

Report of the Academic Program Review
College of Natural Sciences
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Preamble:

The pending and long overdue consolidation of the colleges of Arts and Sciences into an *integrated* College of Arts and Sciences (CAS) can have positive impacts on programs currently housed in the College of Natural Sciences (CNS) (e.g., enhanced transdisciplinary initiatives among the sciences, humanities, and social sciences). Integration is key to the future success of the CAS – simply binding together existing silos will yield little improvement over the current situation. Although the “college” of natural sciences may cease to exist after the reorganization, it is strongly recommended that there be a formal organizational structure (e.g., a Division of Natural Sciences and Mathematics) in the “new” College of Arts and Sciences and that the science “unit” be led by someone with the unmodified title “Dean” (reporting to, perhaps, an Executive Dean of CAS).

I. Environmental Scan

The College of Natural Sciences (CNS) appears to have been adrift for a number of years and has suffered from a lack of empowered *leadership* in the Dean’s office for more than a decade. This situation has been exacerbated by considerable administrative turnover throughout the UH. Vibrant and productive programs in the sciences [= mathematics, physical, life, and information-computing sciences] are essential for the University to achieve its strategic imperatives in research and education of future scientists (undergraduate and graduate). Science programs at UH are at a crossroads. Decisions made in the next few years will determine if the programs move toward reaching their full potential or continue to struggle.

II. Critical Issues

A. Organizational Structure

Currently, the CNS appears to have too many small programs/units and may be attempting to do many things with very limited resources. In addition, the current departmental structure may create unnecessary barriers to transdisciplinary and/or interdisciplinary research and educational programs. The latter issue – breaking down the silos – was one of three major concerns raised by the graduate students that were interviewed (especially in the life sciences). The current effort to assess the organization

of the life sciences is a good first-start, but probably needs more directed leadership from the Dean's office and should include a review of all life science units (i.e., including botany). It is recommended that the college consider the creation of a transdisciplinary school of life sciences (or some similarly named unit) instead of a department of biology. In addition, it is recommended that the Dean's office review the structure of the entire college. Particular areas to assess include but are not limited to (1) how to organize astronomy and connect to the other space sciences at the undergraduate and graduate level; (2) how to expand areas of biochemistry throughout the college; and (3) determine the appropriate "fit" of Information and Computer Sciences in the college (perhaps as a school). One model to consider is:

- School of Life Sciences (no departments – transdisciplinary “faculties” – e.g., Marine Biology, EECB, MCD, etc)
- School of Information and Computer Sciences
- School of Astronomy (including IFA)
- Department of Chemistry and Biochemistry
- Department of Physics
- Department of Mathematics
- Appropriate Institutes and Centers

B. Faculty and Administrative Partnership

Advancement of CNS will require a close alignment between the goals of the Chancellor and Vice Chancellors and those of the college. Currently, there appears to be a “disconnect” between the faculty of CNS and the upper administration – an “us” versus “them” attitude. Unfortunately, this attitude is shared by some of the chairs in the college. A number of individuals – faculty, staff, and students – expressed concern over the apparent lack of communication among the various administrative levels of the university. The success of CNS will require that the faculty and administration work as partners in advancing the mission of the college and university. It is recommended that the Chancellor's vision and goals for the University be regularly communicated to the faculty, staff, and students through as many different venues as possible. It also is recommended that the role of the chairs be revised to emphasize their role as the academic leader for their units and that chairs be provided with sufficient administrative support to deal with the day-to-day management of their unit.

C. Faculty – Research/Scholarship

The CNS will deal with a significant number of faculty retirements over the next three-five years (often referred to the “2011” effect). The University needs to handle this issue in a proactive rather than a reactive manner. These retirements provide the CNS with an extraordinary opportunity to reassess future directions of the college. To take full advantage of this opportunity, it is recommended that the Dean's office – in conjunction with the Vice Chancellors for Academic Affairs and Research – conduct a “mind-map/opportunity analysis” of the college as well as related science units throughout the university. The purpose of this activity will be to identify existing areas of strength

within the college/university (e.g., astronomy, EECB, etc) as well as areas of weakness (e.g., biochemistry-health chemistry). These data should be used to identify areas for expansion, contraction, elimination, and/or new programs to be pursued. The analysis could also provide data for enhanced partnerships with other science units on campus, especially SOEST and basic health science programs in the medical school. *It is recommended that the Dean's office develop a five-year strategic hiring plan for the college based on these analyses and that "cluster" hires (involving multiple units from within and outside the CNS) be part of the plan. The plan also needs to include a strategy for providing competitive startup packages.* For this effort to be successful, *it is imperative that the Chancellor/Vice Chancellor clearly articulate and communicate the process by which vacated faculty positions can be reinvested to support the highest strategic priorities of the colleges and improve the timeliness of recruiting new faculty.* *It also is recommended that the college be allowed to pre-fill anticipated retirements in selected areas (to be determined via the "mind-map/opportunity" analysis) that anticipate an especially large number of retirements (e.g., mathematics).*

Extramural fund expenditures to support research programs in the CNS averaged approximately \$24.5M over the past four years and have remained essentially flat during that period of time. This equates to approximately \$153K/FTE track faculty in CNS. However, it should be noted that almost 50% of the CNS research expenditures can be attributed to one highly successful program in the Department of Botany (the Pacific Cooperative Studies Unit). If this program is excluded from the calculation, research expenditures averaged approximately \$12.25M over the four years (ca. \$76.5K/FTE track faculty). These levels of funding are quite low for a college of science. For example, at Arizona State University, average research expenditures for *all* faculty (including the humanities and social sciences) in the College of Liberal Arts and Sciences for FY06 was approximately \$117K/FTE track faculty and \$234K/FTE track faculty for comparable science units. *It is recommended that the Dean of CNS, in conjunction with the VCR and as part of the above described planning process for the college, establish clearly stated goals for increasing external investments from all sources in the research programs of the college.*

D. Facilities and Infrastructure

The single greatest challenge facing CNS is providing adequate physical facilities and research/educational infrastructure to support the students, faculty and staff of the college. Every single group interviewed cited inadequate facilities and infrastructure as an issue negatively impacting their ability to fulfill the mission of the college [see the self-studies for details regarding the extent of these problems]. It is also evident that the college does not have the financial resources to solve these problems on its own. It will take the collective efforts of the entire administration of the UH to acquire the resources necessary to address this university-wide problem. As a first step, *it is recommended that the Dean develop a comprehensive assessment of what will be required to provide adequate facilities (new and renovated) and infrastructure (research and teaching) to implement the overall strategic initiatives of the college over the next five-ten years.* *It also is recommended that the Vice Chancellors work with the Dean of CNS to develop a*

feasible implementation plan for addressing the most pressing needs of the college and communicate that plan as widely as possible in the college.

E. Undergraduate Education

In general, the students interviewed (a select group of high achieving students) were satisfied with their programs of study. They felt that the faculty is of high quality and they especially appreciated and valued experiential learning. The students identified a number of areas in which they would like to see improvements.

a. Curriculum

Students find the current college and university requirements to be quite complex and difficult to navigate. Many of the degree programs in the college are so highly structured and complicated – and require a large number of credit hours (as high as 90 hours in some programs!) – that students find it nearly impossible to complete their degrees in a timely fashion let alone within the 124 hours set by the university. As one student indicated, if high achieving students are having difficulties navigating the system, what must it be like for the “average” student? Students identified a number of issues that they feel contribute to not progressing in a timely manner; for example:

- Failure to declare a major early;
- Inconsistency in offering required courses (especially O, E, and W courses);
- Conflicts in scheduling of required courses – core and departmental requirements;
- Inability to substitute courses when required courses are unavailable for extended periods of time;
- Difficulty in registering for “gateway” courses;
- The large number of prerequisites for upper division required courses;
- Difficulties in establishing course equivalencies for transfer students.

It is recommended that the Dean charge the college Curriculum Committee with (1) reducing the structural complexity of existing degree programs, (2) determining how to increase the number of “real” electives that students can take, and (3) recommending policies and procedures to reduce the amount of time required to complete a degree in the college.

b. Learning Outcomes/Assessment

Progress on moving from a “subject-matter expert” approach for curricular design and assessment to a “performance-based” learning outcomes approach is quite variable within the college. Some units, because of the nature of the field (e.g., LIS), are quite advanced in this regard. Others are just getting started. It was clear that some faculty do not see

value in this effort and the undergraduate students knew nothing about the ongoing activities in this regard or how they might effect the quality of their degree programs. *It is recommended that the Dean charge the Curriculum Committee with organizing a retreat for department chairs, select faculty, staff, and students to inform them on the development of appropriate leaning outcomes and assessment and establish a foundation for implementation of learning outcomes and assessment throughout the college.*

c. Advising

Advising is an extremely important activity within CNS, especially given the complexity of unit and university requirements. Overall, students are mostly satisfied with the advising they have received from faculty within their major (i.e., relating to major requirement and career advising), but were less satisfied with the general education advising they received from Arts and Sciences. Students understand the importance of freshman advising and the need to declare a major as soon as possible. The distribution of advising responsibilities among faculty varies greatly by unit and the use of “professional” advisors also varies. Students and faculty alike believe that advising works best when professional advisors handle general education advising and navigating the complexities of the curriculum. *It is recommended that the Dean appoint an advising task force and charge the group with assessing the current status of advising within the college and provide recommendations for insuring consistency and high quality advising for all programs in the college.*

d. Transfer students

Given the large numbers of transfer students in the college, it was somewhat surprising that little time was devoted to discussing the unique issues involving the success of transfer students. *It is recommended that in the future a separate student survey be administered to transfer students and that the survey questions be designed to address issues unique to transfer students. It also is recommended that the Dean ask the college Curriculum Committee to review the process for evaluating transfer student transcripts and recommend improvements to the process.*

e. Student Life

A sense of community is important to undergraduate students and the students expressed a desire to be more involved with the governance of the college. *It is recommended that the Dean create an **Undergraduate Student Advisory Committee**, to be composed of undergraduate student representatives from the various undergraduate programs in the college, and meet with the group on a regular basis throughout the academic year.*

F. Graduate Education

In general, the graduate students interviewed were pleased with their graduate studies in CNS. The most pressing issue facing graduate students is the low stipends provided by

the departments and this also is a serious concern of the faculty. Low stipends impede the recruitment of the highest quality graduates and the ability of students to complete their graduate programs in a timely manner. Graduate students also are concerned about the wide variation of support provided by various units within and outside the CNS. *It is recommended that the Dean, in conjunction with the VCR, appoint a task force of faculty and graduate students to assess the current situation regarding graduate student support and charge the task force with making explicit recommendations on how to increase investments from all sources to support graduate student education.*

Timely completion of their degree programs is another area of concern for graduate students. Limited course availability, the lack of cross-listing of courses, and the turnover of faculty are major factors contributing to this issue. *It is recommended that the Dean charge the CNS Curriculum Committee with studying the issue of timely completion of degrees and develop recommendations to alleviate this problem (e.g., reducing number of required courses; increasing cross-listing of courses to fulfill requirements; allowing course substitutions when courses cannot be delivered in a timely manner).*

Graduate students want more opportunities to participate in transdisciplinary and interdisciplinary activities. They value **integration** and interaction among colleagues throughout the college. They understand that many of the questions that they are asking in their research programs need to be addressed from a transdisciplinary perspective. They want to break down the intellectual “silos” that exist in the college. *It is recommended that the Dean include graduate students in the discussions regarding reorganization of the life sciences and other programs in the college.*

Graduate students feel that they are not adequately prepared for their teaching assignments and they want additional training beyond that provided by the university. They also are concerned about the heterogeneity of the teaching assignments, which range from grading papers and quizzes to responsibility for a free-standing course. *It is recommended that the Dean appoint a task force of faculty, graduate students and appropriate instructional staff to assess the need for additional training of TAs and develop appropriate training materials/programs to address the needs.*

Graduate students also want to be more actively involved in the operations of and long-range planning for the CNS. *It is recommended that the Dean create a **Graduate Student Advisory Committee**, to be composed of graduate student representatives from the various graduate programs in the college, and meet with the group on a regular basis throughout the academic year.*

Finally, the lack of modern physical facilities and research infrastructure is a major concern of graduate students and no doubt contributes to lack of timely completion of their degree programs.

G. Climate

Results of the student surveys in CNS revealed that there may be issues regarding how welcoming and supportive an environment exists in the college. A surprising number of students indicated that they believe there may be cases of “harassment or coercion” in their department. It is not clear if this is a significant problem or the result of a poorly designed survey instrument and limited number of responses. *It is recommended that the Dean’s office work with the VCAA to administer a professionally designed survey to undergraduate and graduate students to clarify this issue.*

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H. Conclusions

The CNS faces a number of challenges and opportunities over the next few years. Solutions to these issues will require an entrepreneurial spirit and enhanced creativity among the faculty, staff, students, and leadership of the college. The college needs to embrace the notion that it is an enterprise that can exercise control over its future and not simply an agency of the State government. The college leadership needs to engage all members of the college community to expand the resource base of the college and develop a comprehensive plan for the future.