UNDERGRADUATE RESEARCH AT UMASS BOSTON: ENHANCING STUDENT SUCCESS AND DEEPENING THE RESEARCH ENTERPRISE

REPORT OF THE COMMITTEE ON UNDERGRADUATE RESEARCH
MAY 29, 2013

“The year is 2025. At the University of Massachusetts Boston, a great public urban research university...we have taken bold steps to grow in stature as a sophisticated research university and to play a distinguished part on the global stage. We have become the university our founders destined us to be in their original statement of purpose: well equipped to provide opportunities truly ‘equal to the best’...Faculty pursue deeply engaged research, teaching, and service...As undergraduate and graduate students engage in research, they acquire the refined and complex knowledge, values, and skills of inquiry that the globalized world requires. We are meeting our founders’ challenge to preserve and extend the domain of knowledge through research with local and global reach. We are creating new knowledge in all major areas of human concern.”

—Fulfilling the Promise: A Blueprint for UMass Boston

EXECUTIVE SUMMARY

Undergraduate research should be a signature program for UMass Boston, one that enhances undergraduate education, deepens the research enterprise on campus, and makes the university more attractive to potential students. We believe, moreover, that all undergraduate students at UMass Boston should participate in some level of research activity and that, by the time they receive their bachelor’s degrees, UMass Boston students should have a fundamental understanding of research and its importance to society.

1 In the Report of the University of Massachusetts Boston Strategic Planning Implementation Design Team, September 26, 2011: page 5.
As UMass Boston continues on its path as a globally recognized urban research university, it must ensure that research opportunities abound for its students at all levels. The Committee for Undergraduate Research Experience (CURE) was convened in 2012 to explore ways to expand and improve our undergraduate research program and to provide recommendations to Provost Langley.

After studying how other institutions are approaching undergraduate research, CURE recommends the following:

1. **Establish an office of undergraduate research** that has a broad mandate to coordinate the various undergraduate research programs, focus on integrating research into the undergraduate experience, no matter the discipline, and serve as the central resource for undergraduate research at UMass Boston for both students and faculty.

2. **Establish a Research Scholars Academy for Undergraduates** for all students who wish to pursue a research-intensive experience, with significant faculty mentoring and opportunity for professional dissemination of scholarly work.

3. **Convene a committee to explore embedding** a richer research experience into the undergraduate curriculum across all disciplines at UMass Boston.

**INTRODUCTION AND CONTEXT**

Institutions of higher learning, which are at the forefront of inquiry-based information gathering, find that questions in class or in the laboratory setting from students at all levels often stimulate new ideas and methods. Students attending these institutions provide the energy and kindling for research through their own approaches to inquiry and their questions posed to academicians. One never knows who will produce the next breakthrough idea in research—the key to solving a seemingly intractable problem. All students are part of this investigative process and help to shape the academic flavor of an institution. All students at UMass Boston—undergraduate as well as graduate—should have the opportunity to participate in some form of research and inquiry, thereby adding their unique perspective to the collective research whole.

Undergraduate research, according to the Council on Undergraduate Research, is an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to a discipline or disciplines. As such, undergraduate research may be accomplished through several means, including independent research efforts with a faculty member, investigations as a member of a research group, observations via a community-engaged scholarship, or inquiries conducted for a senior-level capstone course related to a particular discipline. Research opportunities are available in many forms, ranging from in-class experiences to individual or small group independent study projects, to full- or multi-year
investigations. Research may be done in the field or the laboratory, in the library or archives, virtually (via access to archived or real-time data collection facilities) or live.

Research at an introductory level that integrates inquiry and discovery tends to create interactive and engaging experiences for students, which generally increase students’ motivation to learn, confidence in their ability to learn, and ultimately retention of knowledge and development of skills. Students learn concepts more deeply than in lecture-based classes because they have more direct experience. They gain a better understanding of the processes of scientific inquiry because they do primary research.

Institutions of higher learning have taken a multitude of pathways to ensure their undergraduates are offered a research experience. Some rely on federal programs, particularly summer internships, while others are embedding the experience in research-intensive courses throughout the required curriculum.

It is sometimes easier to envision undergraduate research opportunities in science laboratories, where undergraduates may work for a professor and/or with a graduate student on a research project. Sometimes these are informal arrangements, but many times the student receives a stipend or academic credit for his or her work. The student may work individually for the professor or may work in a laboratory group on a multifaceted problem. In the liberal arts area, there are similar projects in which talented students can investigate and write meaningful theses on topics central to their discipline. However, these projects are rarely supported by funding. In both cases, students are usually selected because they are doing very well in a course the faculty member is teaching. The teacher encourages the student to delve into deeper thought and meaning by doing original research.

The University of Massachusetts Boston, like many of its fellow institutions, has long offered research opportunities to its high-achieving undergraduates. To become the great public urban research university it aspires to be, however, it must broaden the pool of undergraduates who receive a research experience. UMass Boston’s role is growing both globally and transnationally,

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as is its dynamic potential for significant contributions to the creation and dissemination of new knowledge. Promoting undergraduate research aligns well with the current strategic goals for the university to advance student success and development and to enrich and expand academic programs and research. The university must create the capacity to offer incoming freshmen and transfer students educational experiences that intentionally expose them to a culture of research and inquiry that will inform their own scholarship and practice.

THE COMMITTEE ON UNDERGRADUATE RESEARCH AND ITS WORK

In 2012, Provost Winston Langley and Vice Provost Zong-Guo Xia convened the Council for Undergraduate Research Experience, comprised of faculty and administrators who represent academic and student affairs units that interact with large populations of undergraduate students:

- Joan Becker, Vice Provost for Academic Support Services and Undergraduate Studies
- Lisa Buenaventura, Assistant Vice Chancellor for Co-Curricular Learning and Assessment
- Michelle Foster, Associate Professor of Chemistry, CSM
- Bill Hagar, Associate Professor of Biology and Associate Dean, CSM (Chair of the Committee)
- Laura Hayman, Professor of Nursing and Associate Dean for Research for CNHS/Associate Vice Provost for Research
- Werner Kunz, Assistant Professor of Management & Marketing, CM
- Cheryl Nixon, Associate Professor and Chair of English, CLA
- Rajini Srikanth, Professor of English, CLA, Director of the Honors Program, and Associate Provost
- Maria Idali Torres, Associate Professor of Anthropology, CLA, and Director of the Gastón Institute
- Zong-Guo Xia, Professor of Environmental, Earth & Ocean Sciences, CSM, and Vice Provost for Research and Dean of Graduate Studies

They charged this group with the mission to explore how UMass Boston could expand and improve our undergraduate research programs as a way to enhance the quality of our undergraduate education, to enrich the learning experience, to maximize the intellectual potential of our undergraduate students, to increase the retention of our best students, and to aid in our efforts in promoting UMass Boston as a distinguished public urban research university. Provost Langley challenged the committee to learn and adopt the best practices of other institutions and to develop innovative new models in undergraduate research.
The committee was further charged to develop a proposal that would advise UMass Boston how to both nurture a strong research culture and promote and support undergraduate research and education on campus. Provost Langley and Vice Provost Xia expressed interest in the development of something akin to a Scholar Academy as the University of Houston Downtown had done. CURe also reviewed the methods other institutions (including our eight peer, seven aspirational peer, and nine select exemplar institutions) used to abet and promote undergraduate student research. The committee met several times over the last year to discuss options and reflect on what the university has done in the past.

This report documents the committee’s work and recommendations from its appointment in 2012 to present. It describes what the university already has in place for undergraduate research at UMass Boston and describes intriguing offerings at peer, aspirational peer, and exemplar institutions. The report concludes with a series of recommendations to the provost and the university community. These recommendations propose how we might best build on current undergraduate research programs and opportunities to create a culture of inquiry and innovation at UMass Boston that will propel it into the top tier of research institutions.

**CURRENT UNDERGRADUATE RESEARCH ACTIVITY AT UMASS BOSTON**

The University of Massachusetts Boston currently has several types of programs for undergraduate research: the University Honors Program, department-based honors programs, capstone courses, federally funded science training and research opportunities, research in a faculty lab or on a research project, and university-funded scholarship support for individual research projects. These typically pair a faculty mentor with a high-achieving student or student(s) either in an ongoing, faculty research project or in a student-initiated research project.

The overview below is not an exhaustive list of all the activities on campus, but rather is a representative sample of such activities. It examines a campus-wide curricular structures that encourage undergraduate research, followed by an exploration of science and liberal arts programming. UMass Boston has a strong set of undergraduate research programs in place for the science, technology, engineering, and mathematics (STEM) fields, but does not have an equivalent set of opportunities for liberal arts research. The differing status of science and liberal arts research programming at the university will require different forms of program planning and implementation. Current science programs should be developed and expanded, while the lack of liberal arts programming provides an opportunity to initiate new research structures. Innovative planning in the liberal arts could allow UMass Boston to play a leadership role in newly developing state and national conversations about the shape and aims of undergraduate liberal arts research.
HONORS PROGRAM

The Honors Program seeks to meet the needs of students who thrive on intellectual challenge by offering special interdisciplinary academic opportunities outside the major. The current Honors Program is open to first-year, transfer, and current students from all of UMass Boston’s undergraduate colleges. Students are chosen according to their ability, motivation, and quality of preparation, using such credentials as high school and/or college records, test scores, and evidence of special accomplishments. Once accepted into the program, students must maintain a GPA of 3.2.

Honors students benefit from specially arranged, small, interdisciplinary classes led by committed professors who both teach the fields of their own research and pursue new, emerging research interests. These courses offer enriched curricular experiences that may probe more deeply into theory or venture further into application. Students in the Honors Program receive intensive, personalized advising and help in planning their university careers, and Honors coursework strengthens a transcript. Furthermore, the program connects its students to opportunities for scholarships, internships, research, and service activities. All Honors Program students are required to complete a senior thesis or equivalent project. Most seniors undertake thesis work through their major. Some departments have established two-semester structures for senior thesis work; those departments that do not have formal thesis structures follow the Honors Program’s guidelines for a senior thesis.

While the Honors Program has always included students in the College of Nursing and Health Sciences, those students previously felt that they could not complete the Honors Program’s requirement of a senior thesis because of the clinical placements that all nursing students must complete in their junior and senior years. In AY 2010-11, then Dean Greer and Associate Dean Laura Hayman pledged to make it possible for CNHS students to do a senior thesis research project if they were so inclined. Called the Honors Student in Research Program, this initiative links CNHS students with a faculty mentor who provides them with the research guidance necessary to create and complete their honor’s thesis.

The University Honors Program is accredited as a Commonwealth Honors Program by the Massachusetts Board of Higher Education. UMass Boston is in the process of expanding this program into the Honors College, as described in UMass Boston’s strategic plan.

DEPARTMENT-BASED HONORS THESIS WORK

UMass Boston departments encourage honors thesis work, which typically features a year-long research project overseen by a faculty member and completed in the student’s senior year. Departmental honors gives students an opportunity to engage in advanced forms of discipline-specific research. Honors projects often follow from and build on departmental curricula, allowing students to engage in more advanced, original, and in-depth research than could be completed through coursework. Faculty mentoring is central to departmental honors work.
Faculty help students to formulate unique research questions, train them in advanced research methods, guide them through an advanced research process, and oversee the dissemination of their research findings in thesis papers. The project takes the shape of an academic thesis, which thus requires mentoring in academic writing. Departmental honors work is distinct from the Honors Program's thesis work—it allows students who have not applied to the Honors Program to engage in advanced research. However, those students pursuing departmental honors who are also part of the Honors Program use the same senior thesis to fulfill both departmental and university honors.

**CAPSTONE COURSES**

Capstone courses provide research-level thinking into academic programs and are required for many majors. These courses offer advanced exploration of a subject drawing on a student’s previous training and accumulation of information and techniques from earlier courses. Many departments build into their capstone courses an extra paper or topic to review. This usually suffices for handing the vast number of undergraduate students who need a capstone course for graduation. Capstone courses were incorporated into the curriculum a few decades ago to ensure that all undergraduate students would use their previous coursework and training for a seminal experience. Many upper-level capstone courses, therefore, may provide a student with a research mindset but not the traditional independent research that results in honors projects or publications.

**ANNUAL RESEARCH GRANT COMPETITION FOR UNDERGRADUATE STUDENTS**

UMass Boston has had an active, funded undergraduate research program for a couple of decades; currently, it is supported by the provost under the auspices of the Honors Program. Every year, all UMass Boston students receive an email message inviting them to apply for scholarship support, usually for around $500, for their research endeavors. A faculty committee that includes faculty from all colleges reviews the applications and ranks the students for possible support. This is a competitive award (students are ordinarily expected to have a GPA of 3.0 or higher), and most students applicants have been funded during the last several cycles of review.

The range of student projects is wide, including infant vision and learning, neurophysiology of rats, chemical compounds that contribute to sustainable cleanup, testing of biological enzymes, ethnographic research, and a variety of other science, social science, and humanities questions and issues. Each year, about 45 students apply. Some of these students present their research at discipline-specific conferences (Eastern Nursing Research Society, American College of Sports Medicine, and Oncology Nurses Society, for example, for nursing students), but most present their research at the Massachusetts Statewide Undergraduate Research Conference, held at UMass Amherst in April. Abstracts from these yearly meetings are posted on a website.
FEDERALLY FUNDED SCIENCE TRAINING PROGRAMS AND RESEARCH OPPORTUNITIES

Many UMass Boston departments encourage their students to take advantage of federally funded programs, a number of which strive to increase the interest and number of under-represented groups in science- or math-related fields. Most of the current federally funded programs are comprehensive science training programs that have multi-year research experiences under the supervision of a faculty mentor. The exception is the National Science Foundation’s Research Experiences for Undergraduates (REU), which is a one-semester, summer program.

RESEARCH EXPERIENCES FOR UNDERGRADUATES

REU matches students with ongoing research programs or projects typically based in a single discipline or academic department. A student works closely with the faculty and other researchers for one summer and receives a stipend. At UMass Boston, REUs are offered in the biology and chemistry departments and the new School for the Environment.

RONALD E. MCNAIR POST-BACCALAUREATE ACHIEVEMENT PROGRAM

The Department of Education funds the McNair Program to encourage undergraduate students from underrepresented groups—African Americans, Hispanics, American Indians, and Alaskan Natives—to pursue graduate studies in science- and math-related fields (i.e., biology, chemistry, math, computer science, physics, psychology, anthropology, geography/earth science, or nursing) by providing research, advising, counseling, and networking opportunities. At UMass Boston, the program is administered by the College of Science and Mathematics. By participating in research and scholarly activities under the supervision of a faculty and/or graduate student mentors, undergraduate students are more likely to be inspired to pursue graduate studies, ultimately becoming researchers and teachers at the college level. Each McNair student pursues at least a year of independent research under the close supervision of a faculty mentor at the university or from external research organizations such as area hospital laboratories.

UMass Boston has had a McNair program since 1990, and to date 267 students have participated. These students have been very successful: 57 have completed masters degrees, 20 have completed doctoral degrees and are practicing in a science- or biomedical-related profession, and 17 have earned MDs. Twenty-six are currently pursuing advanced degrees. Two McNair students received the University of Massachusetts Boston’s highest academic award, The John F. Kennedy Award.

CONTINUING UMBRELLA FOR RESEARCH EXPERIENCES (CURE) AND U-54 GRANT

The UMass Boston-Dana Farber Harvard Cancer Center Partnership (DF/HCC) focuses on addressing health disparities in minority populations and on improving research, training, and
outreach opportunities for students, faculty, and scientists. Funded by the National Institutes of Health and the National Cancer Institute, the partnership has continued to significantly expand opportunities for researchers and talented students, especially those from underrepresented backgrounds, in four broad areas of cancer investigation—basic research, clinical research, nursing research, and population science.

Two primary vehicles engage UMass Boston students in cancer-related training opportunities—the DF/HCC Continuing Umbrella for Research Experiences (CURE), and individual research projects and pilots funded by the U-54 grant.

CURE provides high school and undergraduate college students interested in a career in science with a mentored research experience in basic science, clinical research, nursing research, or population science within the Cancer Center. Students apply for either a nine-week, full-time internship in the summer or for a two-year program; the latter includes internships for two summers and ongoing work and support during the academic year. Since 2003, 43 UMass Boston undergraduate students have participated in the program.

Principal investigators (PIs) with U-56/U-54-funded projects, pilots, and pre-pilots are encouraged to provide training opportunities for students. Undergraduate and graduate students work on short-term projects (a summer or a semester long) or are involved in a research project on an ongoing basis. PIs identify students through their classes and/or department with assistance from the Training Core. Ninety-four UMass Boston undergraduates have participated to date in either U-56 or U-54-funded projects since 2005.

**INITIATIVE FOR MAXIMIZING STUDENT DEVELOPMENT**

The Initiative for Maximizing Student Development (IMSD) at UMass Boston is a year-round, research-intensive, skill-building, mentoring program for undergraduates interested in the biomedical sciences (i.e., with majors in biology, chemistry, physics, math, computer science, environmental science, and psychology). Funded by the National Institutes of Health and administered by the UMass Boston Department of Biology, the program aims to increase the number of underrepresented minorities among PhD-level researchers in biomedical fields. A key component of the program at UMass Boston is the university’s partnership with the Dana Farber/Harvard Cancer Center, which addresses health disparities in minority populations and improves research, training, and outreach opportunities for minority students.

IMSD provides professional development opportunities, including year-round guided research experiences in laboratories at UMass Boston or Dana-Farber/Harvard Cancer Center, research skills training, biomedical career development workshops, facilitated study groups in science and math courses, journal club, intensive mentoring and advising, travel to scientific conferences, and the benefits of being part of a community of scientists. Sophomore students taking science courses are recruited to apply to become IMSD affiliates, and each IMSD affiliate is coached by an upper-class IMSD fellow and mentored by an individual faculty member who is a researcher in the student’s area of concentration (principal investigators are faculty in the
biology department). Affiliates who successfully complete at least the first level of IMSD gateway courses are encouraged to apply to become IMSD fellows.

The program has successfully developed a community of science learners (as of 2012, 18 students have participated) with a drive to excel academically.

**LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION PROGRAM**

The Louis Stokes Alliance for Minority Participation (LSAMP) Project, funded by the National Science Foundation, assists universities and colleges to diversify the STEM workforce by significantly increasing the numbers of students successfully completing high quality degree programs in STEM disciplines. Particular emphasis is placed on transforming STEM education through innovative recruitment and retention strategies and experiences in support of groups historically underrepresented in STEM disciplines—African-Americans, Alaskan Natives, American Indians, Hispanic Americans, Native Hawaiians, and Native Pacific Islanders.

Since 2006, UMass Boston has served as the lead institution in the Urban Massachusetts LSAMP program that includes UMass Dartmouth, UMass Lowell, and the Bristol, Bunker Hill, Middlesex, and Roxbury community colleges. Each year about 20 select undergraduates, 10 each from Bunker Hill Community College and Roxbury Community College, attend a one-week collaborative advanced bioscience research skills workshop at UMass Boston. Along with their lab work, students learn about career opportunities in the bioscience, biotechnology, and biomedical science sectors.

The program recently began sponsoring undergraduate biotechnology, pre-engineering, and physical science workshops that bring together community college and university students.

**BRIDGES TO THE BACCALAUREATE PROGRAM**

Funded by the National Institutes of Health, the Bridges to the Baccalaureate Program supports an enrichment and training collaborative to increase the number of minority students, who are underrepresented in the biomedical science research enterprise, to successfully transfer from community colleges and graduate from UMass Boston and other baccalaureate institutions with biomedical-related degree programs. To participate, undergraduates typically have completed one year of chemistry and biology at the community college with a science GPA of 3.00.

UMass Boston has partnered with Bunker Hill Community College and Roxbury Community College, and since its inception in 2006, the Bridges program has brought approximately 70 students to the UMass Boston campus in a summer program anchored by their placement into research laboratories. There, they conduct research under the direction of UMass Boston and Dana Farber STEM research faculty mentors. Bridges participants are typically paired with junior- and senior-year undergraduate students, minority graduate students, or supportive staff research associates.
The Bridges program directly enriches the academic experience and success of many more students, and not just underrepresented minorities, during the academic year at the community college campuses. At least 50 community college students per year have participated in facilitated study groups, mathematics workshops, seminar speakers, career advising services, and tutoring programs on their home campuses. The program’s success is measured by the numbers of Bridges fellows who eventually transfer to four-year research institutions (over 80% of participants) and ultimately graduate with a baccalaureate degree.

**HEALTH EQUITY SCHOLARS PROGRAM**

The Health Equity Scholars Program (HESP), initiated in spring 2013, is a project of the UMass Center for Health Equity Intervention Research (CHEIR) and is supported by a collaborative partnership between UMass Medical School and UMass Boston. CHEIR is funded by the NIH/ National Center for Minority Health and Health Disparities. The major purpose of HESP is to train, support, and mentor students interested in health disparities. To be eligible for HESP, students must have successfully completed at least 24 credits, have a GPA of 2.5, and be from an underrepresented minority community (Black/African American, Native American, Latino, Vietnamese, Cambodian, or Filipino). Health Equity Scholars complete a three-credit elective course that includes content, research methods, and approaches relevant to health disparities as well as information on health careers. Scholars complete a research project in their area of interest and in collaboration with faculty mentor(s).

**RESEARCH IN A FACULTY LAB OR ON A RESEARCH PROJECT**

Sometimes through a federally funded program and sometimes through internal programs, undergraduates conduct research on some aspect of a research professor’s project in a traditional model of top-down supervision from the research professor to the graduate student(s) to the undergraduate(s). The collaborative efforts usually result in a publication with the professor and students listed as co-authors. Each week, research findings and plans for the next week are discussed in a research meeting or seminar. This arrangement serves the students well as there is proper training at each level of training. Some of the students receive academic credit and/or a paid internship, and a few participate for the experience only. At times, and occurring more frequently in the sciences, this is an informal program: faculty make a connection with students in class and invite them to participate in the faculty member’s laboratory or research project. Sometimes it is a student’s initiative that results in a research opportunity. All students are encouraged to ask professors if they may work in their laboratory, but time and space constraints limit participation by all students.

**LIBERAL ARTS PROGRAMS AND RESEARCH OPPORTUNITIES**

In contrast to the sciences, the liberal arts do not have a well-developed series of funded undergraduate research programs on campus. This reflects the limited funding for research in the liberal arts on the national level. It also reflects the lack of a well-developed national
discussion on undergraduate liberal arts research, which results in few models for successful undergraduate research programming. In addition, UMass Boston’s College of Liberal Arts (CLA) includes the humanities, social and behavioral sciences, and visual and performing arts. Each of these areas of study define research differently, requiring a multifaceted understanding of student scholarship, scholarly and creative outcomes, and outcomes assessment. For example, liberal arts student work can range from anthropological fieldwork to sociological surveys to musical performances to creative writing. While these challenges are daunting, they should be framed as opportunities for UMass Boston.

UMass Boston should create new models of mentored undergraduate research in the humanities, arts, and social sciences. Because the national discussion on the importance of undergraduate liberal arts research is still developing, the university could become a leader in this area by creating an innovative liberal arts research program. If UMass Boston were to articulate the goals and philosophies of liberal arts research (explaining how to encourage creativity within research, for example) and create new curricular structures that enabled that research (developing new forms of digital humanities research, for example), it could share those successes with other institutions and play a leadership role in undergraduate research debates. Because the university is located in one of the true cultural capitals of the country, it could articulate how liberal arts research connects to the cultural economy. In addition, UMass Boston’s public mission and diverse student body would allow it to articulate the importance of the liberal arts research to a diverse citizenry.

Because CLA enrolls the largest number of undergraduate students at the university, any attempt to expand undergraduate research must emphasize that college. This report emphasizes the fundamental goal of making a research experience available to ALL undergraduate students. To fulfill that goal, program development will need to focus on CLA, beginning with a survey to determine what forms of undergraduate scholarship and creativity are encouraged, what programs are currently in place and how they are funded, and what opportunities exist for external funding. Most importantly, UMass Boston needs to examine the form that CLA-based undergraduate research takes and promote discussions that foster innovative thinking about new models for liberal arts research.

As this group discussed the need for new approaches to liberal arts research, it generated the idea of research “hubs”—and we briefly describe this idea here to give a concrete example of the type of innovative thinking that UMass Boston could develop and disseminate. We envision a research hub as a community of undergraduate researchers linked to graduate students and faculty in the field; this hub would connect researchers around a key question, issue, or problem, thereby encouraging synergistic interactions as part of the research process. This model might best sustain undergraduate research within and across CLA majors. A research hub emphasizes three aspects of research in the liberal arts:

- A CLA research curriculum can be less linear than that of the sciences; it can take the shape of a hub or web in which issues can be explored in an associative fashion. CLA
research often takes the form of open-ended inquiry, and the model of a hub could embrace that form of thinking.

- The CLA research hub could bring together faculty and students from a variety of disciplines around one key hub issue, allowing that issue to be developed in multiple ways. The model of a hub would emphasize interdisciplinary approaches to a common topic.

- CLA research can appear to students to be an isolated activity, as it often requires solitary library research and writing. Research hubs would emphasize the interconnectedness of ideas, showing how liberal arts research includes a process of connecting to other scholars though the expansion of ideas.

The research hub model would require much more development and support from an office, but it offers an example of how UMass Boston could create new models of undergraduate liberal arts research. Liberal arts research offers a true opportunity for the university to not just create new programming, but to assume a leadership position in defining undergraduate research in national forums. UMass Boston should seize this opportunity.

PROVOST RESEARCH SCHOLARS

Currently a pilot program that started in fall 2012, the Provost Research Scholars receive support from the Vice Provost for Research and Dean of Graduate Studies at UMass Boston. Through a competitive process, the Provost Research Scholars program select faculty engaged in ongoing research projects to serve as mentors to undergraduate researchers. Students apply to specific projects and/or mentors, explaining their training for and interest in the required research. Selected students then engage in a semester of funded research under the guidance of the faculty mentor. At the end of the semester, students report on their research at a Provost Research Scholars forum, sharing their successes with fellow students, faculty, and the provost. Funding in the pilot supported undergraduate research opportunities in the liberal arts, but its success has led to plans to expand it in 2013–2014 to include both liberal arts, STEM, and medical/health fields.

KINGSTON-MANN UNDERGRADUATE STUDENT RESEARCH AWARDS FOR EXCELLENCE IN DIVERSITY/INCLUSION SCHOLARSHIP

Recognizing that students can be producers as well as receivers of research and knowledge, the Kingston-Mann Student Achievement Awards reward and celebrate undergraduate research that focuses on issues of diversity and inclusion. The awards acknowledge the work of students who make a valuable contribution to diversity and inclusion scholarship by expanding our understanding of ideas and experiences that have not always been acknowledged or recognized by traditional disciplines. Interdisciplinary approaches and analysis that consider the intersection of race, ethnicity, gender, social class, age, disability, and sexual orientation are particularly
encouraged. Now in its eighth year, this competitive awards program is intended to encourage students to discover their potential as researchers. Campuses eligible for the student awards program are Emmanuel College, Lesley University, Massasoit Community College, Rhode Island College, University of Massachusetts Boston, University of Massachusetts Dartmouth, University of Massachusetts Lowell, and University of New Hampshire.

**UNDERGRADUATE RESEARCH AT PEER, ASPIRATIONAL PEER, AND EXEMPLAR UNIVERSITIES**

**HOW UMASS BOSTON COMPARES TO OTHER UNIVERSITIES**

UMass Boston is part of a small group of institutions that have a major focus on medical and/or biomedical fields. Only Cleveland State University, the University of Maryland Baltimore County, and the University of Nevada Reno share such a focus.

Similar to UMass Boston, most universities offer research methods coursework within each discipline and use senior thesis projects or methods similar to the UMass Boston capstone to engage students in individual research. The majority of these institutions also offer faculty/graduate student mentoring, summer research programs, and an annual research symposium or forum at which students present their work via a poster session. Most, if not all, offer federally funded programs targeting specific groups, typically underrepresented minorities, and disciplines; for example, McNair Scholars, LSAMP, REUs, Bridges to Baccalaureate.

A few have programs sponsored by foundations, such as the Beckman Scholars and Amgen Scholars. Most of the aspirational peers and exemplar universities have undergraduate research opportunity programs (UROPS), mostly through individual departments, although some are offered only via the honor’s college (many programs offer a competitive award, meaning that only the higher achieving students win them). Almost half of the institutions publish a journal dedicated to undergraduate research. Only a handful have a searchable research database online that connected students with possible research projects.

**INTERESTING AND NOTEWORTHY MODELS**

A few institutions have unique or innovative programs that stand out.

At the University of Toledo, students may now participate in academic courses that are identified as Research Intensive (RI). Alternatively, students may enter into a RI Learning Contract (similar to the Honors Learning Contract) in which they make an agreement with the instructor to turn a regular academic course into a research-intensive course. The course will appear on the student’s transcript as Research Intensive.
At the **University of Memphis**, the Helen Hardin Honors Program administers the **Undergraduate Research Scholar Program**, which adds the designation "Undergraduate Research Scholar" to a student’s transcript. To earn the designation, students must present their research or creative projects at a University of Memphis campus research symposium that is open to the public, present their research or creative projects at the National Conferences for Undergraduate Research or a professional conference in the field of study, and have the endorsement of the faculty mentor(s). All undergraduates are eligible to earn the Undergraduate Research Scholar designation.

The **University of North Carolina Research Scholar Program** is somewhat similar to that at the University of Memphis in that students earn a special designation on their transcripts, but it appears to be more rigorous. In addition to presenting their research at two venues, students must complete one multidisciplinary course (that is either a research-intensive or research-exposure course) and at least two additional research-intensive courses. (Research-intensive courses are defined as undergraduate courses in which over half of the course is devoted to students conducting original research and presenting research conclusions.)

The **Scholars Academy** at the **University of Houston Downtown** began as an experimental, federally funded program that is now an institutionalized part of undergraduate education at the university. Program staff and faculty believe that its success is directly tied to an expanded use of one-to-one and group mentoring used in various settings by peer students, faculty, and staff. Even though most of the students in the Scholars Academy are average high school graduates or average-grade community college graduate transfers, retention rates are high, within the range of 85-95%, and over a third of academy alumni continue on to graduate studies at well-known schools. These statistics are impressive given that most of the students come from underrepresented groups and/or are the first in their families to attend and graduate from college. The university would like to establish “centers of excellence” with the same successful programmatic and pedagogical strategies, mentoring, tutoring, and undergraduate research opportunities across all the disciplines of the university.

The **University of Texas-Austin** believes that every undergraduate has the opportunity to become a researcher and take part in the intellectual work of the university. The **Freshman Research Initiative** at the university offers first-year students in the College of Natural Sciences the opportunity to initiate and engage in authentic research experiences. Each year more than 500 freshmen (25% of the freshman class) begin a three-semester research experience with a semester-long research methods course, which is followed by two semesters conducting original research under the direction of a faculty member. The program provides a platform for future success and the opportunity for students to learn investigative skills as well as leadership and mentoring skills.

The **Massachusetts Institute of Technology** has one of, if not the, oldest undergraduate research opportunity programs in the country. The flagship MIT student research program launched in 1969, and now more than 80% of the institute’s undergraduates participate in the
program. Typically they spend a semester experiencing what it’s like to work in a research laboratory. MIT is now expanding its UROP program, creating the Advanced Undergraduate Research Opportunities Program—or SuperUROP. In addition to working closely with a faculty member for at least a year, participants take a two-semester class, “Preparation for Undergraduate Research,” that covers topics ranging from industry best practices to presentation skills to ethics in engineering. The program also gives undergraduate researchers access to some of MIT’s sophisticated facilities—a privilege typically reserved for graduate students.

**RECOMMENDATIONS**

After several conversations about what other institutions have done to increase undergraduate students’ exposure to research, and how these might fit into UMass Boston’s overall plans to enrich and expand academic and research programs, CURe recommends three initial steps.

1. **ESTABLISH AN OFFICE OF UNDERGRADUATE RESEARCH**

   To provide the coordination and services necessary to provide a research experience to all undergraduates, the university should establish an undergraduate research office. This office should be much more than merely a matchmaker between undergraduates and potential research opportunities and funding, though those of course would be integral to its mission. It should also serve as the focus for an emphasis on integrating research into the undergraduate experience, no matter the discipline. It should serve as the central resource for undergraduate research at UMass Boston for both students and faculty.

**ORGANIZATION OF THE OFFICE**

The question of where to house the Office of Undergraduate Research has two possible answers at UMass Boston: the Office of Research and Sponsored Programs or Academic Support Services and Undergraduate Studies. Much depends on what the office’s goals are. At those universities that focus such an office on the administration of externally funded programs that match select undergraduates with faculty projects, the office is under the research arm. At universities attempting to imbue every undergraduate’s experience with research, which can have a major impact on both the required and elective curriculums, the office is housed in the academic realm responsible for undergraduate education.

Wherever it is housed, we recommend that the office have three main charges:

- Increase the exposure of all undergraduates to research
- Administer an academy, tentatively named the Research Scholars Academy, for students who, after an initial exposure to research, wish to enhance their research experience under faculty mentors and disseminate scholarly findings
Investigate, via a multidisciplinary committee identified by the Provost, how to embed research across the curriculum.

We also envision an advisory group that would help guide the new Office of Undergraduate Research and establish its scope.

We recommend that the office be staffed at a minimum with a director and a program coordinator, with additional staff depending on the scope of the office. We advise against too timid an approach to staffing the office—adequate staffing must be provided from the office’s inception.

**OBJECTIVES AND ACTIVITIES OF THE OFFICE**

The Office of Undergraduate Research will have the mandate to administer, coordinate, and/or act as a clearinghouse for the various programs on campus that offer research experiences to undergraduates. It will further be charged with expanding the exposure of every undergraduate in all the UMass Boston colleges and departments to the concepts and experience of research—the form that research takes will of course depend on the discipline.

While the actual scope of the office will need to be determined, we can break its tasks down into a few, specific areas with potential activities, as in the following table.

<table>
<thead>
<tr>
<th>Task</th>
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<tr>
<td>Administer the Research Scholars Academy.</td>
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<td>Investigate how UMass Boston can embed a richer research experience into the undergraduate curriculum across all disciplines.</td>
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<td>Coordinate undergraduate research programs and efforts throughout UMass Boston and between the campus and the community.</td>
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<td>Sample Activities</td>
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**Build awareness of both the opportunity for and outcomes of undergraduate research on the UMass Boston campus.**

<table>
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<tr>
<th>Sample Activities</th>
<th>Build connections with UMass Boston faculty and staff, given that faculty participation is the key to the success of the undergraduate research program. Help faculty members increase undergraduate involvement in their research.</th>
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<td>Encourage both traditional and new, alternative models of research projects, whether they be the top-down approach (with the research professor in charge of the laboratory research and an array of graduate and undergraduate students carrying out the research), the thesis approach (with an individual student working on an original analytical paper under the guidance of a faculty mentor), or the research “family” in a research hub or sandbox laboratory (with groups of undergraduate researchers working as a group on a research topic)</td>
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<td>Establish a Web presence.</td>
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<td>Launch annual symposium to highlight and celebrate undergraduate research.</td>
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<td>Launch an interdisciplinary journal for undergraduate research.</td>
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<td>Provide access to travel funds to scientific conferences/poster sessions.</td>
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**Support students and faculty with workshops and reference materials.**

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<tr>
<th>Sample Activities</th>
<th>Provide research skills training.</th>
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<td>Prepare guidelines for ethical behavior in research (e.g., Conduct your Research Responsibly).</td>
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<td>Develop and conduct workshops/courses on effective presentation skills, including PowerPoint and how to prepare good posters.</td>
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<td></td>
<td>Create an online Student Research Handbook — describes programs, requirements, compensation options, completion criteria, etc.</td>
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<td></td>
<td>Help faculty incorporate research and creative activities into their curriculum at increasingly sophisticated levels, should recommendation #3 lead to embedding research across the curriculum.</td>
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</table>

**Increase funding and incentives for faculty participation**

<table>
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<tr>
<th>Sample Activities</th>
<th>Develop faculty incentives to participate in undergraduate research: Any effort to expand the undergraduate research available at UMass Boston will require increased participation by faculty, whether as mentors or developers of research-intensive courses. We see mainly three areas of potential faculty incentives: monetary incentives, student research funding, and teaching support. We assume that an effective incentive structure would combine elements of these three types of incentives.</th>
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<tr>
<td></td>
<td>Advocate for increased funding of undergraduate research at UMass Boston and connect undergraduates to potential funding sources.</td>
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<td></td>
<td>Actively pursue federal, state, and foundation funding.</td>
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2. **ESTABLISH THE UMASS BOSTON RESEARCH SCHOLARS ACADEMY FOR UNDERGRADUATES**

CURe recommends that UMass Boston establish a Research Scholars Academy, an academically competitive program that promotes scholarship and student success. This academy would provide an avenue for undergraduates from any major who, once they have had a taste of research, want to pursue a more demanding research experience and career. It would have a
robust and extensive mentoring structure, and it would be open to undergraduates from all colleges and disciplines on campus from the freshman year forward. We expect that students participating in the academy will come to think of original research as being part of all scholarly activities, a view that would continue well past their graduation from the university.

**OPPORTUNITY FOR INNOVATIVE LIBERAL ARTS-BASED RESEARCH**

Within this new academy, UMass Boston has an opportunity to create new models of mentored undergraduate research in the humanities, arts, and social sciences (the traditional liberal arts areas). Most research programs across the nation have focused on the sciences, and UMass Boston is no exception. The university, however, could really stake a claim in liberal arts research and become a leader in this area—because the liberal arts are "behind" the sciences in developing undergraduate research programs, there is a lot of room for innovative thinking here. Our Boston location—we are in one of the true cultural and historical capitals of the country—combined with our diverse population would allow us to move into a leadership position in liberal arts research.

**ORGANIZATION OF THE RESEARCH SCHOLARS ACADEMY FOR UNDERGRADUATES**

The Academy would be housed within and administered by the new Office for Undergraduate Research. We recommend the academy be staffed at a minimum with a director, a program manager, and an administrative assistant.

The essential mentoring component could be structured in three-tiers:

- Peer-mentored teams, with each peer mentor assigned a group of about 10–12 students
- Experienced faculty mentors, who monitor each group of students and its peer mentor
- A senior peer mentor, who is an advanced student with ample experience within the academy, and a peer mentor coordinator, who is an experienced faculty member; these oversee the peer mentors and the faculty mentors, respectively

The mentors so essential to this academy could perhaps be drawn from the ranks of existing UMass tutors and mentors throughout the colleges.

We also recommend that an executive committee composed of college deans and department chairs (or their delegates) advise the director of the academy. The program manager and administrative assistant would take care of the business side.
OBJECTIVES AND ACTIVITIES OF THE ACADEMY

The academy’s overall objective would be to provide an enhanced research avenue for undergraduates who wish to pursue a research-intensive experience at UMass Boston, with the ultimate goal of retaining students through graduation and encouraging students to pursue advanced degrees.

Students in the academy may enter with average grades, but the intense mentoring and enhanced research program will encourage attainment of higher GPAs. Scholars will participate in special extracurricular activities and classes. They will enroll in small classes taught by selected full-time faculty. Scholars will participate in academic seminars, fieldtrips, community service, research internships, and social/academic events with visiting professionals and Research Scholars Academy alumni.

3. ESTABLISH A TEAM TO INVESTIGATE EMBEDDING UNDERGRADUATE RESEARCH DEEPER INTO THE CURRICULUM

While the committee did not delve in depth into the topic of curricular changes, we nonetheless feel this is an important area that deserves attention. We recommend that a group be convened under the umbrella of the Office of Undergraduate Research to consider a number of programs underway at other universities and to think about how UMass Boston could embed a richer research experience into the undergraduate curriculum. Such a group must consist of those individuals responsible for curriculum development in the colleges and departments as well as those creating outcomes assessments.

The following table contains sample topics such a group might consider.
<table>
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<tr>
<th>Topic</th>
<th>Example</th>
<th>Description</th>
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<tbody>
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<td>Develop introductory research course</td>
<td>Research Exposed! (University of Washington)</td>
<td>Offers the undergraduate an opportunity to learn about current research in a wide variety of disciplines, including the process of discovery, how faculty come up with an idea for research, how inquiry is structured in the different disciplines, and how students can become involved in the knowledge-making process.</td>
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<tr>
<td>Integrate a research component to existing courses and/or develop new research-intensive courses</td>
<td>University of Houston, the new Research-Supportive Curriculum Development Program</td>
<td>Encourages faculty, departments, and colleges to enhance research-related skills training and to offer course-based research experiences to undergraduates. Since its students come to the campus with differing levels of interest in and aptitude for research, the university will develop a research-supportive curriculum at three levels: core, intermediate, and advanced.</td>
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<tr>
<td>Launch an Undergraduate Research Certificate Program</td>
<td>The University of South Florida-Tampa and University of Texas-Austin</td>
<td>South Florida offers an undergraduate research certificate (via its College of Behavioral &amp; Community Sciences), and the University of Texas-Austin has filed legislation to offer such a certificate that is specific to each discipline.</td>
</tr>
<tr>
<td>Create research- or scholarship intensive courses</td>
<td>George Mason University</td>
<td>Designs research- and scholarship-intensive courses around an authentic research or creative project in the context of the course. These courses provide a unique opportunity for faculty to merge their teaching and scholarship. RS courses are upper-division courses identified on the student’s transcript as a unique educational experience.</td>
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<tr>
<td>Embed research earlier into the curriculum</td>
<td>Freshman Research Initiative, the University of Texas-Austin</td>
<td>Offers a three-semester course that begins in the freshman year and that offers students in the College of Natural Sciences an opportunity to advance academically while conducting cutting-edge, original, and publishable research.</td>
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<tr>
<td>Change department and GenEd requirements</td>
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<td>If we embed research into the core curriculum, not only would the way GenEd requirements are met need to change, but the schools and departments will have to alter their requirements as well. The question is, would research courses offered in the freshman year take the place of required research courses in the sciences? What about laboratory safety courses? Would they be part of the freshman research course, or would they be a specialized, elective research course?</td>
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<tr>
<td>Retool capstone courses for more emphasis on undergraduate research</td>
<td></td>
<td>All majors feature a capstone requirement, which provides a natural place for advanced research at the end of the undergraduate career. On the other hand, if undergraduate research coursework was to begin with an introduction to research method course and end with a capstone course, students could explore a research theme in-depth throughout.</td>
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their academic career at UMass Boston. This would require a change in some general education structure (Gen Ed) to allow for such a significant allotment of time for this research. It would, however, lead to a more inquiry-based activity for the required capstone-based completion activity in the last year of undergraduate education.

CONCLUSION

In sum, we feel that UMass Boston can develop innovative approaches to undergraduate research. Beginning with the creation of an Office of Undergraduate Research, which would coordinate the many efforts both underway and in the future, and adding a Research Scholars Academy for Undergraduates to nurture and guide cadres of students, we believe UMass Boston can take several giant steps toward its goal of imbuing its students with the “refined and complex knowledge, values, and skills of inquiry that the globalized world requires.”

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3 Fulfilling the Promise: A Blueprint for UMass Boston, the Report of the University of Massachusetts Boston Strategic Planning Implementation Design Team, September 26, 2011: page 5.
APPENDIX

UMASS BOSTON PEER INSTITUTIONS

- Cleveland State University
- University of Illinois at Chicago
- University of Louisville
- University of Maryland, Baltimore County
- University of Massachusetts Lowell
- University of Memphis
- University of Missouri—Kansas City
- University of Nevada, Reno

PROVOST’S ASPIRATIONAL PEERS

- George Mason University
- Georgia State University
- Temple University
- University of Memphis
- University of Wisconsin—Milwaukee
- University of Houston
- University of Toledo

EXEMPLARY INSTITUTIONS

- University of Texas—Austin
- Louisiana State University
- Massachusetts Institute of Technology
- University of California—Los Angeles
- University of North Carolina
- University of Delaware
- University of Washington
- University of Michigan
- University of South Florida—Tampa

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4 Peers listed on http://www.umb.edu/oirp/peer_institutions_urban_coalitions
5 Aspirational peers listed on http://www.umb.edu/oirp/peer_institutions_urban_coalitions