Northeast Ohio Bioscience Partnership Choose Ohio First Narrative Proposal
Total Request: $963,840
Ashland University (AU), Lead Partner: $714,400
The Ohio State University Agricultural Technical Institute (ATI): $88,000
North Central State College (NCSC): $99,840
Lakeland Community College (LCC): $61,600

I. Background and Regional Need (Criteria #3)
A. Does program meet a statewide educational need?

The biosciences are a diverse and often converging group of industries with a common link – they apply knowledge to develop solutions that sustain, restore and improve the quality with which humans, plants, and animals function and utilize biological products to address unmet needs. These industries are often separated into four common groups: drugs and pharmaceuticals; medical devices and equipment; agricultural bioscience (agbio); and research, testing and medical laboratories (RTML). This proposal focuses on the latter two sectors (See **Appendix 1**).

Agbio applies life sciences knowledge, biochemistry and biotechnologies to the processing of agricultural goods and production of organic and agricultural chemicals. The subsector also includes the emerging activity around biofuels. The RTML subsector includes a range of activities; from highly research-oriented companies working to develop and commercialize new drug discovery/delivery systems, and gene and cell therapies, to more service oriented firms engaged in medical and other life sciences testing services.

According to the 2008 State Bioscience Initiatives report (sponsored jointly by Battelle, SSTI, Biotechnology Industry Organization, and PMP Public Affairs Consulting, Inc,), Ohio is one of only five states labeled as both a large and highly concentrated (relative to U.S.) employer in agbio. The state RTML subsector grew faster than the national rate at an astounding 41% between 2001-06. Further, hospitals, academic medical centers and medical colleges commonly engage in clinical bioscience work, and academic bioscience research expenditures in Ohio grew at nearly twice the national rate.

Industry Subsector	Ohio		United States	
	2006	2001–06 Change	2006	2001–06 Change
Agricultural Feedstock & Chemicals				
Establishments	83	7.8%	2,183	3.8%
Employment	6,197	-11.2%	105,846	-6.1%
Location Quotient	1.46		n.a.	
Direct-Effect Employment Multiplier	8.31		11.22	
Total Employment Impact	51,495		1,214,709	
Average Annual Wage	$78,114		$67,870	
Research, Testing, & Medical Laboratories				
Establishments	785	47.9%	22,857	32.7%
Employment	9,427	40.6%	449,991	17.8%
Location Quotient	0.52		n.a.	
Direct-Effect Employment Multiplier	2.28		3.25	
Total Employment Impact	21,490		1,440,500	
Average Annual Wage	$49,003		$71,284	

Even given the recession, statewide employment prospects are high for these fields especially given recent state and federal policy initiatives. For examples, part of the $20 billion in proposed renewable energy tax credits go toward biofuels.

While Ohio issued nearly 5,000 bioscience-related degrees in 2006, it is having difficulty keeping up with growing demand of the bioscience industries (**Appendix 2**). Further, many of the students who earn these degrees leave the state, while others use biology degrees as a gateway to medical schools. This demand is further evidenced by a statewide workforce survey conducted in 2007 by BioOhio, the state's nonprofit bioscience professional association. Conclusions from 53 responding companies noted substantial hiring projections within all categories and education levels, yet only moderate success with out-of-state recruiting. Most companies did not use external resources for professional development, yet wanted to engage in the educational process (**Appendix 3**).

B. Is program integrated with strengths of regional economy?

According to BioOhio, northeast Ohio leads the state regions in terms of economic and employment impact, as well as the testing laboratory part of RTML. When considering the core counties targeted in this proposal (Ashland, Crawford, Holmes, Medina, Richland, Stark and Wayne), the impact of agbio and RTML are even more staggering. In 2006, regional educators, employers, economic development experts, and others primarily from these counties organized an effort to develop multiple career pathways for regional bioscience companies. The group branded itself as the Bioscience Consortium of Northeast Ohio (Consortium), and has grown into arguably the most active bioscience workforce initiative in rural Ohio. The quarterly meetings of the Consortium now regularly attract more than 50 attendees from industry, education, economic development, government and nonprofit. Several mayors have formed an elected official's subgroup, and the consortium is sponsoring a series of regional agribusiness breakfasts. (**Appendix 4**).

Regional Employment Projections, Agbio and RTML[1]

Description	2008 Jobs	2013 Jobs	Change	% Change	EPW	2007 Establishments
Regional Total	1,629	1,876	247	15%	$53,482	86
State Total	38,178	40,652	2,474	6%	$78,884	1,545
National Total	1,112,417	1,212,205	99,788	9%	$93,904	42,995

Source: EMSI Complete Employment - Fall 2008

[1] Does not count 650 employees at Ohio Agricultural Research & Development Center, which cannot be broken out from education industry

Additional regional labor market information is available in **Appendix 5.**

Three institutions exemplify this explosive growth. WIL Research Laboratories is one of the world's premier contract research organizations focused on toxicological research. It is one of the largest employers in Ashland County at 600, and is expected to add another 100 jobs upon completion of an expansion later this year. The Ohio Agricultural Research & Development Center is the research arm of The Ohio State University's College of Food, Agricultural, and Environmental Sciences. It employs nearly 650 scientists and staff, mostly at its Wooster campus, which is the largest agbioscience research facility in the United States. It is involved in annual collaborations with more than 130 businesses throughout the world, and recently opened an adjacent research park to provide space for private companies developing commercial products and services resulting from OARDC research. Finally, Clinical Research Management, Inc. is a Medina-based contract research organization with

more than 200 employees in Ohio and the Washington. D.C. area. For 10 years, it has performed successfully on over 500 contracts and tasks for the federal government.

The Consortium efforts led to piloting one of the first rurally-located Project Lead the Way programs in biomedical science in the nation. There are now 27 juniors and seniors in the program based at Ashland County West Holmes Career Center (ACWH), with most in the upcoming graduating class intending to pursue bioscience-related degrees. These efforts were tremendously assisted by obtaining a $500,000 federal earmark in 2008 to fund career pathway development at the secondary and post-secondary level.. This helped spur construction of a state-of-the-art bioscience lab at ACWH, enhancements in Advanced Placement programs at Ashland High School, formation of an adult education program for bioscience at ACWH, development of a bioscience certificate program at North Central State College and new undergraduate major in biotechnology at Ashland University. There has also been tremendous K-12 outreach, including short-term externships for science teachers at WIL Research and workshops for local school districts. Another Wayne County district, Northwestern, has launched a companion PLTW program in biomedical sciences..

II. Proposed Innovations & Impact on Regional Need (Criterion #2 and #8)

A. Does the proposed program emphasize innovations related to: a) redesigning the STEM gateway courses; and/or b) developing course materials for students in STEM areas; and/or c) enhancing STEM student learning through internships, cooperative education experiences and mentoring? (See Appendix 6 for curriculum worksheets and/or course descriptions)

WIL Research Laboratories, LLC and Clinical Research Management, Inc., have employed interns in the past and have expressed interest in providing internship opportunities for COF pathway students. OARDC has an annual summer internship program hosting high school and undergraduate students to assist in laboratory and field research. The Research Internship Program was launched in 2008 to provide real-world research experience to nearly 40 high school and college students. Interns work a minimum of 30 hours per week, mentored by an individual faculty member(s) and conclude by giving presentations about their research projects. Internship slots are competitive and OARDC cannot limit competition to COF partner schools, but the program is non-residential which could give local colleges an advantage. (**Appendix 7**).

WIL Research Laboratories and Ashland University are in the final stages of implementing a formal internship program that would host four AU science students for 40 hours/week during the summer and up to 20 hours per week during the academic year. Interns would be mentored by WIL Research scientists and would meet jointly every two weeks during the summer to discuss their research along with AU faculty and their research students. At the end of each summer WIL Research will hold a symposium for students to present their work. This program will foster stronger ties between WIL Research and AU and provide an excellent opportunity for WIL Research to recruit future employees. In addition, the COF schools will continue pursuing internships with other employers in the core Consortium and nearby counties. It will make use of tools such as an online internship search tool soon to be launched as part of the Ohio Skills Bank Region 6 career pathway effort (**Appendix 8**).

Scholarships will be available for qualifying majors in biochemistry, biology and toxicology, and AU has begun the curricular processes to launch a new major in biotechnology in Fall 2009. This will include a new gateway "Introduction to Biotechnology" course. AU science programs are complemented by $50,000 in annual investment in equipment and maintenance. In addition to regrouping current chemistry and biology offerings and the gateway course, the biotechnology curriculum is unique in that it integrates business/entrepreneurship curriculum from the renowned

Richard E. and Sandra J. Dauch College of Business and Economics at AU. In fact, the development of a service learning credit option is planned for students who participate in a mentoring program for high school teams competing in the Scholarship for Entrepreneurial Engagement (SEE-STEM), an innovative program to engage high school students in entrepreneurial science. AU is in the planning stages of a professional science master's degree program, in collaboration with WIL Research, to retain incumbent worker scientists in the region. AU is in the final stages of formalizing an internship program with WIL Research to provide industrial experience and mentoring opportunities.

ATI will launch a new biotechnology/agricultural bioscience major to replace the current lab science major in Fall 2009. The major is being revised to better prepare graduates for careers in the agricultural biosciences and related fields. As part of this revision, the major is adding five new courses: Animal Tissue Culture, Genetics, Recombinant DNA, Bioinformatics, and Forensic Science. To support these revisions, ATI has purchased nearly $50,000 in equipment. All ATI AAS students are required to complete an occupational internship, which consists of one quarter of full-time employment in their area of specialization. The new program director, Dr. Carrie Gerber, formerly worked at the Cleveland Clinic and has numerous connections for additional internship sites.

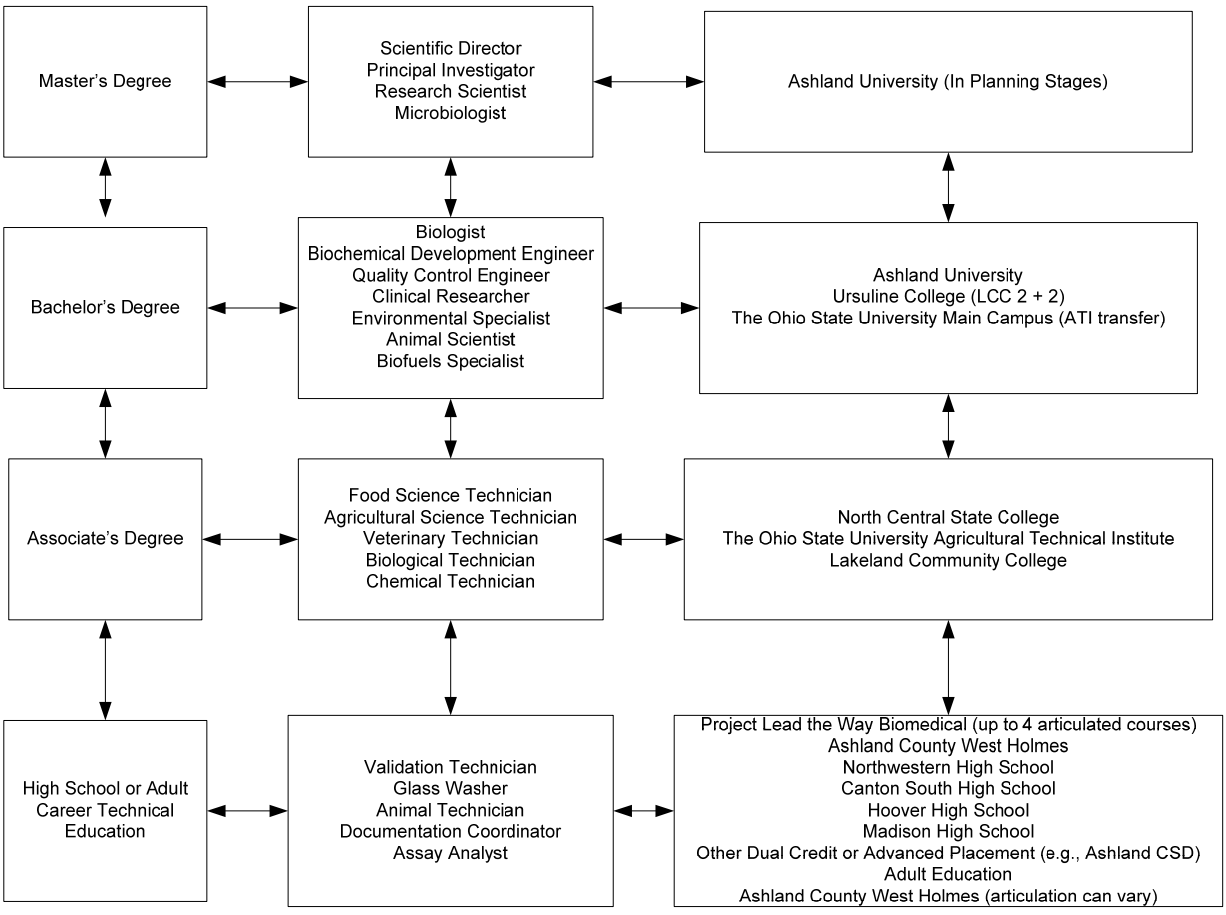
NCSC has launched an Associate of Applied Science in Health Services Technology, allowing students to combine two health-related disciplines including bioscience. In addition to core biology, chemistry, microbiology, and anatomy and physiology courses, the degree offers an option for five "bioscience" courses. These include a new "gateway" course called Introduction to Biotechnology, designed to give students an introduction to scientific concepts and laboratory research techniques currently used in the field of biotechnology. These will be followed by: Introduction to Forensic Toxicology, Laboratory Instrumentation and Analysis, Histology I and Histology II. These will be supported by a dedicated laboratory and new equipment, of which NC State has already raised nearly $60,000 from various external sources.

LCC's bioscience technology program was the first of its kind in northeast Ohio. Through this COF program, it will revise its two gateway courses: Principles of Biology and also Microbiology. These revisions will help LCC better meet the prerequisite needs of bioscience students, and will also align Lakeland's offerings with similar courses across the state to keep pace with Transfer Assurance Guide Requirements. The curriculum will be complemented by substantial recent equipment investments from grants and other resources. During the final stage of the program, students are provided an internship at an academic or industrial laboratory. As LCC intends to use the COF scholarship as a recruitment tool to the Project Lead the Way biomedical programs at ACWH and Northwestern, this could help broaden internship opportunities into the Lake County area as well as the core Consortium counties.

In addition, as a result of the COF proposal the partner institutions have begun discussing the potential for using distance learning technologies allowing either co-enrollment or bachelor completion. As each two-year college has unique offerings in its programs (ATI-agbio, NCSC-histology, LCC-various industries); a student who wishes to specialize in a particular field could potentially take classes from another site to earn an Associate of Technical Studies. Another option could be AU delivering via distance learning upper-level lectures simultaneously to the two-year sites as part of the growing "university center" movement.

B. Will the proposed plan of action enable the university/college and its partnering institutions to increase the recruitment of Ohio residents back into the state to pursue graduate study in STEM, medical or STEM educational disciplines, and or will the proposed plan encourage two-year STEM graduates to continue on for a baccalaureate degree, and/or will the proposed plan of action encourage current non-STEM students to become STEM majors?

Economic modeling software from EMSI, Inc, projects that between 2008-2013, the population of adults in Consortium counties aged 25-29 will shrink by **10%.** Many companies have to hire outside of the region given the difficulty of retaining local talent. WIL Research has stated that most of its turnover is due to the fact that it has to hire people from outside the region who lack a previous connection. While it would prefer to do more internal promotion and backfilling, the lack of a regional educational career pathway hindered this process. The Consortium was formed to address this issue, realizing the best solution was to "grow your own" along a series of connected education and training opportunities and services for students and incumbent workers. The Consortium was working at what the Ohio Skills Bank would later term a career pathway – coherent, articulated sequences of rigorous academic and career courses leading to an industry-recognized certificate, license or degree. It would provide access for all students regardless of education or skill level. Unfortunately, since the Consortium counties encompass three state economic development regions it has been difficult to coordinate and identify the biosciences as a unique pathway through the OSB thus far, though at least EDR 6 intends to begin the process. The following is a rough sketch of potential pathways for COF students in this proposal that will be refined upon further study:



One of the COF partners, LCC, features a state-of-the-art online "career coach" for biotechnology that could be used as an advising tool for potential pathway students (http://www.lakelandcc.edu/biotech/careers.htm).

Students in the PLTW Biomedical Sciences program can articulate up to four courses: Principles of Biomedical Science, Human Body Systems, Medical Interventions and Science Research. For example, the ACWH program, set to graduate 11 seniors, has already struck articulation with NCSC and LCC, is in discussion with AU, and will enter discussion with ATI. Eight of the 11 seniors at ACWH intend to enroll at one of the COF schools anyway, with three definitely committed to bioscience technology thus far. In addition, NCSC is articulating one course from the ACWH adult bioscience program.

In addition to these high school populations in specific programs, the explosive growth of STEM dual credit courses within the high schools (via Ohio HB 119) will be a recruiting source for students not intending to major in STEM. This unique program is entering its third year, and enrollment has grown from 174 in 2006-07 to an anticipated 433 in 2008-09. The DE/DC program is a partnership among regional high schools and colleges for the purpose of delivering high quality, postsecondary coursework and instruction by offering dual credit to students enrolled in participating high schools. Courses taught in the DE/DC program must follow the college course syllabus, use the college textbook, assess student achievement by using college exams and report student achievement using the college established grading scale. Dual credit instruction delivered by NCSC includes 11 current or pending biology and chemistry courses.

The COF partners also intend to offer flexible programs and curriculum to attract adult students as well into the biosciences. For example, NCSC is attempting to make its curriculum offerings as convenient as possible for the non-degreed workforce at WIL Research. Students can take the majority of their general education coursework via video conference during the evening at ACWH, simultaneously with sites in Bucyrus and Willard. Students can even take one of the biology courses in the bioscience curriculum through videoconference, and fulfill the lab requirements on Friday evenings after work.

The articulation relationships between the two-year COF partners and AU will result in a less costly and more convenient pathway for bachelor's completion. NCSC and ATI are within 30 minutes of AU, and it is likely that LCC graduates will be former PLTW students from the area who can commute from home if they wish. The scholarship opportunities, combined with nearby internships and the potential of full-time employment upon graduation, will definitely drive more two-year students toward bachelor completion.

Other forces will drive more non-STEM students into the biosciences. The first is the continuing marketing efforts of the Consortium. BioOhio has stated this is the most active rural effort in Ohio to promote the bioscience workforce. The mayors of Ashland, Shelby, Mansfield, Medina and Orrville have formed a sub-group to jointly promote the biosciences amongst their residents and part of the current earmark is geared toward promotion and awareness, including K-12 outreach. Using either Consortium earmark dollars and/or pooled college/university resources, the COF partners will develop a joint marketing brochure for the COF bioscience program to be distributed to local high schools, One-Stops, and other recruiting locations. Likewise, a page on the Bioscience Consortium website could be developed to market the COF program, including easily understandable quick reports from NCSC's economic modeling software. The vendor has given NCSC permission to share such reports with partners (**Appendix 9**).

III. Program Diversity and Economic Impact (Criterion #7 and #9)

A. Does the proposed program enhance all of the participating institution's ability to attract an ethnically diverse student population who are eligible to receive these scholarships, and will the proposed plan of action attract students who otherwise could not afford to attend a university and/or college, especially first generation students.

The key to ensuring that diverse, first generation and/or economically disadvantaged populations is to minimize the cost of education, through articulated/dual credit and scholarship, to local students regardless of where they enter the pathway. The following chart illustrates proposed scholarships over the five year period. Note that in years 3 and 4 the AU scholarships increase to accommodate associate degree transfer students.

Annual Scholarship Projections, Choose Ohio Bioscience Partners

	Year 1	Year 2	Year 3	Year 4	Year 5	Totals
Ashland University						
Tuition and General Fees [1]	$24,342	$24,829	$25,325	$25,832	$26,349	
COF Scholarship	$4,700	$4,700	$4,700	$4,700	$4,700	
Institutional Scholarship [2]	$11,000	$11,000	$10,500	$10,300	$10,300	
Annual Scholarships [3]	15	30	38	46	23	
Total COF Contribution	$70,500	$141,000	$178,600	$216,200	$108,100	$714,400
Bachelors Awarded				23	23	46
Ohio State University -- Agricultural Technical Institute						
Tuition and General Fees	$5,976	$6,096	$6,217	$6,342	$6,469	
COF Scholarship	$2,200	$2,200	$2,200	$2,200	$2,200	
Institutional Scholarship [4]						
Annual Scholarships	5	10	10	10	5	
Total COF Contribution	$11,000	$22,000	$22,000	$22,000	$11,000	$88,000
Associates Awarded		5	5	5	5	20
North Central State College						
Tuition and General Fees	$3,706	$3,780	$3,856	$3,933	$4,011	
COF Scholarship	$2,080	$2,080	$2,080	$2,080	$2,080	
Institutional Scholarship						
Annual Scholarships	6	12	12	12	6	
Total COF Contribution	$12,480	$24,960	$24,960	$24,960	$12,480	$99,840
Associates Awarded		5	5	5	5	20
Lakeland Community College						
Tuition and General Fees	$4,126	$4,209	$4,293	$4,379	$4,466	
COF Scholarship [5]	$4,700	$4,700	$4,700	$4,700	$4,700	
Institutional Scholarship						
Annual Scholarships	2	4	4	4	2	
Total COF Contribution	$9,400	$15,400	$15,400	$15,400	$6,000	$61,600
Associates Awarded		2	2	2	2	8

[1] All institutions assume a 2% annual increase from 08-09 cost

[2] AU merit scholarships will vary in value from $6,000 to $13,000 per year for the freshman cohorts, with an average value of $11,000. AU merit scholarships will vary in value from $7,000 to $10,000 for the transfer cohorts, with an average value of $9,000.

[3] Assumes two cohorts each of eight transfer students beginning to receive scholarships in Year 3 that meet all AU articulation criteria

[4] Each year ATI gives out $60,000 in institutional scholarships which could support the program as seen fit

[5] 1st year tuition/fees is $4,700, second year is $3,000

The plan would result in 46 bachelor degrees awarded by AU at the conclusion of the project. This would include 30 students starting their education at AU and 16 transfer students from the partner two-year colleges. Given the intent of the COF program to "**sustain the student's scholarships over their entire program of study until graduation",** first priority for awarding these transfer scholarships will be given to qualifying COF students who have attained their associate degrees. Those not awarded to qualifying COF transfers could then be distributed to other transfer students to ensure their distribution. This would increase bachelor's access for all the students in these associate programs and provide further incentive for all of them to perform academically to attain a merit scholarship.

As stated before, this plan assumes many of these students will be arriving at college with dual or articulated credit from high school or adult programs, further reducing the cost to students. Many of these students will also qualify for federal and state/local grant aid. According to the National Center for Education Statistics, in 2006-07 the following percentage of full-time first-time degree-seeking students at LCC, NCSC, ATI and AU, respectively received such grants: 38%, 42%, 30%, 24% (federal) and 35%,13%, 20%, 90% state. Finally, since most of these students will be from the region, in many cases they can reduce costs by commuting to classes from home.

All of the COF partner schools are concerned with ensuring ethnic diversity for scholarship recipients. While program graduates will be unlikely to go into criminal forensic science, the success of television programs like CSI will make these programs appeal to a wide population base – especially if marketed correctly.

At the secondary level, the dual credit program should help attract more diverse, first generation and/or economically disadvantaged students. While the program has rigorous standards, in an attempt to broaden access, the entrance requirements were revised from standard Post-Secondary Option Programs. An e-mail survey returned by 35 high school students in the 2007-08 program pointed to the potential benefits of this approach: 100% indicated their teachers had high expectations of them, 97% reported the DE/DC course was harder than their high school courses and they had to work very hard, **and 69% reported they would be more likely to apply to college after participation in the program.**

At the adult level, a unique social services program at NCSC could also attract more diverse and ethnically disadvantaged students into the scholarship program. Richland Job and Family Services uses public assistance (TANF) funds for an educational/supportive service program for families required to participate to receive cash assistance from Ohio Works First. The program was recently moved to the NCSC campus and is being administered by the college. Services provided include intensive assessment/career exploration activities, basic skills remediation, development of individual career plans, work experience and transportation assistance. Program participants are integrated into the college experience and have access to college courses, a self-paced high school credit recovery program (PLATO) and a special ABLE program for students who have a GED/diploma but score very

low on college placement tests. During the first year on campus, 239 participants were enrolled in the program and nearly two dozen subsequently enrolled at NC State or other colleges.

As previously mentioned, the spike in dislocated workers will also drive more disadvantaged persons to college and hopefully to the biosciences. The biosciences remain one of the few bright spots in a deteriorating economy. When ACWH advertised its adult program launch in conjunction with WIL Research, it immediately filled up. The Richland One-Stop has a satellite office at NCSC, and the counselor there regularly uses easy to read labor market information such as those in **Appendix 9** to advise potential students on beneficial pathways. The proposed brochure or other collateral material such as the EMSI quick reports could be distributed to all regional One-Stops.

On a final note, attraction of diverse and traditionally disadvantaged populations needs to be followed by retention efforts. NCSC is part of a national initiative in student success called Achieving the Dream, focusing at the developmental and gatekeeper level. NCSC research mirrored national patterns in showing that retention dramatically falls for students who fail developmental or gatekeeper courses, especially for traditionally disadvantaged populations. The college has seen tremendous retention success after implementing strategies in 2006, including a revised biology gateway for nursing. The beauty of the COF proposal is that nearly every single partner will be creating a new or revised gateway course for bioscience, and in doing so will focus on balancing student success with rigor. In addition, the focus on faculty mentored undergraduate research at Ashland University is a strong contributor to student retention.

B. Will the proposed plan of action increase the state's or region's capacity in educational or economic areas of need?

The following graph shows educational attainment of Consortium Counties in comparison to state and national levels.

2007 Adult Population with at Least Some College Education

Area	Population	% of 25+ Cohort
Region	279,569	44.72%
State	3,894,587	50.98%
Nation	112,766,251	56.89%

EMSI – Fall 2008

The next chart shows median hourly earnings for all occupations for the same areas:

2007 Median Hourly Earnings

Area	Median Hourly Earnings
Region	$14.41
State	$16.37
Nation	$16.91

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There is certainly a correlation between low wages and low educational attainment. However, the following chart maps projected openings and regional wage levels for common degreed bioscience jobs in agbio and RTML for the Consortium counties (not including OARDC):

SOC Code	Description	2008 Jobs	2013 Jobs	Change	% Change	% of Industry	Hourly Earnings	Education Level
17-2199	Engineers, all other	67	76	9	14%	4%	$32.29	Bachelor's degree
19-2031	Chemists	63	76	13	21%	4%	$22.88	Bachelor's degree
19-4031	Chemical technicians	46	54	8	18%	3%	$17.08	Associate's degree
29-2034	Radiologic technologists and technicians	43	54	11	25%	3%	$21.78	Associate's degree
17-3025	Environmental engineering technicians	40	47	7	17%	2%	$21.06	Associate's degree
29-2011	Medical and clinical laboratory technologists	31	42	11	38%	2%	$22.67	Bachelor's degree
19-4091	Environmental science and protection technicians, including health	24	28	4	14%	1%	$17.23	Associate's degree
29-2012	Medical and clinical laboratory technicians	20	24	4	22%	1%	$16.88	Associate's degree
19-4021	Biological technicians	20	22	2	10%	1%	$17.12	Associate's degree
17-2041	Chemical engineers	16	19	3	15%	1%	$35.32	Bachelor's degree

Source: EMSI Complete Employment - Fall 2008

These do not include replacement estimates, which will increase the number of annual openings. Even the associate degree positions are far above the median regional wage for all jobs. Further, employment increases in these high-technology fields will have significant ripple effects in the local economy. The following chart estimates the ripple effect of adding 147 jobs (as projected) in the testing laboratory sector for the region:

Description	
Year	2007
Jobs Change	275
Earnings Change (in thousands)	$11,236
Earnings/Worker Change	$2.13
Sales Multiplier	1.59
Jobs Multiplier	1.87
Earnings Multiplier	1.49

Source: EMSI Complete Employment – Fall 2008

The economic modeling software projects that adding 147 new jobs in this industry would actually create more than 125 spin-off jobs. This would increase total earnings in the region by more than $11 million.

IV. Program Quality & Relation to Academic Mission (Criterion #1, #4, #5)

A. Are the STEM programs chosen to receive scholarships at all of the participating universities/colleges currently of high academic quality, and will the requested additional resources significantly enhance future quality?

Details by institution (see consultant/instructor biographies and program summaries in **Appendix 10**). Note all programs are led by instructors with doctorate degrees.

- AU has a strong track record of preparing students for industry, professional schools and graduate school. In the last five years 18 AU graduates have gone on to health- related professional programs, and 19 have entered M.S. and PhD programs. Many of our other students go straight into industry positions, often within the state, including nine graduates from the last five years who have taken positions with WIL Research Laboratories, a partner in this proposal. All of our eight full-time faculty members hold Ph.D. degrees and involve students in their independent research. Students who conduct research with faculty acquire essential skills for success in future STEM careers. AU recently received a $60,000 grant from the Merck/AAAS Undergraduate Research

Program to directly support student summer research, and three of our faculty members currently support summer research students with external federal grants. AU and WIL Research are also in the final stages of implementing a formal internship program. AU spends $50,000 a year on science equipment purchases and maintenance, with equipment used in both the classroom and research lab. Furthermore, $12 million was recently invested in renovation and expansion of its science building. AU has one of only six undergraduate toxicology programs in the country and an American Chemical Society accredited biochemistry major.

- ATI: ATI is implementing an AAS in biotechnology/ag/bioscience in Fall 2009. It is a revision of the current ATI Laboratory Science major involving major changes. Dr. Carri Gerber has been hired from the Cleveland Clinic to develop and instruct the new major. Her work at the Clinic focused on recombinant DNA technology. Dr. Gerber worked very closely with the ATI Academic Affairs Committee in developing the new courses to ensure their innovation, and ATI has purchased nearly $50,000 in new equipment to support the major.

- North Central State College. Five new courses were designed for the bioscience certificate in consultation with staff from WIL Research, and will be taught by Dr. William Urban, D.V.M..The courses with a major histology focus are part of A.A.S. in Health Services Technologies recently approved by the Regents. The program was designed to provide a cross-trained worker in various health care related environments. It combines a core of science (biology, chemistry, microbiology, anatomy/physiology), general education and two "stackable certificates" including bioscience. Nearly all of the certificates correlate to recognized industry credentials. Other concentrations students can choose from include emergency medical technician, phlebotomy, state-tested nurse assistant, dialysis technician, surgical technician, and community health worker. The flexible program will articulate with both secondary and adult career technical education programs. The program has a dedicated lab serving up to 20 students, and the college has secured $60,000 in grant funds thus far for new equipment purchases.

- Lakeland: Lakeland's bioscience technology program is the first of its kind in Northeastern Ohio, led by Dr. Joseph Deak. The program provides students with both in-depth understanding and hands-on experience in a wide range of bioscience laboratory techniques. During the final stage of the program, students are provided an internship at a local academic or industrial laboratory. The Bioscience Technology program prepares students for entry-level laboratory technician positions in research and industrial laboratories engaged in biotechnology. The program emphasizes hands-on training utilizing industry standard equipment to perform both routine and specialized experimental techniques. Classes can lead to either an A.A.S. degree or academic certificate for students who already hold a bachelors' or associate with a basic science background.

These colleges will offer quality programming regardless of COF funding. However, scholarships will free up, as well as leverage, other dollars such as SSI that in turn can be redirected back into the program for equipment, new curriculum, etc.. The sensitive nature of the bioscience industry demands relevant programs with continual upgrades in curriculum and equipment, so this stream of students and related revenues will help offset resources required to update.

B. Do the proposed admissions criteria ensure that a student who is awarded a scholarship is appropriately qualified, and will the proposed program of study significantly enhance the student's ability to successfully complete their baccalaureate degrees in a cost effective and timely manner?

Admissions criteria for Lakeland Community College's bioscience program include: 1. Completion of high school chemistry with a grade of "C" or above or successful completion of CHEM 1100 Elementary Chemistry. 2. Successful completion of MATH 1500 Intermediate Algebra or placement into MATH 1650 College Algebra.

Admissions criteria for North Central State College's Associate of Applied Science in Health Technology include: 1. Completion of high school chemistry (minimum C-) or CHE 100 Introductory Chemistry (minimum C-). 2. Completion of MTH 103 Introduction to Algebra or Compass algebra score of AR 31 or higher or ACT Math subtest of 21.

Admissions Criteria for AU: Minimum requirements are an ACT of 18 and a high school GPA of 2.5. However, the sciences at AU targets students for recruitment with an ACT of at least 23.

Admission Criteria for OSU-ATI: Ohio State ATI strongly recommends, but does not require, the following minimum high school preparation for new students pursuing the Associate of Applied Science degree: 4 units of English; 3 units of mathematics; 2 units of science, not including general science; practical experience, including agriculture or horticulture education, may also be beneficial.

Project Lead the Way programs can articulate up to four classes. For ACWH's program, there are 12 quarter hours articulated with NC State: BIO 105, CHE 110 and HLT 100. There are 17 semester hours with Lakeland Community College: BIOS 1050 Intro to Bioscience - 3 hours, BIOS 1200 - Bioscience Lab skills - 5 hours, BIOL 1510 Principles of Biology - 4 hours and CHEM 1500 - General Chemistry I - 5 hours. ACWH is discussing articulation with AU and intends to enter articulation discussions with ATI. For ACWH's adult program, 4 quarter hours are articulated for HLT 100 with North Central State.

NCSC, LCC and ATI will then enter articulation agreements with AU's various programs to maximize credit transfer for COF students and allow them to complete their bachelor degrees in an efficient manner. Other articulated bachelor's pathways for these students would include LCC to Ursuline College (2 + 2) and to Ohio State University's main campus for ATI students. This articulation between the secondary/adult career tech, associates and bachelors levels will allow regional students to maximize transfer.

In addition, the three associate schools will enter discussion for articulation amongst themselves at the associate level. This could also help reduce cost to students who wish to take a core of general education and science courses at a home campus, but possibly specialize at another two year campus. Further, since most of the institutions are all within driving distance, they wouldn't even need to incur the cost of room/board.

To the degree possible, the COF partners will also attempt to accommodate the unique schedules of students, especially adults and incumbent workers. All the schools offer online courses. In addition, NCSC offers classes during the evenings at ACWH High School, Bucyrus High School and Willard High School via video-conference. Consequently, an incumbent worker at WIL Research could complete a major portion of their degree without leaving Ashland County, including some technical science courses.

Depending on the articulation discussions and technology capabilities, an expansion of distance learning opportunities may be feasible if there is demand. This could potentially involve bachelor courses beamed from AU to NCSC, LCCC and/or ATI. It could even involve ATI beaming courses to NCSC if demand presents itself, allowing Mansfield-area students wishing to focus in ag/bio to supplement transferable general education and core technical courses with ATI coursework.

C. Are the academic programs chosen to receive scholarships clearly integrated with the university/college's mission, and does the proposed plan of action facilitate a more efficient use of existing faculty and academic programs?

The NCSC mission is to: "*Provide quality, responsive, lifelong learning opportunities, including occupational, degree and other educational programs for individuals, business and industry, and the communities we serve."* Flowing from this mission, NCSC has embarked on an ambitious strategic planning process heightening its role as a regional convener for workforce development solutions to industry demand. It played a founding role in the NEO Bioscience Consortium, helped attract and administer a $250,000 Regional Innovation Grant for EDR 6, and also serves as the Ohio Skills Bank Coordinator for the Region.

The LCC mission is "To provide quality learning opportunities to meet the social and economic needs of the community." While not located within the core NEO bioscience consortium counties, LCCC has nonetheless been actively involved in consortium meetings and activities. It believes its involvement in the consortium/COF proposal can benefit both the consortium region and the LCC service area. LCC's accredited bioscience technology program is the most established in Northeast Ohio, and their program offers a full bioscience associates leading to careers in any conceivable bioscience-related industry. Despite the distance and lack of on-campus housing, it has actively recruited and offered articulation to Ashland PTLW students. One senior is seriously considering enrolling in its program. It is the only COFS partner to offer a complete scholarship (two per year) for the length of the grant, upon which students could return to AU to complete their bachelors. LCC is also interested in learning from the rural outreach efforts of the Consortium, as it wishes to replicate this effort for its program in rural high schools east of its campus, particularly Madison High School and schools in Ashtabula County. Madison High School just adopted the PLTW biomedical curriculum and LCC wishes to encourage this expand PLTW and/or science dual credit into Ashtabula County, which was recently designated a part of Appalachia.

ATI's mission is: "to provide associates degrees in agriculture, horticulture, environmental science, business and engineering technology." With a high value placed on lifelong learning, we provide accessible, high-quality, applied education experiences." It is the only higher education institution in Ohio with a Board of Regents statewide mandate for comprehensive associate degree agricultural and related sciences education, and this major directly ties to the emerging field of agricultural bioscience.

AU's mission is: "educate and challenge students to develop intellectually and ethically, to seek wisdom and justice, and to prepare for the rigors of living and working as citizens aware of their global responsibilities." The academic rigor involved with AU's bioscience programs is obvious, but there are two other major mission connections in AU's proposal. First is the planned service learning credit option for mentoring high school students. Second is the linking of science and entrepreneurial education.

Each of these programs has unique aspects: NCSC (histology certificate integrated within a general health technician degree); LCC (comprehensive general bioscience degree), ATI (comprehensive degree with focus on agricultural bioscience and related fields). Credit flows into these programs from secondary (PTLW, AP, dual credit) and adult career technical. Likewise, credit flows out of these programs and into AU, or other universities not part of this proposal. Moreover, the increasing sense of collaboration amongst Consortium education partners, mixed with the technology investments each has made, opens the door to shared distance learning models as previously discussed. This could involve two-year college to two-year college, or AU to two-year college for bachelor completion.

IV. Metrics (Criteria #10)

A. Are metrics proposed to demonstrate specific successes by STEM graduates in fields that match the high technology economic strengths of Ohio?

Certainly the COF partners intend the prescribed baseline and annual report (beginning 2010) data. The partnership believes that additional period measurement could assist in both formative and summative evaluation. One measurement vehicle already exists in the employer workforce survey by BioOhio that could be replicated with regional bioscience employers. This could be complemented by the planned business satisfaction survey to be administered by the Regents.

In addition, there are elements of the Ohio Department of Development strategic plan that could be localized and made industry-specific. These include versions of: job growth measurement and related income, productivity measurements, new business formation, and announced major private investment projects. NCSC employs economic modeling software (Economic Modeling Software, Inc. or EMSI) that can assist in estimating past and projected labor market trends down to the NAICS/SOC code and county level (see example below). Statistics on new business formations and expansions can be tracked through data-sets at ODOD's Office of Strategic Research.

Top Occupations in Regional Agbio and RTML

SOC Code	Name	2008 Jobs	2013 Jobs	Change	% Change
17-2199	Engineers, all other	67	76	9	13%
19-2031	Chemists	63	76	13	21%
51-9061	Inspectors, testers, sorters, samplers, and weighers	54	61	7	13%
51-8091	Chemical plant and system operators	47	63	16	34%
19-4031	Chemical technicians	46	54	8	18%
29-2034	Radiologic technologists and technicians	43	54	11	26%
43-9061	Office clerks, general	41	48	7	17%

Source: EMSI Complete Employment - Fall 2008

There are numerous elements of potential qualitative evaluation as well. For example, the colleges will collect and analyze evaluations from supervisors of student internships. Also, at AU students conducting independent research or internships will be required to give presentations that will be judged to assess the effectiveness of the program.

V. Stakeholder Commitment and Sustainability (Criteria # 6)

Is the amount of institutional, public and private resources pledged to the proposed program sufficient to achieve the proposal's objectives, and will these resources sustain the student's scholarships over their entire program of study until graduation?

The COF partners have nearly **doubled** the required 1:1 match for this proposal, as detailed in the accompanying budget. This includes the 10% cash line item. The partner investments largely include curriculum development, equipment, institutional scholarships and project management/evaluation.

While all partners will contribute on at least a 1:1 basis, Ashland University's match equals nearly 2.3 times the requested amount. As there is currently no public university main campus within reasonable commuting distance of many Consortium counties, AU feels these combined scholarships will provide a cost-effective alternative.

The investment of the federal earmark grant cannot be understated as a complement to achieving program objectives. This includes both direct pledges largely funding the matches of partners like NCSC, but also indirect support in the form of: professional development and externships for K-12 science teachers; construction of a new bioscience lab at ACWH; curriculum development at ACWH and Ashland High School, internship opportunities for high school students; creation of an adult workforce program at ACWH; entrepreneurship education services through AU and the regional Edison business incubator; and general project coordination.

In addition, the Consortium has been invited to apply for a future earmark grant which is currently in the process of drafting in consultation with Ohio congressional offices. The Consortium has hired its own grant writer as a sign of commitment to future funding.

In addition to the grant funding, the support of employers is also crucial to this effort, especially in terms of internships experiences. Specifically WIL Research Laboratories, LLC, the Ohio Agricultural Research & Development Center, and Clinical Management Research, Inc., will provide internship opportunities for students as evidenced by their support letters, within their institutional limitations (**Appendix 11**). The COF partners intend to monitor when internship funds become available from the Governor's 2008 Jobs Stimulus package and coordinate with these employers to access these funds and expand internship opportunities.

Other potential support from these companies includes: validation of new curriculum being developed, referrals of the non-degreed incumbent workforce, and continuing outreach to future prospective workers such as facility tours for youth. These employers have already been actively involved in these areas through the Consortium and on their own.

All the partners have proposed allocation of scholarships on a cohort basis so that a student who is awarded a scholarship will have funds to carry him/her through to graduation at the associate or bachelor's level. There is even a provision of scholarships for 16 qualifying transfer students at AU out of 30 assumed associate graduates in Years 1-3. Unused transfer scholarships can be allocated for other qualifying associate degree students to provide them a pathway at AU. In addition, transfer scholarships can be provided to recruit students into the freshman cohorts should some of the freshmen leave the program before graduating.