaborative efforts among the undergraduate students.

Cultivate a sense of community

- a. The enriching experience of association with people of diverse backgrounds, ethnicities, cultures, and beliefs must be a normal part of university life.
- b. Residence halls should nurture community spirit.
- c. Collaborative study groups and project teams should be used as a means of creating customized communities for residential and commuting students.

- d. Common interests, such as that in maintaining the beauty of the campus setting or supporting charitable or service projects, should be cultivated by creating teams that build community as they work toward a shared goal.
- e. Major issues forums, multi-cultural arts programming, and other extra-curricular sharing of ideas, opinions, and arts bring students together, particularly when groups or clubs sponsor or help sponsor the events.
- f. Campus programming, such as lectures and performing arts programs, taken as a whole, need to touch the interests of as many audiences as possible.

6) In a related vein, I am impressed by the seminal ideas of Bergquist and Philips published in 1975 in the *Journal of Higher Education*, 46 (2): 177-215, named *Components of an effective faculty development program*. They posited that effective faculty development must become an interactive process along three dimensions: organizational, instructional, and personal. The organizational dimension includes programs that create an effective institutional environment for teaching and learning, with such activities as administrative development for chairs, and other academic leaders, and the establishment of policies that incorporate the evaluation and recognition of teaching into the reward structure. The instructional dimension is focused on the process of education and includes evaluating course organization, presentation skills, and effectiveness through such means as class visits, videotaping, and student feedback. Programs might address the identification of course goals and teaching methods, broader curriculum development, and media design components. The personal dimension includes programs to promote personal growth, life planning and interpersonal skills. More recently, in *Paths to the Professoriate: Strategies for Enriching the Preparation of Future Faculty*, Wulf and Austin offer a compendium of recent research and initiatives to support faculty across the career span. Mary Deane Sorcinelli, associate provost and director, Center for Teaching, University of Massachusetts, Amherst, calls it exceptionally stimulating and comprehensive offering a resource that beautifully distills what is known and what needs to be done to ensure that the next generation of faculty is well prepared.

So, with that note, “Have a good day!” And you have my admirations for the amount of work already accomplished since your taking the Rector’s Office since 2008. I just pick up the good news that our current campus in Taipa is to launch our experimental residential halls this coming fall of 2010. Let us work together to make our university the best it could achieve in the immediate future. Thanks for your efforts.

All the best,

Vat

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