

The NSF Urban Massachusetts LSAMP grant is for 5 years with a total award of \$2,370,026. It can be found under the NSF Fastlane website under a 'University of Massachusetts Boston' search. Only the first 2 years of funding is listed for the award amount at this time.

Award Abstract - <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0603099>

Urban Massachusetts Louis Stokes Alliance for Minority Participation

I. Project Approach and Impact

A. Alliance Rationale

Recognizing that the economic vitality the Commonwealth of Massachusetts is inextricably linked to both quality and number of the people entering the workforce with scientific and technological skills and interests, policymakers have called for increased collaboration among all sectors of the educational pipeline as well as industry, government, and researchers (Mass Insight, 2003). Led by the University of Massachusetts Boston, UMass Dartmouth, UMass Lowell, and Wentworth Institute of Technology and their community college colleagues Bunker Hill, Roxbury, Bristol, and Middlesex have come together to form the Urban Massachusetts Alliance for Minority Participation (UMLSAMP).

The Alliance members recognize that their individual efforts to date to attract and retain underrepresented students in science, technology, engineering and mathematics fields (STEM) have not yielded sufficient results. They have come together knowing that they need the synergy of working collectively and collaboratively to make significant increases in STEM degree production in Massachusetts. The close geographic proximity of the Alliance members will facilitate this collaboration and will allow for enhanced joint programming. Importantly, the Alliance members serve urban areas with large minority populations; 34,000 underrepresented students attend the public schools in these urban areas.

As part of the University of Massachusetts system, the Boston, Dartmouth, and Lowell campuses are working to strengthen their undergraduate STEM programs, to develop new programs, and to significantly increase and enhance their research enterprise. As importantly, each campus also has deep ties to their community college partners, working over the years to enhance articulation, facilitate transfer, and enhance student opportunities and outcomes. Wentworth Institute of Technology, located in the heart of Boston, brings a number of strengths to the partnership including strong leadership, a unique experiential learning model that combines class work, laboratory work, and cooperative education, and a commitment to urban students.

Several planning sessions were held in the development of this proposal to better understand what each institution was already doing in term of access for low income, first generation students, students with disabilities and underrepresented students in general, and in the STEM area, in particular. Each of our institutions offers a number of programs designed to interest and prepare middle and high school students for college as well as programs designed to ensure the retention and graduation of these students as undergraduates, including Upward Bound, Urban Scholars, GEAR UP, Talent Search, College Now, and Student Support Services. Several offer math and science focused programs, including Math Science Upward Bound, Health Careers Opportunity Program, and, START at UMass Dartmouth, a privately funded initiative aimed at supporting non-traditional students in technical careers.

Tech Prep and 2+2+2 programs support students during high school through community college and ultimately baccalaureate degree programs. There are also opportunities for junior and senior level students to engage in undergraduate research, including NSF-sponsored Research Experiences for Undergraduates and U.S. Department of Education-sponsored McNair Post-baccalaureate Achievement Programs. In

addition to these student-directed activities, each institution is involved in a variety of initiatives focused on improving K-12 curriculum and instruction, including the Boston Area Technology Education Consortium (BATEC), the Greater Boston-East STEM Pipeline Network, and the Noyce Scholarship Program and notably a UMass Boston, recently awarded NSF Math/Science Partnership grant, focused on improving STEM teaching in Boston Public Schools.

It became clear from the planning sessions that three interrelated problems contribute to the low number of underrepresented students attaining STEM degrees. First, the number of underrepresented students at the Alliance institutions who are majoring in STEM fields is relatively small. In Fall 2004, only 820 Alliance undergraduates were enrolled in a STEM major, 12% of the approximately 7000 underrepresented students. Of the students who do enroll in a STEM major, far too few graduate—only 99 STEM BS degrees were awarded to underrepresented students by Alliance institutions in 2004. Finally, there is a lack of alignment between courses and programs offered by community colleges and the four-year institutions to which the majority of the community college students transfer. One consequence is that completion of pre-requisite courses at the community college level does not always fully prepare students for the next level courses at the university. Lack of alignment also often greatly increases the amount of time it takes students to progress to degree completion, a major impediment for students with limited financial support. Both inadequate preparation and increased time to degree completion are known factors negatively impacting persistence.

To address these barriers, the Urban Massachusetts LSAMP (UMLSAMP) will utilize a three-pronged strategy to increase STEM degree production by 150% over five years: Marketing and recruitment; Academic preparation, mentoring, and STEM career awareness; and Curriculum and program alignment. All Alliance members are committed to achieving the following objectives:

- Collaboratively design and implement programs to increase the number of underrepresented students interested in, and prepared to successfully complete, a STEM degree through summer and academic year bridge programs, intensive advising and faculty mentoring, facilitated study groups, mentored research experiences and other scholarly activities.
 - Ensure that UMLSAMP participants develop the mathematical, science, and technology skills and knowledge to successfully complete STEM degree programs.
 - Provide UMLSAMP participants with opportunities to learn about research careers, to develop an understanding of how scientists interact with and approach problems, to develop strong scientific learning and research skills, and to stimulate their interest in a STEM graduate education and careers.
- Improve the alignment of courses and programs of the Alliance community college STEM related courses and degrees and the BS majors so that students transfer readily prepared to complete successfully STEM BS degree requirements.
- Continuously evaluate the program and activities using common measures to assess progress toward alliance goals.
- Disseminate program outcomes and share best practices across and beyond the Alliance to contribute to the knowledge on promoting access for underrepresented students for STEM careers

B. Project Design and Logic

The Alliance's comprehensive and multi-faceted program is based on years of experience working with low-income, first-generation students in helping them to access, persist at, and complete post-secondary education. The program is also grounded in the literature on best practices in STEM education and the education of underrepresented students. In particular, we drew upon Tinto's (2004) report on the retention

and graduation of low-income students; Muraskin and Lee's (2004) study of common practices in institutions with high graduation rates for low-income students, and Sharp, Kleiner, and Frechtling's (2000) study of best practices in programs focused on increasing underrepresented students' participation and success in STEM fields.

Alliance members recognize that to increase enrollment in STEM majors, we need to invest resources into sparking and sustaining underrepresented students' interest in STEM careers as early as possible so that students can begin to take the requisite coursework in high school. It is equally important to connect them to role models and mentors who can help them begin to develop the necessary resolve to do the hard work. Alliance members also recognize the need to aggressively recruit students for the UMLSAMP. Because we know that students' readiness for UMLSAMP services and expectations will vary, there will be multiple entry points—as entering students, as transfer students, and after matriculation.

Alliance members understand that increasing the number of students enrolled in STEM majors is necessary to increase baccalaureate degree production, but they also understand that without strong academic preparation, advising, and mentoring (Muraskin and Lee, 2004; Sharp, et al., 2004; Tinto, 2004) students are less likely to graduate. Bridge programs have been found to be especially effective in positively effecting retention (Ackerman, 1990; Gold, 1992; and Sharp et al, 2004). Because a strong foundation in mathematics is crucial for success in STEM and the lack of adequate preparation in mathematics is a significant factor in the failure of many underrepresented students to pursue and complete a STEM degree (National Research Council 2003), building strong quantitative skills and preparing students for calculus will be a key focus of our proposed AMP project.

Academic support such as supplemental instruction, facilitated study groups, and tutoring are also important (Muraskin and Lee, 2004). Facilitated study groups will be implemented for gateway courses in math, chemistry, physics, and biology. Research experiences are also important in preparing students for and sustaining interest in a STEM career (Sharp et al, 2000); students will engage in early exposure to research and, as they progress through the program, have opportunities to design and conduct research projects under the supervision of a faculty mentor. Equally important are strategies which foster what Tinto (1993) calls ...“social and academic integration” and what the Sharp best practices study characterizes as ...“a caring, nurturing community of developing scientists.” To these ends, our AMP students will have access to drop-in centers and will receive intensive mentoring from peers and faculty..

Finally, Alliance members recognize the importance of the transition from community college to baccalaureate degree programs and will focus on articulation and alignment of STEM courses and degree programs between the community colleges and the four year institutions. Wilton (1999) found a direct correlation between the number of credits transferred and student persistence, suggesting that increasing the number of credits articulating will positively impact retention.

In each of these areas, Alliance members will engage in activities that bring UMLSAMP students, faculty, and staff together to share and learn from one another. A full-time project director will supervise and support the day-to-day implementation on each campus. Each campus will appoint a faculty member or professional to serve as Site Coordinator to implement the program.

Marketing and Recruitment

Each Alliance institution will engage in an aggressive recruitment and marketing campaign aimed at encouraging underrepresented students to pursue STEM degrees and at encouraging those who do to enroll in the UMLSAMP. Each campus has strong ties to their local public schools and to community organizations. The site coordinators will work with middle and high school teachers to identify students with interest in and potential for a STEM career. The campuses also operate numerous pre-collegiate programs and there are others in their communities; the staff of these programs will be an excellent

resource in identifying potential LSAMP students. The site coordinators will also organize career speakers and STEM awareness activities for use in secondary school classrooms and by after-school and summer programs. STEM faculty and students will be involved in admissions recruiting activities. The Alliance will make special efforts to address the extreme paucity of Native American students in STEM work and has recruited the Executive Director of the Massachusetts Commission on Indian Affairs to be a member of the Advisory Committee to provide expertise and help build relationships.

The site coordinators will actively recruit students for the UMLSAMP. They will recruit from their own student body, from pools of incoming first-year students, and in the case of the four-year institutions, from pools of incoming transfer students who have an interest in and/or potential for pursuing a STEM career. The Site Coordinators will provide information about UMLSAMP services, the application process, selection criteria, and program benefits and requirements. The Site Coordinators will hold orientations for Admissions Counselors so that they can help to identify potential participants as they recruit students. They will also disseminate information about the UMLSAMP widely to local high schools and pre-collegiate programs. Information will also be distributed to academic departments, the various academic support services offices, and student organizations. Faculty in math, science, and engineering-related departments will be a critical referral source.

Students interested in becoming UMLSAMP participants will be asked to complete an application. They will submit a personal statement describing their interests and educational background, an academic transcript, financial aid information, and two letters of recommendation. The Site Coordinators, with the assistance of their faculty advisory committee, will interview eligible applicants and then make selection decisions according to the following criteria:

- Majoring in or planning to major in a STEM field
- Willingness to commit to UMLSAMP requirements and expectations
- For community college students, interest in baccalaureate study
- Demonstrated motivation

Some students will enter UMLSAMP through bridge programs; others will begin during a semester. In order to maintain their status as UMLASMP participants, students will be expected to meet regularly with their faculty advisor and the site coordinator, participate in required courses and study groups, and take advantage of opportunities to explore STEM careers.

Academic Preparation, Mentoring, and STEM Career Awareness

Crucial to increasing BS degree production is to ensure that students develop the skills and knowledge needed to succeed in a STEM field and that they maintain their interest and resolve. The Alliance will implement comprehensive academic preparation, mentoring, and STEM career awareness. UMLSAMP participants will first have their needs assessed and be oriented to the Alliance, its services and requirements. Throughout their tenure in the program, they will be provided with intensive, intrusive advising and mentoring; Bridge programs and facilitated study groups will build scientific and quantitative skills. Mentored research experiences and other scholarly activities will further build participants' skills and knowledge of the research process. In addition, each institution will create a drop-in center for participants. These centers will be dedicated spaces staffed by upper classmen, tutors, mentors, and project staff and will have computers, other resource materials and technology available for student use. These centers will serve as work and study communities for the AMP participants.

Needs Assessment and Orientation

Assessment of individual participant's need for specific services and monitoring of their academic progress to ensure satisfactory progress is an integral part of the process that will maximize his/her completion of associate and bachelors degrees. Academic strengths and weaknesses and the need for

academic support will be assessed through a review of the results of each institution's entry assessments in reading, English, and math. Based on these results and discussion with the participant, the Site Coordinator and faculty advisors will complete a profile of areas of need for services such as advising, study skills and time management, tutoring, and the like. Participant profiles will include updates at the end of each semester. This will enable UMLSAMP Coordinators to identify areas of academic and affective need and to design individual plans for services to address these needs.

UMLSAMP staff will orient newly accepted participants either as part of their entry into a bridge program or during the first semester of admittance to the UMLSAMP. The orientation will familiarize participants with the objectives, expectations, and activities of the program and the resources and services that are available for academic and personal development. The orientation will also be an opportunity to meet UMLSAMP staff, faculty, and study group facilitators and provide an opportunity to build camaraderie among participants and foster a positive sense of identification with the AMP program.

Advising and Monitoring Academic Progress

Proactive advising is key to the success of the UMLSAMP in ensuring that participants successfully enter or transfer into baccalaureate degree programs in STEM fields. The focus will be on making sure the students, especially during the first two years, successfully progress into and through college, and in helping them develop and define their academic and career goals. Site Coordinators will coordinate advising and will identify a faculty advisor for each participant. Monitoring students' academic progress and ongoing needs assessment is a critical element of the advising process. Students will meet individually with their Advisor at least once a month to discuss their academic progress and concerns. These meetings will focus on the student's academic record, major plans and progress toward requirements, career and graduate school goals, and courses he/she will take the following semester. The Advisor will recommend additional services, including tutoring and personal counseling, as needed.

Summer and Other Bridge Programs

Alliance members will implement new and enhance existing summer and other bridge programs focused on mathematics for incoming freshmen and for community college transfer students. In these programs, students will take intensive mathematics skill-development courses focused on preparing for them to take calculus, interdisciplinary STEM courses, and be introduced to the research process. They will also learn study skills and time management and be exposed to campus life, and meet faculty, fellow students, and upperclassmen. All bridge programs will have three core components:

- **Mathematics Skill Development:** A significant obstacle to the success of underrepresented students in the STEM is a lack of a strong foundation in mathematics, thinking, and problem solving skills (National Research Council 2003). Individualized courses focused on filling gaps in students' Algebra 2, Pre-calculus and Calculus knowledge and skills will provide students with the depth and breadth in mathematics to be successful in calculus, statistics, and core STEM courses. Some Alliance institutions will use ALEKS, an interactive, online, mathematics teaching program that continually assesses the development of students' skills and knowledge as they progress from Algebra to Calculus II. Others will use alternative models that also allow students to move quickly through material they know, refreshing and reinforcing their knowledge, thereby allowing them to spend more time on material they do not know.
- **Interdisciplinary STEM Course:** Scientific and engineering concepts and models are more and more quantitative and research is becoming increasingly interdisciplinary requiring students to have a strong foundation in the life and physical sciences and in mathematics (National Academy of Sciences, 2004). Courses that illustrate the interconnectedness of important scientific problems will be offered to further develop students' scientific skills and interests and to illuminate the

need for strong knowledge across the disciplines. These courses will also emphasize writing and communicating.

- **Exposure to Laboratory Research:** Students will work part of the day in a research lab to experience the research process and begin to understand the need for rigor and precision. They will also learn good laboratory safety practices and to maintain a proper laboratory notebook. This experience will serve as a starting point for gaining the more sophisticated critical-thinking and problem-solving skills that will be instilled through the mentored research experiences.

Facilitated Study Groups, Peer Study Groups, and Academic Tutoring

Lack of academic preparation, lack of confidence, and a lack of knowledge about how to study effectively are primary obstacles to the success of underrepresented students in STEM fields (National Research Council 2003). Facilitated Study Group is a powerful tool for supplementing core STEM courses with extra homework, discussion, explanation, and strong reinforcement of key course concepts and principles. Facilitated study group sessions will be provided for students enrolled in gateway math, science, and engineering courses; each study group will meet for two hours per week.

Facilitators will provide an integrative approach to solving mathematics, science, and engineering problems, emphasizing the theoretical basis as well as the practical application of concepts. Conceptually based study techniques will be emphasized rather than memorization. Students will learn to use concept maps to organize topics and facts. Students will be required to come to class with written questions from lectures, from reading, discussions in classes, or exams. Student questions will be read aloud, clarified by discussion, and common themes identified. Themes will be chosen as the focus of discussion for each session, one theme at a time. Emphasis will be placed on students helping one another, with the facilitator acting mainly to enhance the exchange of ideas, to point out emerging themes, and to make summary remarks. This will allow students to generate their own predictions and questions about the topic, thereby assessing their own level of understanding.

Study groups also provide the opportunity for Facilitators to identify individuals who may need more intensive tutoring and advising sessions. Facilitators will be available for one-on-one discussion/advising sessions as needed. They will also be responsible for tracking the students' progress in the course and identifying problems as they arise. Students who require further attention will be assigned a tutor for supplemental assistance in that course.

STEM Career Awareness Workshops

Underrepresented students lack access to role models who are research scientists and they lack information about scientific research careers. To address this need, a bi-monthly Career Awareness Workshop will be developed. The workshops will feature guest mathematicians, scientists, engineers and educators, and especially highlight successful STEM professionals who were trained in LSAMP, McNair, MARC, RISE, IMSD, and STEP programs. The focus will be to "socialize" students to become scientists, to instill good habits of mind, and to generate excitement around STEM careers. In recruiting speakers, concerted efforts will be made to bring in speakers who are underrepresented in the STEM related career fields (e.g. Mary Jo Ondrechen, Theoretical and Computational Chemistry, Northeastern University, Native American; Paul Turner, Yale University, Experimental Evolution in Viruses, African American; Jose Arguello, Mechanisms of Ion Transport, Worcester Polytechnic Institute, Latino.)

Mentored Research Experiences

We know from the success of our McNair Post-Baccalaureate Achievement Programs and the literature (Sharp et al, 2000), that an independent research project, carefully guided by a faculty mentor, has a powerful impact on a student's resolve and ability to be a mathematician, scientist or engineer and will be the culmination of the UMLSAM students' experience. Students who have completed at least 60 credits

will have the opportunity, during the summer and the academic year, to participate in a mentored research experience in a university laboratory or an off-campus laboratory. This could be in one of the many university and industry-based research laboratories in eastern Massachusetts or in a summer enrichment project elsewhere in the country such as a NSF sponsored program Research Experience for Undergraduates (REU) program. The Project Director and Site Coordinators will actively assist interested students in finding such off-campus placements. The Massachusetts Technology Leadership Council has committed to develop internship placements for UMLSAMP participants and both the President of UMass system and UMass Boston have committed to helping students find such placements (see letters of support, Supplement 4).

Experienced faculty mentors with a commitment to developing young STEM professionals will be recruited to offer projects that are well suited to undergraduate participation. Students will take an active role in defining research questions and developing experimental designs. Our aim will be to help students develop independence in making research decisions, an understanding of the complexities of experimental design and data analysis, and an appreciation for the wide expanse of scientific research that touches many fields and agendas. Students will receive a stipend while engaged in these independent research projects to relieve them of the burden of taking on non-academic jobs.

Other Scholarly Activities

In addition to participating in a rigorous and high-quality research experience, UMLSAMP students will be encouraged to participate in a wide range of scholarly activities designed to prepare them for graduate study. Students will have opportunities to attend in-state and out-of-state meetings and conferences with their mentors so that they can meet and learn how to network with scholars while learning about cutting-edge research. They also provide an opportunity to receive guidance about graduate programs and preparation for graduate study. As they do more independent research AMP students will be encouraged to present their findings at these meetings and to publish their research findings in scholarly journals. Massachusetts has a wealth of top flight research institutions with whom we have close connections, enabling us to provide our students with opportunities to attend seminars with minimal travel costs (e.g., T-ride from UMass Boston to MIT costs only \$1.25).

Curriculum and Program Alignment

In addition to providing direct services to students, there is a need to expand and improve articulation agreements in the STEM concentrations between the community colleges and the four-year institutions to ensure courses are aligned and fully transferable. In addition, many transfer students have difficulty interfacing their knowledge and study habits with the accelerated pace and academic demands of a university. Peer groups are not the same, and the intensity and coverage of material is different between two-year colleges and universities. Coursework needs to fully prepare students for the next level. For example, whereas all of the AA STEM degree courses at BHCC and RCC transfer to UMB one-to-one, only one of the biology courses is a sophomore-level course, and the chemistry courses are all at the freshman level. Thus, students do not currently transfer into the UMB biology or chemistry majors ready to do junior-level course work.

To provide smoother student transfer from community colleges to Alliance universities and other baccalaureate programs, a team of faculty from science and mathematics departments at the Alliance institutions will meet quarterly to discuss levels of coverage and instruction in their courses and to identify course material and rigor that is not aligned. They will make modifications in individual courses and in program requirements that increase the success of students in community college STEM programs and increase the number who successfully transfer to baccalaureate degree programs.

Financial Support for Students

Adequate financial aid is essential for the retention and graduation of underrepresented students (Mortenson, 2001; Choy, 2002). Students who successfully complete the bridge program will receive a stipend to reduce their need to work. Students will also be able to earn a stipend during mentored research experiences. Alliance members and the advisory committee are committed to aggressively pursuing external and legislative funding for scholarship funds targeted on STEM students.

Collaboration across the Alliance

Alliance members value the synergy that results from working collaboratively and, in addition to joint governance of the Alliance, have planned several activities to capitalize on the group's collective wisdom and energy. First, community college and college/university staff will jointly plan and, where practical, jointly implement bridge programs for first-time and transfer students. Speakers, career awareness and other activities will also be jointly planned and implemented. Site Coordinators will inventory support, enrichment and research opportunities for UMLSAMP students and faculty. These inventories will then be stored in a database that students and faculty across and outside the Alliance would be able to access. The Project Director and the Site Coordinators will work together also to develop internship opportunities and will include information about these opportunities in the UMLSAMP database.

Second, we will develop common data metrics and benchmarks and we will collect and analyze data on STEM enrollment and progress to degree completion. We will use this process to identify and better understand, and then develop ways to eliminate institutional obstacles that impede the progress of underrepresented students in STEM majors.

Finally, an annual research and best-practices conference will be rotated among the Alliance Institutions. The conference will provide opportunities to share research, to enhance awareness of STEM careers, as well as for networking, mentoring, and motivation building. The Northeast LSAMP and similar programs in the region will be invited to participate (see letter of support from Northeast LSAMP, Supplement 4).

C. Impact and Outcomes

Impact on Student Access and Success

The overarching goal of the UMLSAMP is to increase underrepresented students' interest in, preparation for, and success in a STEM field. Specifically, we expect to achieve the following outcomes by the end of five years:

- **50%** increase in the number of Black, Hispanic, and Native American students majoring in STEM fields.
- **150%** increase the number of BS STEM degrees awarded to Black, Hispanic, and Native American students
- **150%** increase the number of students who successfully transfer from Alliance community colleges into BS STEM majors.

Table 1 provides data on the enrollment of underrepresented students in STEM fields at the Alliance universities and demonstrates that there is a critical mass of undergraduates, 820, who would benefit from the services proposed by UMLSAMP. As importantly, the Table clearly demonstrates that there is a large pool of students who can be encouraged to pursue STEM baccalaureate degree programs and make our goal of increasing the number of majors to 1,230 readily attainable. In addition to the 1,386 community college students already majoring in a STEM field, there are 34,000 Black, Hispanic, and Native American middle and high school students attending public schools in Boston, Lowell, Lawrence, New Bedford, and Fall River—the cities where the Alliance institutions are located (MA Department of Education, 2004) who would benefit from greater exposure to STEM careers.

Table 1: Enrollment in STEM Majors and Concentrations—SY 2004-05		
	URM	Total
UMass Boston*	203	963
UMass Dartmouth	131	1,446
UMass Lowell	175	1,748
Wentworth Institute of Technology	311	2,891
Total BS Degrees	820	7,048
	URM	Total
Bunker Hill*	226	562
Roxbury*	156	278
Bristol	22	285
Middlesex	114	565
Total AS Degrees/Certificates	518	1,690
Total	1,386	8,738
* data for 2003-04; complete 2004-05 data not available		

As illustrated in Table 2, baccalaureate degree production for Black, Hispanic, and Native American students in 2004-05 was 99, ranging from a low of 12 to a high of 37. These numbers will serve as the baseline against which progress toward the goal of a 150% increase to 250 per year by 2011 will be measured.

Table 2: Degree Completion in STEM Majors—SY 2004-05		
	URM	Total
UMass Boston*	24	168
UMass Dartmouth	12	188
UMass Lowell	26	329
Wentworth Institute of Technology	37	497
Total BS Degrees	99	1,092
Bunker Hill*	32	70
Roxbury*	25	35
Bristol	2	28
Middlesex	34	250
Total AS Degrees/Certificates	93	383
Total	192	1,475

Table 3 provides baseline data on the number of community college students who transfer into BS STEM programs at the partner universities and illustrates the need for significant improvement, with as few as four underrepresented students transferring. The goal is to increase this by at least 100% to 80 per year.

Table 3: URM Transfers into STEM Majors—Fall 04	
	STEM
Bunker Hill* to UMass Boston	8
Roxbury* to UMass Boston	4
Bristol to UMass Dartmouth	12
Middlesex to UMass Lowell	16
Total	40

Impact on Alliance Institutions

In addition to directly impacting students, the UMLSAMP will permanently change the participating organizations in several important ways and, as a result, will have an ongoing impact on the development of scientists from underrepresented backgrounds. In addition, the creation of drop-in centers for all minority SMET student development initiatives will facilitate collaboration, enable better coordination of services, and reduce duplication of services. The drop-in centers will provide ongoing support for students. Other outcomes include:

- Raising awareness of the importance of encouraging underrepresented students to enter STEM fields
- Improved curriculum at both the community colleges and the four-year institutions so that courses are more readily transferable and students enter baccalaureate STEM programs with the requisite skills
- Closer working relationships among administrators, faculty and staff among Alliance institutions, joint problem solving and sharing of failures as well as effective practices, will improve the programs across the Alliance
- Collaboration with Northeast LSAMP resulting in increased opportunities and support for students and faculty. (See letter of support in Supplement 4.)

D. Coordination with Other NSF and Related Programs

Members of the Urban Massachusetts LSAMP participate in a number of NSF-supported training and teacher development programs including a GK-12 Watershed Integration Science Partnership, Math Science Partnership, Noyce Scholarship Program, Foundations of Technical Careers; ATLAST, MATLAB, Allied Technical Education Center; and the Boston-area Allied Technical Consortium. In addition, member institutions participate in a number of other programs designed to promote the development of underrepresented scientists—at the pre-collegiate level, including Camp Tech, Math Science Upward Bound, GEAR UP, and Health Careers Opportunity Program, and at the post-secondary level, including the McNair Post-Baccalaureate Achievement Program, Project START, Research Experiences for Undergraduates, Undergraduate Mentoring in Environmental Biology, and GAANN.

Extensive work is being done with K-12 teachers—to encourage more people to pursue STEM teaching careers and to enhance the skills and knowledge of veteran teachers. The UMLSAMP will capitalize on this by tapping into the network of teachers involved in these projects to enlist their support in the identification and mentoring of promising potential LSAMP students. Alliance members also support a number of student development initiatives. These programs will serve as referral sources for LSAMP students and as placements to enhance services provided by the program. The Project Director and Site Coordinators will work closely with faculty and staff involved in student development programs to ensure that services are not duplicated and student opportunities are maximized.

II. Alliance Partners and Key Project Personnel**A. Alliance Partners and Roles**

Led by the University of Massachusetts Boston, the Urban Massachusetts Louis Stokes Alliance for Minority Participation is a comprehensive and multi-faceted partnership among UMass Dartmouth, UMass Lowell, Wentworth Institute of Technology, and Bunker Hill, Roxbury, Bristol, and Middlesex Community Colleges. As discussed previously, Alliance institutions are located in major urban areas serving large numbers of underrepresented students—34,000 Black, Hispanic, and Native American students attend public middle and high schools in these communities. An additional 6,210 attend Alliance

community colleges. Access to a large pool of potential students, coupled with a strong track record of providing access and collaborating across the educational pipeline, puts the alliance in a strong position to make a significant impact on the production of the next generation of mathematicians, scientists and engineers. The chancellors and presidents strongly endorse the goals of the Alliance and pledge institutional support to facilitate their attainment. Letters outlining institutional commitments and providing an overview of the institutions can be found in Supplementary Documents, Supplement 2.

UMass Boston will serve as the lead institution for the Alliance, managing the overall budget, reporting, and evaluation. All Alliance members will participate equally in making decisions about program design and resource allocation through representation on the Governing Board which is discussed below under Management Plan.

B. Role of research faculty in the Alliance

The intensive, productive involvement of senior research faculty is integral to engaging UMLSAMP participants in meaningful research projects and other relevant scholarly activities that will prepare them to identify with the intellectual community of STEM researchers. It is also a key element of the support that low-income, first-generation, and underrepresented students need to effectively prepare for a rigorous bachelor's degree program in a STEM major. Faculty mentors will work closely with the AMP participants through all phases of the research process. They also work closely with the Coordinators and the Director in the development and implementation of other awareness, support, and research activities. We will make a concerted effort to attract mentors who themselves are members of underrepresented groups. Minority faculty members who are first-generation professionals will be able to offer students essential academic guidance as well as effective strategies to navigate the road to the attainment of a baccalaureate degree and beyond.

C. Key Personnel

The Chancellors and Presidents of the alliance institutions are deeply committed to the goals of the UMLSAMP and have designated their chief academic officers to oversee the day-to-day operation of the Alliance. Dr Paul Fonteyn, Provost, UMass Boston, will serve as Principal Investigator for the UMLSAMP and will be responsible for overseeing the entire project and supervising the Project Director. In consultation with the external Advisory Committee Board, the Governing Board, and the Project Director, Dr. Fonteyn will assure the quality of activities and services and the achievement of the project's goals. He will devote 5% of his time to these responsibilities during the academic year and 10% of his time during the summer.

Dr. Fonteyn is an excellent leader for the UMLSAMP due to the important roles he has held as well as his dedication to the development of a skilled and diverse STEM workforce. First, as an accomplished professor in the Biological Sciences, Dr. Fonteyn has intimate knowledge of the pedagogical and empathetic skills required of faculty to convey knowledge and the love of STEM fields to students from diverse backgrounds. The development of proper faculty perspectives and effective curriculum delivery will be an important topic covered with the various faculty members in the 8 member colleges in LSAMP. Finally, Dr Fonteyn is himself already an experienced LSAMP administrator. From 1993-2002, Dr. Fonteyn, having spearheaded the design of the Phase I and II AMP programs for the California State University Alliance for Minority Participation (AMP) Program, played a major role in the implementation of both Phases before taking the position of Provost at UMass Boston in 2002.

Marshall Milner will serve as project director and will work closely with the campus-based site coordinators, faculty, facilitators, and student participants in the design and implementation of Alliance activities. He and Dr. Fonteyn will serve as principal contacts with NSF and will establish policies in consultation with the Governing Board. Mr. Milner will coordinate student tracking, data management, and follow-up on graduates and oversee the external evaluation. Mr. Milner brings extensive skills and

experiences to the position. He spent twelve years as associate and director of the MIT/Wellesley Upward Bound Program where he acquired skills in working with faculty, public school officials, and students and parents from diverse, largely poor backgrounds to find common ground to advance the educational interests of all the various stakeholders. Mr. Milner then spent eighteen years in the corporate sector as a professional manager, a brand product administrator, and as a manager of project managers. In the private sector, he served on multiple cross-industry committees and boards where he improved his negotiation skills for consensus building and organizational development for startups and not-for-profit community--service initiatives. He is also an accomplished fundraiser and proposal writer. Mr. Milner has a particular interest in science and math education—he served for three years on the Board of Directors for the Roxbury Black Big Brothers Association, on the Massachusetts Pre-Engineering Program Board of Directors for 15 years and has been involved in the Algebra Project for since its inception.

Each Alliance Institution will designate a Site Coordinator as primary contact for operational issues and communication of policies as generated by the Governing Board. Site Coordinators will have a strong understanding of the needs of diverse students, experience in student development, the ability to network and leverage involvement and resources, high energy, and good organizational skills. Grant funds will support a portion of the coordinators' time. The coordinators will work as a team with the project director to establish and maintain advantages of the Alliance in support of LSAMP goals and objectives for our region and in cooperation with other alliances. Coordinators will be responsible for arranging for the proper utilization of space and resources at their colleges for LSAMP activities; collection and maintenance of data on LSAMP student progress; coordination and counseling in regards to any on-site mentoring or research assistantships with faculty; and participation in faculty development events which are to benefit the quality of teaching and learning under LSAMP STEM degree attainment objectives.

III. Management Plan

The primary means of communication will be through conferences, conference calls, electronic communication and routine meetings as discussed below. The Urban Massachusetts LSAMP will be managed by an advisory committee and a governing board. The Project Director will be responsible for day-to-day coordination and management of the Alliance with oversight from the Principal Investigator and the Governing Board and advice from the Advisory Committee. A timeline for key activities is in Supplement 1.

Governing Board

Internal operation of the Alliance will be overseen by a Governing Board. Composed of the provosts and vice presidents of Academic Affairs of each of the participating institutions, the Board will oversee general operation of the UMLSAMP and will ensure that Alliance objectives are achieved and institutional resources are marshaled. Annually, the Governing Board will review requests for resources in light of each institution's plan for the coming year and progress in meeting Alliance goals. The Board will also allocate funds for cross-institution activities. The Governing Board has the experience and expertise, long-standing commitment to minority student development in STEM, and expertise in training to ensure that the Alliance will be highly successful. See Supplemental Documents, Supplement 2 for Letters from the Chancellors and Presidents appointing their provosts. Bio-sketches of the Governing Board members are found in the bio-sketch section. Provost Fonteyn will chair the Governing Board which will meet quarterly and have phone conferences as needed between meetings. The Project Director will serve ex officio and provide regular reports on Alliance activities and progress toward Alliance goals.

Advisory Committee

The Advisory Committee is comprised of a diverse group of leading STEM professionals, educators, and policy makers who have expertise in recruiting and developing young STEM professionals, especially those from underrepresented backgrounds, in STEM curricula and instructional practices that are interdisciplinary and prepare students to tackle complex research questions, and in multi-institutional

partnerships. The Advisory Committee will meet twice a year and will critically evaluate the overall program; assure that opportunities for collaboration are being well-utilized; and provide guidance and consultation on the Alliance's short- and long-term goals. The Advisory Committee will also provide direction and assistance in broadening the base of support for UMLSAMP objectives among academic, industrial, governmental, and other sectors of society. Dr. Jack Wilson, President of the University of Massachusetts, has agreed to serve as chair and will ensure the Alliance goals are coordinated with and supported by system-wide efforts to enhance STEM education. Letters accepting the invitation to serve and outlining their commitments to the Alliance can be found in Supplemental Documents, Supplement 3.

- Jack Wilson, President, University of Massachusetts, Chair
- Terry Gomes, President, Roxbury Community College
- Marilyn Decker, Senior Program Director, Science, Boston Public Schools
- Robert Mena, Professor and Chair, Mathematics, California State University Long Beach
- William Geunther, President, MassInsight
- Judith Gill, Chancellor, Massachusetts Board of Higher Education
- Edgar Smith, Professor Emeritus, Biochemistry and Molecular Biology, UMass Medical School
- Zorica Pantic-Tanner, President, Wentworth Institute of Technology
- John Peters, Executive Director, Massachusetts Commission on Indian Affairs
- Paul Fonteyn, Provost, UMass Boston and UMLSAMP Principal Investigator, ex officio
- Marshall Milner, Project Director, ex officio

IV. Grantee Contributions to Project

The Alliance will leverage federal support to increase the resources available so that a full complement of support services can be provided for all students and a wide variety of opportunities to develop their interest in and resolve to pursue a STEM career. With assistance from the presidents, chancellors and Advisory Committee members, the Project Director and Governing Board will aggressively pursue private sector funding opportunities and they will work with key legislators to increase state dollars for STEM development. In addition, Alliance members will pursue other federal funding opportunities that complement and supplement LSAMP funds, including NIH Bridges to the Baccalaureate, NIH Initiative for Minority Student, MARC, and NSF STEP. Alliance members are also committed to institutionalize key practices, including the facilitated study groups and the math skills and interdisciplinary STEM courses, ensuring long-term self-sustainability. To this end, they will collect data on the effectiveness of these interventions and will use these data to argue to institutional governance bodies of the appropriateness and importance of making these activities credit-bearing. As credit-bearing courses, the facilitated study groups and math and STEM courses would be open to all students who would either pay for the credits or would have the costs covered in their financial aid package. The articulation work that the collaborators plan to undertake will also be institutionalized at the end of the grant period.

Each member will make available faculty and staff, administrative support and supplies, office space, space for a drop-in center, and computer and office equipment. As lead institution, UMass Boston will also dedicate a portion of the project director's salary, the principal investigator's time; and financial management of the grant. In addition, the university will recover 8% of facility and administrative costs as opposed to the negotiated rate of 52.5% to further advance the work of the Alliance.

V. Evaluation Activities

Evaluation will be performed by Drs. Alan Peterfreund and Kenneth Rath of Peterfreund Associates. They have extensive experience in evaluating undergraduate and graduate students' experience in a number of programs. These include NSF-funded GK-12 projects at San Francisco State University (SFSU), Northeastern, Yale, and Harvard; NSF-funded Louis Stokes AMP (Bridge to Doctorate) projects at SFSU and the Northeast Alliance (UMass Amherst, Worcester Polytechnic, the Univ. of Rhode Island, Northeastern, and the Univ. of Connecticut); MORE programs through NIH that support the development

of minority students in biomedical-related science fields at SFSU; a MORE-based research project in conjunction with SFSU, New Mexico State, and Cal State Los Angeles; and a project funded jointly by the Massachusetts Dept of Ed. and an industry partner to improve information technology education across the curriculum from elementary school to college.

The evaluation of this project will involve formative and summative activities, designed to provide feedback to the project leaders to aid in program improvement and to describe the project outcomes. Responsibilities will be shared between the program director (primarily focused on the collection of standardized data) and the external evaluators (primarily responsible for data reporting and collection, processing and reporting survey-based information.) The table below demonstrates the relationship between the various evaluation activities and the goals of the proposal. A description of the individual activities follows.

UMLSAMP GOALS	Evaluation Activities
1: to increase the numbers of URM students who apply to STEM majors at Alliance institutions;	<ul style="list-style-type: none"> • Compile and report standardized institutional data • Track outreach and bridge activity participants
2: to increase, over a five-year period, URM undergraduate STEM enrollment across the Alliance;	<ul style="list-style-type: none"> • Compile and report standardized institutional data • Biannual survey of STEM depts documenting actions perceived as driving improvements
3: to increase the persistence of URM students in STEM majors, and increase by 150% the number of STEM degrees awarded to minority students at Alliance;	<ul style="list-style-type: none"> • Compile and report standardized institutional data • Annual survey of students leaving STEM majors
5: to ensure academic and financial support for URM students in STEM majors at Alliance institutions;	<ul style="list-style-type: none"> • Annual survey of students leaving STEM majors
6: to expand academic year/summer research opportunities for URM students in STEM;	<ul style="list-style-type: none"> • Compile and report standardized data about program participants • Annual student and advisor surveys
7: to build an infrastructure to ensure continuation of the Alliance and its activities beyond the funding period.	<ul style="list-style-type: none"> • Biannual survey of institutional leaders
8: to form an alliance-wide community of LSAMP students through annual meetings and inter-campus activities;	<ul style="list-style-type: none"> • Annual survey of participants in meetings, etc.

Standardized Institutional Data. Site coordinators will supply data regarding the numbers and ethnic/racial identity of students applying to their institutions, enrolling in STEM majors, and graduating from these majors to enter STEM graduate studies and careers. These data will be collected on a yearly basis, as well as historical data for at least three years before the UMLSAMP program was awarded (where available).

Track Outreach and Bridge Activity Participants. Middle- and high-school students who participate in LSAMP-funded outreach activities will be tracked over the years following their participation. Data will be collected regarding their academic success and course selections, progression toward college, and college selection.

Biannual Survey of STEM Departments. Surveys will be administered to the heads of STEM departments (chairs and/or undergraduate advisors) at each of the UMLSAMP campuses in order to document those actions that are being undertaken to improve student success, including activities with

and without LSAMP support. These surveys will ask the faculty members to comment also upon the place and visibility of LSAMP activities on their campuses and their department's commitment to supporting these activities.

Annual Survey of Students Leaving STEM Majors. Every year, those students who left STEM majors at the UMLSAMP campuses, either by switching to another major or by dropping out, will be identified and provided with a survey asking them to comment on the reasons behind their leaving. Students will be asked to comment on any possible financial reasons for their decisions, among other possibilities.

Standardized Data About Program Participants. For each student who takes part in an UMLSAMP-supported activity, whether it be undergraduate research, an AMP scholarship, etc., a standard set of data will be compiled. This will include their progression toward acquiring a degree; whether or not they participated in research and when; what products (if any), including papers, presentations, etc., resulted from their research participation; when they graduated and in what status; and what path they took after graduation.

Student and Advisor Research Surveys. All participants in research will be asked to complete annual surveys regarding the quality, scope, and impact of their research experiences. Their advisors will be asked a similar set of questions to get their impressions of the experience's impact on their students.

Biannual Survey of Institutional Leaders. A survey will be distributed to relevant institutional administrators and program leaders from all campus programs designed to support underrepresented minority STEM students. This survey will focus on the place and visibility of UMLSAMP activities on their campuses and their commitment to supporting these activities.

Meeting, etc., Participant Surveys. Surveys will be conducted after all UMLSAMP-funded activities to get reactions from participants as to their value, etc. The surveys produced for these activities will be delivered to both faculty-level participants and students as appropriate and will be built to measure outcomes specific to the activity.

VI. Dissemination Activities

Project innovations will be disseminated and the adaptation of effective strategies will be fostered through several mechanisms. First, Alliance members will hold an annual conference, which will bring together students, faculty, and staff involved in the project to share the results of research and best practices. Alliance members will seek out and take advantage of other opportunities to share the UMLSAMP work such as the Massachusetts Science Network, the Northeast LSAMP, the New England Board of Higher Education's Science Network, and the American Council on Education's College is Possible Initiative. The Project Director and Site Coordinators will work with institutional publicity offices to identify opportunities for media coverage. Finally, Alliance faculty and staff will be encouraged to submit journal articles and make conference presentations.

VII. Prior NSF Support to PI or Co-PI(s) within the past five years

Paul J. Fonteyn (Ph.D. biology) is Provost and Senior Vice Chancellor for Academic Affairs, UMass-Boston and a tenured full professor of biology. Prior to his appointment at UMB in 2003, Dr. Fonteyn was Dean of Graduate Studies and Research at San Francisco State University from 1990 to 2002. For the past fifteen years, he has been directly involved in science education and science and mathematics "pipeline" programs. He currently is the project director of a NSF-sponsored program to establish community science centers in eight impoverished communities across the United States and is a member of the governing board of the NSF-sponsored MSP Boston Science Partnership. Dr. Fonteyn is PI on two current NSF grants: Community Science Workshops: Beginning a National Movement, National Science

Foundation, Supplement \$199,541, Project Director, 2004-05 and Community Science Workshops:
Beginning a National Movement, National Science Foundation, \$3,059,252, Project Director, 2001-2005.