

2014 CNS Curriculum Strategic Planning: DRAFT Recommendations

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Overview

The College of Natural Sciences (CNS) is a “Destination of Choice” for more than 6400 undergraduates who are majoring in one of the 21 undergraduate majors. In addition, CNS provides the core curriculum in mathematics, chemistry, physics, and biology for undergraduates in the College of Engineering and the School of Public Health as well as students of any major preparing for post-graduate degrees in the health sciences. CNS also services all undergraduates by offering general education courses in mathematics and life and physical sciences.

CNS has experienced tremendous growth at the undergraduate level reflecting the growth of STEM disciplines nationally. There is particular urgency in ensuring the continued success of students majoring in STEM disciplines given the global increase in demand for STEM graduates. In response, it is our goal to increase the retention and completion rates and overall success of STEM majors, with particular emphasis on the advancement of women and underrepresented minority (URM) students.

Effective practices and conditions that improve STEM student success, particularly for underrepresented populations, have been identified and validated. To persist and achieve success in a STEM major, students should develop a relationship with a faculty member, be a member of a peer group, receive holistic and comprehensive advising, and engage in an authentic research experience. Research suggests that instructional practices that promote active engagement in the classroom, such as peer learning, inquiry-based learning, and team-based learning, are associated with a range of positive student outcomes that include motivation, course satisfaction, test performance, content retention, and mastery of problem solving skills. Furthermore, the incorporation of inquiry-based laboratories into introductory STEM courses has been demonstrated to increase student learning, persistence in a major, and graduation rates among student majoring in STEM disciplines.

The CNS Departments recently completed their ‘look in the mirror’ component of the strategic planning process. In assessing both their strengths and their challenges, Departments identified areas and issues that, if addressed, will improve STEM student success and student satisfaction. The CNS Curriculum Committee reviewed these recommendations and those deemed to be of high priority and impact are presented here. The recommendations address issues identified by the Chancellor and the Joint Task Force on Strategic Oversight in the areas of Curricular Coherence, Engaged Learning, A Rich Choice of Opportunities, the Research Advantage, and Career Development and Preparation.

The College is committed to increasing STEM student satisfaction and success and achieving the goals described below. Several of the high impact recommendations can be achieved only

with the investment of significant resources to increase student access to courses, reduce class size, improve advising, and provide STEM students with training and opportunities for authentic research in and out of the classroom. We believe that investment in and implementation of these recommendations will result in realization of the University goals of improving STEM student success and satisfaction.

CNS Recommendations for Improving Student Success

1. Curricular Cohesion and Continuity

A. Goal: Explore ways to deliver unified and coherent curricula that align with the course objectives and departmental learning goals with the following possible outcomes.

- Establish college-wide learning goals including: interdisciplinary thinking, communication skills, critical and creative thinking, information literacy, teamwork and problem solving, ability to test hypotheses, analyze scientific literature, and perform scientific research; ethical judgment and integrity.
- Reinforce and expand CNS learning goals with discipline-specific learning goals for each major.
- Develop measurable learning outcomes for all courses and assessment plans to measure whether the objectives are being met.
- Establish departmental review of syllabi or a guide for effective syllabus design.
- Identify and share successful strategies for teaching and meeting the need for Junior Year Writing and Integrative Experience (IE) courses.

B. Goal: Explore ways that will allow CNS to provide a more coherent framework for undergraduate training with the following possible outcomes.

- Explore the pros and cons of forming a School of Earth, Sustainability, and the Environment (ESE) within CNS.
 - Unify and coordinate undergraduate education programs across the ESE departments.
 - Maximize attractiveness, retention, and graduation timeline among our majors.
 - Develop a set of core ESE curricular goals and outcomes
- Explore the pros and cons of forming a School of Life Sciences within CNS.
 - Form an independent entity (e.g. the Core Life Sciences Program) to teach and advise life science and pre-professional students in the introductory life science core curriculum.
 - Integrate instructors from departments with major requirements that include the introductory life science core curriculum.
 - Design and teach a unified introductory life science core curriculum in collaboration with contributing departments that includes core concepts, learning objectives, examples that demonstrate the relatedness of science disciplines, and assessment methods.
- Examine existing majors to determine if any need to be added or changed.

2. Engaged Learning

A. Goal: Expand the use of evidence-based teaching methods (teaching methods for which there is scientific evidence of effectiveness) that promote student learning, engagement, and success with the following possible outcomes.

- Provide opportunities for instructors to share their teaching approaches and successes.
- Support instructors in their efforts to adopt teaching strategies that are demonstrated to increase student learning and engagement.
- Offer a yearly workshop for effective teaching for new CNS faculty.

2. Engaged Learning (continued)

- Collaborate with the Center for Teaching to educate and support instructors in the use of evidence-based teaching practices.
- Partner junior faculty members with effective instructors in team teaching a course.
- Formalize robust mentoring relationships for junior faculty around research and teaching.
- Create a CNS-based supportive network for the mentoring and career development of Lecturers.
- Improve access to undergraduate computer-based classrooms.
- Emphasize interdisciplinary learning goals to help students understand relationships between courses and disciplines and help to ensure that their educational experience is integrated.
- Provide more effective and consistent training for Teaching Assistants.
- Work with CFTD and CNS Personnel Committee to develop multimodal methods (i.e. compared to SRTIs) for evaluating teaching effectiveness.

3. Research Experience and Opportunities

A. Goal: Expand the on-campus opportunities for students to develop and practice research-centered skills, professional practice, and habits of mind individually and in teams with the following possible outcomes.

- Improve and increase access to modern undergraduate teaching lab space including teaching facilities on and off campus that are available to all programs.
- Redesign curricula to provide authentic research experiences early in students' training through lab courses or as lab components of courses.
- Develop a lab-fee style mechanism to support the cost of laboratory courses and ensure that they are sustainable.
- Offer introductory research methods training for students that will position them for advanced research and internships.
- Increase the number of students engaged in independent research.
- Provide some fiscal support for labs to cover the cost of students engaged in independent research.

B. Goal: Expand the off-campus opportunities for students to develop and practice research-centered skills, professional practice, and habits of mind with the following possible outcomes.

- Provide guidance for the skills and abilities required to be competitive for an internship.

- Develop guidelines for assessing student performance in an internship if taken for credit.
- Produce a web-based ‘How To’ guide for applying to and securing an internship.
- Develop a clearing house where students can identify and be matched with internship opportunities.
- Establish a CNS alumni network to identify and establish internship opportunities specific for UMass students.

4. Effective Use of Resources

A. Goal: Explore ways to standardize the allocation of instructional resources to maximize the delivery of the best curricular experience for all CNS students by increasing student access to classes, reducing class size, and providing more and richer learning opportunities with the following possible outcomes.

- Review TA workloads and expectations across the College.
- Review the allocation of TAs to courses.
- Review the teaching loads of instructors within and across disciplines.
- Identify courses with common learning objectives and work to increase efficiencies.
- Consider the fiscal cost and benefits gained from the unfunded General Education, Integrated Experience and Junior Year Writing requirements.

5. Student Community and Cohesion

A. Goal: Expand the community of scholarship for CNS majors with their peers and CNS faculty with the following possible outcomes.

- Bring students together to learn and share effective learning strategies.
- Expand the BIOS-type experience for STEM majors.
- Increase the number of Residential Academic Programs (RAP) for first year CNS majors.
- Strengthen the ties between faculty and student-run discipline-based clubs and groups.
- Increase number of college and department events with an undergraduate focus.
- Evaluate and improve as necessary the physical space that CNS majors identify as their departmental home.

6. Diversity and Recognizing the Needs of Special Student Populations

A. Goal: Explore ways to work with the CNS Director of Student Success and Diversity to meet the needs and increase the participation and success of select groups of STEM students with the following possible outcomes.

- Increase the participation and persistence of women and URM in STEM majors.
- Increase the participation of URM students in BIOS-type experiences.
- Identify factors impacting the success of students transferring to the University as STEM majors and improve transfer student success rates.

- Devise a sustainable approach for meeting the needs (small enrollment courses, capstone experiences) of increasing numbers of CHC students without compromising the education and experience of non-CHC students.
- Collaborate with campus partners to support international students and ensure their opportunities for success.

7. Advising

A. Goal: Explore ways to improve departmental advising in order to increase student success and progression through the major and provide early identification of students in trouble with the following possible outcomes.

- Assess advising in the college to identify strengths and areas needed for improvement.
- Provide training for faculty and advisors so that they are aware of, have access to, and utilize student success data that will aid them in servicing students, especially underrepresented minorities, first generation, and international students.
- Provide training regarding SPIRE, UMETRX, the Student Success Collaborative, and OIR.
- Provide information to advisors regarding resources on campus including Campus Career Service, CMASS, CCPH, Dean of Students, and Disability Services.
- Provide mechanisms for the routine assessment and tracking of students at the department level.
- Improve department websites to provide a comprehensive consistent message to undergraduates and to make them more informative by including FAQ sheets, model pathways for advancement, etc.
- Develop and use Continuation policies and the Student Success Collaborative for early identification of students unlikely to succeed in the major.
- Mandate the use and accuracy of Academic Requirements Reports (ARR) by all Departments.
- Mandate the use of SPIRE NOTES across all Departments.
- Adopt measures to assess the quality of advising throughout the undergraduate experience.

8. Career Preparation

A. Goal: Explore ways to prepare students more effectively for careers after graduation with the following possible outcomes.

- Create a dedicated career counselor to better service students.
- Solicit and utilize insights from alumni, employers, and stakeholders.
- Strengthen connections with alumni and increase student access to networking.
- Improve and expand departmental web-based resources including “How To” pages.
- Offer career seminars either at the department or college level.
- Provide stronger, more in-depth internship opportunities and better track student experience.
- Create departmental guidelines regarding supervision and evaluation of students involved in internships and off campus experiences
- Create more enterprise classes that simulate real-world professional experiences and professional practice.

9. Logistics and Administration

A. Goal: Explore ways to improve communication, clarity, and responsiveness of the administrative groups with Departments and students with the following possible outcomes.

- Address anomalies in the general education system that negatively impact student progression and satisfaction.
- Discontinue the misleading PreMed and PreDental major designations on the Common Application and at the University.
- Advocate for a greater degree of collaboration between CNS and the Scheduling and Registrar's offices with the goal of achieving a seamless registration experience for students and departments.
- Advocate for a greater degree of collaboration between CNS departments and Enrollment Management and CHC to set guidelines and targets for enrollment of students most likely to succeed in STEM majors, especially the involuntary undeclared students and to ensure timely graduation, specifically with regard to availability of resource-intensive courses (e.g. laboratory courses, research laboratories for CHC thesis work).