

# **Engineering and Technology Industry Council Campus Investment Proposal Biennium from July 1, 2009 to June 30, 2011**

**Campus: Eastern Oregon University**

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## **Summary of Proposal:**

EOU will advance STEM education and lead the technological preparation of students in Eastern Oregon. This proposal requests funds to grow the CSMM and pre-engineering programs, create a unified physical environment for the programs, and actively work to recruit and retain qualified students. In addition, the institution will actively seek collaborations within OUS and private industry to strengthen STEM course delivery and research.

## **Vision Statement**

Eastern Oregon University seeks to continue to provide leadership in the delivery of state-of-the-art technological education and development and maintenance of a STEM pipeline in Eastern Oregon. EOU provides students the opportunity to study pre-engineering and traditional computer science, including software development, network administration, scientific computing and robotics. We also offer a unique concentration in multimedia design and development that prepares students for work and research in interactive graphical applications such as web development, instructional software, and simulation and gaming. Graduates enter industry as software development professionals or pursue graduate degrees.

## **Aspirational Peers**

Owing to the inclusion of multimedia studies in EOU's computer science program, we find ourselves in the unique position of being the only program of our kind. We have nevertheless identified two programs with some common ground.

At Wake-Forest University, the computer science and art programs recently completed an NSF-funded collaborative effort to define a curriculum for digital media. The materials developed as part of this effort are in use nationally and represent an inspirational

synthesis of ideas. Still, the digital media curriculum does not prepare students for development of interactive software.

The computer science program at Virginia Tech has long included some courses in multimedia development, but there is still no specific concentration in multimedia.

## **Long-term Goals**

### *1. Degrees Granted and Credit Hours Delivered*

In 1999 the CSMM program had just been initiated, and there were no graduates as yet (see <http://www.eou.edu/ir/documents/TenYearGraduates.pdf>). In the seven years since the first graduate in AY '00-'01, 41 students have received the BS degree from the CSMM program. Our goal for five years from now (2013) will be to award 18 degrees in CSMM, and 26 in 2020. As will be discussed in the section that follows on "Investment Description" we believe that these are achievable goals.

Furthermore, currently (Winter 2008) there are 66 undergraduate students enrolled in the 15 courses offered by the program, taking a total of 402 credit hours (note that most of these students are in more than one class). By 2013 we propose to offer more courses, so that we would expect the latter number approximately to double. This can be accomplished both by increasing the number of courses offered and by growing enrollments. Since the CSMM courses are 3-4 credits (depending on the number of class meetings per week), an average enrollment of just 20 students in 20 classes per term would more than meet this goal.

### *2. Externally Funded Research*

EOU STEM disciplines have an established culture of promoting and fostering research for undergraduates. Currently several chemistry faculty have relatively small but nonetheless significant grants in STEM education. In particular Professor Colin Andrew is PI on a "Research at Undergraduate Institutions (RUI)" grant from the National Science Foundation. Dr. Anna Cavinato's research involving the use of near infrared technology for the development of non invasive methods of analysis is funded by the Oregon Sea Grant and the Western Regional Aquaculture Consortium. Dr. Hettiarachchi has received funding from DARPA and the Joint Ground Robotics Program (JGRP) to work with students on multi-agent systems, his primary area of research interest. His paper "Simulating Mobile Robots for Undergraduate Research" has just been accepted for presentation at the CCSC-SW 2008 conference and will be published in the *Journal of Computing Sciences in Colleges*. Professor Hettiarachchi is the lead author, along with three EOU students: Eli Cohen, Timothy Willey, and Nathan Schmidt. One of the important components of the proposed project is to increase amount of research opportunities for our undergraduate students.

However, EOU is primarily a teaching institution, and faculty do not have much support or time to seek external funding for research projects. Adding the additional faculty

member to the program staff should allow us some time for grant writing; also, every effort will be made (as with Dr. Hettiarachchi) to recruit an instructor who already has an active research program.

At this time we are not planning on any patent disclosures, license revenue, or spin-off companies, but we are certainly not averse to exploring these issues with our Industry Advisory Board.

### *3. Other desired outcomes*

One major aspect of our activities in the next biennium will be a continuing effort to pioneer a new paradigm of rural, regional educational delivery that includes innovative pedagogy and synchronous multi-modal delivery of courses at a distance. At the same time we plan to increase our recruitment activities, so as to build a STEM Pipeline with community colleges, regional high schools, and even the middle schools through our Girls in Science and Robotics programs. It will be important to develop a better understanding of the regional economic needs, in particular in the vital areas of renewable energy and agro-informatics. Finally, the most important outcome will be a sustainable and vital CSMM and pre-engineering program that serves the needs of the region and the larger community.

## **Investment Description**

### *1. Explain what investments will be made and why*

The total request for the next biennium 2009-2011 is \$875,000. The goals of this project are threefold:

- To create a pipeline in Eastern Oregon of computer science-multimedia and pre-engineering graduates who are able to enter the marketplace with breadth and depth in their education and skills set;
- To create a pipeline in Eastern Oregon for young adults in high school for STEM programs; and
- To double the number of student credit hours in Eastern Oregon region and increase the number of STEM graduates.

### *2. Collaboration with universities and companies within Oregon*

As noted above, the Computer Science/Multimedia Studies Program at EOU is unique in its focus on software development for the whole range of applications, from traditional CS to the latest in multimedia. As such, there is clearly a potential for enhanced collaboration with other universities in the OUS system, as well as with private industry in the region. We propose to recruit an **Industry Advisory Board** from among the major employers in the region. These include, in Union County, Boise Cascade, Nash RV,

Anderson-Perry, the Grande Ronde Hospital and the county government. We will be contacting firms in the rest of the area in the next few months. In this effort, we will be working closely with Mary Beth Horton, Deputy Director of the Business Education Compact, to identify possible collaborators. In an e-mail to Dean Levine of the College of Arts and Sciences, Ms. Horton wrote: “We are so impressed by the passion you have for the work of educating young minds, exposing them to an exciting world of possibilities, and then delivering quality curriculum. It's challenging work, to be sure, but I know that there are many beneficiaries of your efforts who wouldn't have opportunities without your dogged determination and creative energy! I look forward to exploring possible collaborations!” (12/12/2007)

### 3. *Feasibility issues*

- New Faculty

The budget request includes support for two existing faculty along with one new instructor to be recruited over the next two years. The additional faculty member will be responsible for teaching introductory CS courses, freeing up the existing faculty for course development and providing an opportunity to seek new sources of external funding. Currently, we are able to teach all of the courses in the program catalog, albeit by teaching some electives in a biennial rotation, but there is no time or support for grant writing or creating multi-modal course materials. The new faculty member also will be able to help meet the ambitious recruitment goals of the program. One important component of this proposal is that faculty in the CSMM program will be significantly involved in recruitment efforts, working with the area high schools and community colleges to provide a pipeline of incoming freshmen and transfer students (see below).

- Space and equipment.

At present the CSMM program is located in two separate buildings on the La Grande campus. Three faculty, Croft, Thomas and Pratter, along with two labs (the UNIX and Network Security research facilities) are in Badgley Hall, the new Science Center. The parallel processing cluster is also physically located in Badgley. Professor Roy and the two multimedia labs are in Loso Hall, the primary Arts & Sciences building. The proposed plan would be to bring all of the faculty and lab facilities together in a single space. Dr. Jaeger, Provost and VP for Academic Affairs, has agreed to find sufficient space on campus for the program's needs; a memo documenting the space and equipment requirements is attached as Appendix A to this document.

- Recruiting and retention

As noted above, one of the major thrusts of this proposal is to increase the number of Oregon graduates in Computer Science and pre-engineering. To this end, a portion of the new faculty member's responsibility will include recruitment and retention efforts. Some important components of this are already in place, including the award-winning Girls in Science program, the FIRST Lego League robotics tournament, and the High School

Mathematics competition held annually at EOU. We plan on building from this basis of strength to reach out to the schools in the Eastern Oregon region to attract the best and brightest high school graduates and community college students.

One of our most powerful retention tools remains the high faculty/student ratio and the individualized attention that faculty can dedicate to each student. We also anticipate increasing retention in the STEM disciplines by reinstating the pre-engineering courses. Informal assessment points to several cases where outstanding CS students have chosen to leave EOU because of the lack of engineering courses. We hope to remedy this deficiency and better serve our student population.

4. *Strengths, weaknesses, opportunities and threats that your program faces as well as reconciling your plan with your progress vs. previous plans.*

The major strength of our program is its unified focus on application development. As the ACM document “Computing Curricula 2005: The Overview Report” notes:

The development of [software engineering] is a response to a very real problem: a shortage of degree programs that produce graduates who can properly understand and develop software systems. CS programs have shown that they can produce students who have sound skills in programming fundamentals. However, many believe that they have not been successful at reliably producing graduates able to work effectively on complex software systems that require engineering expertise beyond the level of programming fundamentals. In the post-1990s world, many software projects are large and complex, and there is a pressing need for software engineers who can apply professional practices that ensure that software is reliable, meets the goals and needs of users, and is produced on schedule and within budget. (*Joint Task Force for Computing Curricula 2005*, © 2006 by ACM and IEEE).

The CSMM program at EOU focuses precisely on these needs. Although students are provided with a thorough grounding in the fundamentals of CS, the emphasis throughout both the traditional CS curriculum and multimedia studies is on good software development practices.

One possible weakness that must be addressed is the potential supply of students in the Eastern Oregon region. There is no question that qualified applicants are available; our students score in the highest categories on national measures such as the COMAP competition, and have high employment rates on graduation. The question is whether there will be enough of them to meet the goals of this program. The answer is to some extent unknown. We feel that the size of the region, and the population served will in fact generate enough high quality students. Currently, the rate of high school students going on to college in the region is well below state averages. If we can make the program attractive enough, we feel that we can increase this rate up to the state ratios, at a minimum. If so, then we should be able to meet if not exceed our enrollment goals. The need is there. We have only to produce a supply of graduates to meet the growing information technology requirements of the region.

Over the past decade, since the inception of EOU's CSMM program, the number of graduates has gone from four (in physics) to a total of nine last year. We feel that given adequate resources, we can certainly reach the stated goals of 18 graduates in five years and 26 by 2020. Over the past four years, with the help of ETIC support, we have succeeded in building four new CSMM labs and hired one new faculty member, Dr. Hettiarachchi. In addition, EOU's science center now has a high-performance UNIX cluster for research computing. We want to build on these successes to enhance the pipeline of STEM graduates and extend our program offerings in the areas of systems design and application development.

## **Private Support**

No private support will be expected in this biennium. However, the establishment of an Industry Advisory Board will be the first step in seeking private support in the future.

## **Results and Benefits**

### **Short-term**

The proposed enhancements to the CSMM curriculum align with OUS strategies for doubling the number of work-ready technical graduates and contributing to the global competitiveness of Oregon industries, in particular, in the Eastern half of the state. The heart of our proposal is to increase the number of faculty in CSMM, thereby enabling us to offer a broader range of courses, increase enrollments and actively recruit qualified high school graduates and transfer students. In order to support growth in course offerings, the proposal includes a request for expanded infrastructure, including some office space, new lab and research facilities, and updating of existing computer labs.

An increase in the number of faculty will have several desirable outcomes:

- *Enhanced course delivery* – In order to increase the number of graduates and double the number of credit hours, it will be necessary to offer more sections of existing classes as well as new and innovative courses. The latter will focus directly on topics where Oregon industries will require an expanded trained workforce. Our proposal includes a request for funding to establish an Industry Advisory Board comprised of business leaders from Eastern Oregon to help plan for this expansion.
- *New pedagogy for distance delivery* – Eastern Oregon University is already a national leader in the area of distance education, in large part due to the necessity for serving a widely distributed, mostly rural population. The proposed expansion of the CSMM program will provide faculty the time and resources required to develop new course materials and for training in new delivery modalities, in order to make the existing program even more successful.
- *Support for recruiting and retention* – Part of the workload of the new faculty member will be as a part-time recruitment coordinator for undergraduates in the STEM disciplines. In addition, all of the program faculty will be involved in

outreach to high schools and community colleges in the region. Recruitment activities include actively meeting with students throughout Eastern Oregon, along with continued, proactive participation in the highly successful Girls in Science, High School Math and FIRST Lego League events. As for retention of existing students, EOU is nationally noted for its excellent student/faculty ratios and one-on-one support. These strengths are critical for retaining students in our programs. With the proposed increase in the number of students, there must be a commensurate increase in faculty in order for them to continue in this effective mentoring and advising role.

- *Opportunities to seek external funding* – EOU’s existing support for undergraduate research will be enhanced in two ways. First, our faculty currently spends all of their time in teaching and other essential university functions. With more staff, we will be able to devote the time necessary to seeking out and obtain funding for expanded undergraduate research programs. Second, we will actively attempt to hire a faculty member who already has an ongoing research agenda and a record of successful grant applications. We have been fortunate with Dr. Hettiarachchi that, in addition to being an outstanding classroom teacher, he also is actively mentoring a group of students in his research area of multi-agent systems. We hope to be able to recruit a new instructor who is similarly effective.
- *Sustainability* – The continued success of the CSMM program at EOU is dependent on support from ETIC. We are a small, rural teaching institution, in an area of the state where a lot of promising students are unable to afford college. Many of our graduates are the first in their families ever to get a 4-year degree. We cannot depend exclusively on tuition and fees to pay for our programs; there must be a commitment on the part of the state to help us deliver quality education to this underserved population. The funding we have received in the past four years through ETIC recommendations has made it possible to continue teaching CSMM at EOU, and even to grow the program modestly. Now we would like to go to the next level, to achieve “critical mass” in the region, with the eventual goal of making the program self-supporting insofar as possible.

### **Medium-term**

Over the course of the next decade, EOU will have the opportunity to demonstrate that we can in fact achieve the goals we have set forth, with clearly measurable outcomes. We have identified three vital strategic initiatives: to grow the faculty in CSMM and pre-engineering, to create a unified physical environment for the programs, and actively work to recruit and retain qualified students. In addition, we plan to establish collaborative relationships with partners in the OUS system and private enterprise. By 2020, there should be more than 100 majors in the CSMM program (up from approximately 50 at present), so that we can graduate a quarter of these each year. This will make EOU a leader among the regional universities in this important discipline. To maintain the existing high quality of the program, we will require expanded support from the state. In return, there will be strong results for Oregon, providing a qualified base of trained graduates to maintain and enhance our viability in the global high technology sector.

## **Future Plan & Resources**

The future of the CS/MM and Pre-engineering programs at EOU will depend largely on the willingness of the university to support them. In order to achieve our 2013 and 2020 goals we will need continued funding either from general fund dollars or renewed ETIC support for existing faculty and those added between 2007 and 2011. With support and continuing outreach efforts across the university's service area, our enrollments should maintain or grow without outside support. Once faculty seeded with ETIC resources become tenure-track, additional faculty should be funded by program growth.

## Proposed Investment and Private Support Forecast (\$M)

|    |  | Level 0<br>Base Budget |
|----|--|------------------------|
| 1  | <b>Sources of funds</b>  |                        |
| 2  | Base budget for ETIC-related programs – all sources except ETIC allocation & private support | 0.180                  |
| 3  | Proposed allocation from ETIC budget (\$M)   | 0.414                  |
| 4  | Expected private support (\$M)   | 0.000                  |
| 5  | <b>Total (\$M)</b>   | <b>0.594</b>           |
| 6  | <b>Personnel supported (FTE)</b>   |                        |
| 7  | Existing faculty   | 2.0                    |
| 8  | New faculty  | 0.0                    |
| 9  | Existing staff   | 0.0                    |
| 10 | New staff  | 0.0                    |
| 11 | <b>Total</b>   | <b>2.0</b>             |
| 12 | <b>New positions created</b>   |                        |
| 13 | Faculty  | 0.0                    |
| 14 | Staff  | 0.0                    |
| 15 | <b>Total</b>   | <b>0.0</b>             |
| 16 | <b>Uses of ETIC funds in line 3</b>  |                        |
| 17 | New facilities   |                        |
| 18 | Improvements to facilities   | 0.092                  |
| 19 | Laboratory equipment   |                        |
| 20 | Other equipment  | 0.069                  |
| 21 | Other one-time expenses  |                        |
| 22 | Existing faculty salaries & benefits   | 0.219                  |
| 23 | New faculty salaries & benefits  | 0.000                  |
| 24 | Existing staff salaries & benefits   |                        |
| 25 | New staff salaries & benefits  | 0.000                  |
| 26 | Services & supplies  | 0.034                  |
| 27 | Other  |                        |
| 28 | <b>Total</b>   | <b>0.414</b>           |

**Metrics Forecast (for programs/departments receiving ETIC funding):**  
**Level 0 Base Level Funding**

|   | Actuals (1) |      | Projected (2) |      |      |
|---|-------------|------|---------------|------|------|
|   | AY 99       | AY07 | AY11          | AY13 | AY20 |
| Undergraduate student credit hours          | 0           | 2666 | 2860          | 2800 | 2950 |
| Graduate student credit hours               |             |      |               |      |      |
| Graduation rate, 6-year                     |             |      |               |      |      |
| Bachelor's degrees granted                  | 0           | 9    | 10            | 12   | 14   |
| Master's degrees granted                    |             |      |               |      |      |
| PhD degrees granted                         |             |      |               |      |      |
| Women graduating                            | 0           | 11%  | 11%           | 11%  | 11%  |
| Minorities graduating                       | 0           | 33%  | 33%           | 33%  | 33%  |
| Externally-funded research expenditures     |             |      |               |      |      |
| Invention disclosures                       |             |      |               |      |      |
| License/options                             |             |      |               |      |      |
| License income received                     |             |      |               |      |      |
| Spin-off Companies                          |             |      |               |      |      |
| National ranking of <program or department> |             |      |               |      |      |

With support from ETIC we have been able to increase the program size modestly. Without increased funding, we anticipate being able to maintain the current level of offerings. We would not have the resources to carry out the recruiting program needed to reach critical mass.

## **Appendix A. Memo documenting space and equipment requirements**

**To:** Anna Cavinato  
**Re:** Proposed CSMM Facility Requirements  
**CC:** Richard Croft  
**Date:** January 15, 2008

The following represents plans for the ideal facility for the CSMM program. Obviously reality has a way of getting in the way of the ideal, but it seems reasonable to propose a goal and then see how much of this would actually be achievable.

### **1) Office space for 6 faculty and a lab manager**

Currently the CSMM program has four instructors: Croft, Hettiarachchi, Pratter and Roy. The ETIC proposal includes two new faculty and a lab technician. Assuming 150 sq.ft. per office, we would need 1050 sq. ft. for seven offices. At present 3 of the CSMM faculty are in Badgley and one in Loso. Clearly it would be better for them all to be in a single location.

We would need office furniture such as desks and chairs. Our existing file cabinets and bookshelves could be moved, but this would require the services of a truck and a crew for a day.

The offices would need to be wired for phone and computer access.

### **2) New multi-modal classroom**

The ETIC proposal includes one new classroom for multi-modal delivery. We would need audio and video capabilities, desks and chairs if not already provided and high-bandwidth network access. The classroom should seat about 25 students. The classroom would be needed five days a week during regular instructional hours, but could be available for other programs at times when the CSMM program was not using it.

### **3) New computer lab**

The current 2007-2009 ETIC proposal included funds for a new computer lab. If we set the goal of 40 workstations, we would need about 1200 sq. ft. of space. In addition, we could use the 25 existing systems in BH 123 but these are getting near the end of their useful life. It would probably be more prudent to purchase 40 new systems at a cost of about \$75K including software. We would also need to cable the room with power and network access and provide adequate HVAC for that many systems.

We also should include an additional \$10K to replace our old network servers, which are also getting on in years. We will need a space with adequate ventilation to house the servers.

We will also need tables and chairs for the computers.

Note that students will need access to the lab at night and on weekends when the building would normally be closed.

### **4) Move parallel-processing cluster computer system**

The cluster is currently installed in the basement of Badgley. When Fred Ziari visited he noted that the power supplies for the computer are underneath the main snowmelt returns for the building. A leak in one of the pipes is potentially disastrous and could cause a serious fire, not to mention destroying a \$50K server. Ideally, we should move this system to someplace safer (and more accessible). The cluster generates about 14000 BTUs per hour, so adequate ventilation would be essential.