

Education and Student Affairs Committee

Board of Regents, State of Iowa

Subject: University of Northern Iowa Proposed Program in Bioinformatics

Prepared by: Anthony G. Girardi

Date Submitted: June 7, 2004

Recommended Action:

Approve the University of Northern Iowa's proposal to establish a new Bachelor of Science degree in Bioinformatics.

Executive Summary:

The University of Northern Iowa has requested approval for a new Bachelor of Science degree in Bioinformatics in the Department of Computer Science, College of Natural Sciences. UNI's program proposal was part of the University's curriculum changes submitted to the Board of Regents in March 2004.

The Interinstitutional Committee on Educational Coordination (ICEC) and the Board Office have reviewed the program proposal and recommend it for approval. The program meets the Board of Regents criteria for new programs.

Background:

No conditions on Board approval

The ICEC indicated to the Board Office that its recommendation for program approval is made on the condition that both SUI and ISU may, in the future, also seek and be granted approval to offer Bachelor of Science degrees in Bioinformatics. The Board Office recommends approval of the proposed program without such a proviso. The Board of Regents is not bound by this proposed condition and will review each new program request on its own merit according to Board policies and procedures.

Analysis:

Review of New Program Criteria

The following is an analysis of the program proposal with respect to the Board's criteria for new program approval.

Program aligns with UNI mission

Centrality. As an undergraduate degree program, the proposed program aligns with UNI's mission as a comprehensive college. The Bioinformatics program will build on and combine courses from four departments. In addition, persons with bioinformatics skills are in great demand in biosciences industries. By preparing students with these skills, the program may help to address critical local and state needs. Addressing such critical needs is an explicit institutional goal.

Program supported through reallocation

Costs. Resources for the proposed program will be reallocated by the Provost's Office. The estimated incremental costs during the first year will be \$111,000, primarily for one faculty position. A second faculty

position will be needed in the third year of operation. Total incremental cost increases associated with the program over three years are estimated at \$223,000.

Bioinformatics skills expected to be in high demand

Need/Demand. The field of bioinformatics is widely forecast to have high demand for skilled persons in the coming decade. The U.S. Department of Labor, Bureau of Labor Statistics (Occupational Outlook Handbook 2004-2005), projects strong demand for computer specialists, such as bioinformatics specialists, in pharmaceutical and medical research and development. In Science And Engineering Workforce: Realizing America's Potential (NSB 03-69, 2003), the National Science Foundation lists bioinformatics as one example of an "area of national skill needs."

Program provides interdisciplinary skills

Quality. The proposed program would offer focused professional preparation for careers in bioinformatics and expand lifetime learning opportunities. The work of professionals in the field of bioinformatics demands effective interdisciplinary cross-training to master the language and techniques of computer science, biology, chemistry, and mathematics. The proposed program will support instruction, research, and training in these areas.

Program not offered elsewhere in Iowa

Duplication. There are no other undergraduate degree programs in Bioinformatics in Iowa. There are graduate programs at ISU and SUI for which this major would provide appropriate preparation.

Program matches UNI strategic plan

Link to Institutional Strategic Planning. The proposed program is consistent with the university's stated commitment to intellectual vitality. In addition, the proposed program addresses the goal stated in the University Strategic Plan "addressing critical local, state, national and global needs that also enrich the educational experiences offered by the University."

Program aligns with Board strategic plan

The proposed program is also consistent with the following objectives of the Board's 2004-2009 Strategic Plan:

- Objective 1.1. Offer high-quality programs through ongoing program improvement for undergraduate, graduate, professional, and non-degree students and special school students.
- Objective 1.3. Provide educational experiences that enhance the knowledge, abilities, opportunities, and personal incomes of individual Iowans through educational attainment.

Post-Audit Review

As called for in the Board of Regents' Policy Manual, § 6.07, the University is reminded that a post-audit report will be due on this program in June, 2009.

New Program Review Questions

The University's responses to the Board of Regents New Program Review Questions are attached to this memorandum.

REGENTS PROGRAM REVIEW QUESTIONS

UNI contact for new programs:
DEPT/SCHOOL: Computer Science
Program Title: Bioinformatics (B.S.)

Susan Koch, Associate Provost
COLLEGE: Natural Sciences

1. Need

- a. How will this proposed program further the educational and curriculum needs of the students in this discipline?

The undergraduate program in Bioinformatics will support instruction, research and training in those areas that join biology with the computer sciences, mathematics, and chemistry. The program will encourage undergraduate students and faculty to work together to study mathematical models of biological systems, databases, pattern matching, modeling and simulation tools, and to conduct basic studies of bioinformatics tools for integrating and interpreting data.

- b. How does it further the educational and curriculum needs of other units in the college or university?

This is an interdisciplinary program involving the departments of Biology, Computer Science and Mathematics.

2. Relationship to other programs

- a. What programs in this field of study are available in other colleges and universities in Iowa?

There are no other undergraduate degree programs in Bioinformatics in Iowa.

- b. With what representatives of these programs have you consulted in developing this proposal? Provide a summary of the reactions of each institution consulted.

University of Iowa, Dept. of Computer Science - We have received a strong letter of support for this new major (see attached). Additional consultation is also underway with the College of Medicine and the College of Nursing. Iowa State University, Dept. of Computer Science - We have sent information requesting review of this proposed major and a response is pending.

- c. In what ways is this proposed program similar to those mentioned above? In what ways is it different or does it have a different emphasis?

This is an undergraduate program. There are no similar programs at the Regents' institutions. However, there are graduate programs at ISU and SUI for which this major will be appropriate preparation.

- d. How does the proposed program supplement the current programs available?

Not applicable.

- e. Has the possibility of some kind of inter-institutional program or other cooperative effort been explored? What are the results of this study?

No.

- f. Please list the Iowa institutions in which articulation agreements are being developed for the proposed program (NOTE: This applies only to community college degree programs which may transfer students to this program).

There are none specific to this program at this time.

- g. Please provide the Classification of Instructional Program (CIP) Code for the proposed program.
26.9999 BIOLOG SCIENCES/LIFE SCIENCES OTHER

- 3 Estimate the enrollment in this program for the next five years.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
a. Undergraduate:					
Majors:	10	20	40	45	45
Non-majors:	0	0	0	0	0
b. Graduate:					
Majors:	0	0	0	0	0
Non-majors:	0	0	0	0	0

- c. On what basis were these estimates made?

Survey of student interest.

- d. What are the anticipated sources of these students?

High schools in Iowa and nearby states.

4. Provide any available data or information on employment opportunities available to graduates of this program in Iowa and nationally.

The Bureau of Labor Statistics does not presently have a separate category for Bioinformatics but covers the area generally under the term "Biotechnology" with the following comments:

"Biological and medical scientists enjoyed very rapid gains in employment between the mid-1980s and mid-1990s, in part reflecting increased staffing requirements in new biotechnology companies. Employment growth should slow somewhat as increases in the number of new biotechnology firms slow and existing firms merge or are absorbed into larger ones. However, much of the basic biological research done in recent years has resulted in new knowledge, including the isolation and identification of new genes. Biological and medical scientists will be needed to take this knowledge to the next stage, which is the understanding of how certain genes function within an entire organism, so that gene therapies can be developed to treat diseases. Even pharmaceutical and other firms not solely engaged in biotechnology are expected to increasingly use biotechnology techniques, spurring employment increases for biological and medical scientists. In addition, efforts to discover new and improved ways to clean up and preserve the environment will continue to add to growth. More biological scientists will be needed to determine the environmental impact of industry and government actions and to prevent or correct environmental problems. Expected expansion in research related to health issues such as AIDS, cancer, and Alzheimer's disease also should result in employment growth."

A Sloan Foundation study (including biotechnology) in 1999 found:

(http://www.sloan.org/programs/scitech_page4.shtml)

"The results of our current survey make it clear that the majority of these jobs are not being filled by graduates of formal programs" who by our count represent about 15 percent of the positions advertised in 1997. And, we believe the 15 percent figure to be an overestimate given that ads have been growing over time and our most recent ad count is for 1997, a year earlier than our hiring data. This leads us to

infer that most of the advertised positions are being filled by individuals trained in informal programs and by individuals who change jobs. The distinct possibility exists that a number of these jobs remain vacant for a period of time, an issue not studied here. Furthermore, our pipeline estimates (see Table 2) lead us to conclude that the number of individuals currently enrolled in formal programs falls far short of the number of positions that have recently been advertised.”

According to the California Healthcare Institute, more than 170,000 California residents work for biomedical companies, a number projected to grow 30 percent over the next 10 years. Eighty-one percent of California companies expect to expand research and development facilities within the next two years.

5. Are there accreditation standards for this program?

No

- a. What is the accreditation organization?

Not applicable.

- b. What accreditation timetable is anticipated?

Not applicable.

6. Does the proposed program meet minimal national standards for the program, e.g., Council of Graduate Schools or other such bodies?

Yes

7. Report any reactions of the Iowa Coordinating Council for Post-High School Education.

Pending

Additional Resource Needs

1. Will the program require new resources? No XXX

2. Will the program require reallocated resources? Yes XXX

If yes, what is the university's reallocation plan to fund this program?

Because this program is highly interdisciplinary and includes courses from the departments of Biology, Chemistry and Mathematics, as well as courses from Computer Science, the reallocation of resources will involve four departments within the College of Natural Sciences. Two new FTE faculty will eventually be needed to support this program. One line will be allocated at the Provost level. A second line will be allocated at the College level as soon as is financially possible. We expect an ongoing annual expense to purchase, maintain and service a specialized computer server for bio-informatics databases. The CNS equipment budget along with allocations from student computer fees will support this cost. Library costs will be supported through the Library budget.

3. At what level of enrollment will additional resources be required for the program?
See below

4. For programs planning to use external grants, what would be the effect of the grant termination?

NA

5. Estimate the total cost (or incremental increases in expenditures) that may be necessary as a result of the new program for the next three years:

ESTIMATED INCREMENTAL COST				
		First Year	Second Year	Third Year
(1)	Faculty	\$100,000.00	\$0.00	\$100,000.00
(2)	Graduate Assistants	\$0.00	\$0.00	\$0.00
(3)	General Expense	\$2,000.00	\$0.00	\$2,000.00
(4)	Equipment	\$3,500.00	\$3,500.00	\$3,500.00
(5)	Library Resources	\$2,500.00	\$0.00	\$0.00
(6)	New Space Needs	\$0.00	\$0.00	\$0.00
(7)	Computer Use	\$3,000.00	\$0.00	\$3,000.00
(8)		\$0.00	\$0.00	\$0.00
	Total	\$111,000.00	\$3,500.00	\$108,500.00