

THE POTENTIAL FOR ARTICULATION BETWEEN BIOTECHNOLOGY PROGRAMS

The fast-growing biotechnology industry in the Pacific Northwest has caught the attention and imagination of science instructors at all levels of education. Elementary classrooms are studying the basic structure of DNA and proteins while junior high school students are isolating and manipulating DNA from bacterial, plant and animal sources. Many area high schools now offer molecular and cellular biology courses for advanced students and a few high schools actually have dedicated biotechnology programs. To meet this widespread interest in biotechnology both community colleges (e.g., Shoreline and Seattle Central) and four-year universities (e.g., SPU) have added biotechnology programs of their own in the last decade. These programs share some goals, especially those related to the teaching of foundational and practical skills, but there are also goals that may differ significantly between these institutions. Community college programs tend to emphasize preparation for entry-level laboratory positions in industry whereas four-year institutions may also place emphasis on teacher training or preparing students for graduate school and pre-professional programs.

The opportunity for articulation among these various programs is wide open and it is not surprising that exploring the potential for such articulation was one of the stated aims of the Biotechnology and Biomedical Skill Standards Project. Seattle Pacific University has trained and placed many teachers in elementary and secondary schools throughout the region. For several years, the Program in Biotechnology at SPU has offered a summer course entitled "Biotechnology Applications for Secondary Teachers" that has introduced basic techniques to teachers who have little or no experience in molecular and cellular biology. We have also seen a growing number of transfer students interested in taking courses within our program. Phase II of the Skills Project has enabled us to study the feasibility of setting up formal articulation agreements with community colleges, beginning with the biotechnology program at Shoreline Community College. The agreement below was formulated by Dr. Bruce Congdon, Professor of Biology at Seattle Pacific University. Aside from allowing a fairly smooth articulation between the Associate of Applied Arts and Sciences (AAAS) degree to a Bachelor of Science degree at SPU, it has the unique element of a "back-articulation": SPU students will be required to take specific, vocationally oriented courses at Shoreline CC (courses not available at SPU). In the current agreement, the two courses identified for back-articulation are "Media and Solution Preparation," and "Tissue Culture and Staining." These topics represent areas that are too specialized for the SPU program to offer at this time; however, they offer important information from which biotechnology students could truly receive benefit. The agreement will continue to undergo review by faculty and administrators at both institutions during the 2002 academic year. Similar articulations could be arranged in the future between SPU and other colleges (e.g., Seattle Central Community College's biotechnology program).

CONCLUDING REMARKS

This voluntary assessment of the Seattle Pacific University Program in Biotechnology has enabled us to compare the design and implementation of our curriculum against skill standards set by representatives of the industry that many of our students hope to enter. Through discussions with high school teachers, community college instructors, and industry liaisons we reviewed the goals of our program, performed a gap analysis to delineate strengths and weaknesses in our curriculum, and drafted an agreement for articulation with a neighboring biotechnology program. We will use the information obtained from this assessment to set priorities for the future and to develop strategies for program improvement. Although this assessment is nearing completion, in reality the hard work has just begun.

**BIOTECHNOLOGY PROGRAM ARTICULATION AGREEMENT
BETWEEN SHORELINE COMMUNITY COLLEGE AND
SEATTLE PACIFIC UNIVERSITY
(Effective Summer 2002)**

Overview

Seattle Pacific University and Shoreline Community College have agreed to an articulation where students from Shoreline Community College may complete a Bachelor's degree at SPU in Biology with an emphasis in Molecular Biology and Biotechnology (BS Option III in the Biology section of the Seattle Pacific University 2003-2004 catalog). A maximum of 90 credits will be transferred from the Associate in Applied Arts and Sciences, Biotechnology Lab Specialist degree from Shoreline Community College to SPU. A minimum of 180 credits including 60 upper division credits will be completed to receive the Bachelor's degree. To be considered for admission to Seattle Pacific University, students must submit an SPU admission application, including other admission requirements and submit an official transcript with approved degree from Shoreline Community College posted. The specific transfer course equivalencies and SPU course requirements are shown below.

Course Equivalencies/Requirements

The following table compares the requirements for the AAAS Biotechnology Lab Specialist degree at Shoreline Community College with those for the Bachelor of Science in Biology – Biotechnology Emphasis at Seattle Pacific University. The left column shows the Shoreline AAAS requirements that will transfer to SPU. The right column shows equivalent SPU courses (in parentheses) and additional requirements for the SPU Bachelor's degree indicated by "**Take SPU**".

Shoreline CC AAAS Biotechnology Lab Specialist	SPU BS (Option III) in Biology Molecular Biology and Biotechnology Emphasis
Biology	Biology 75 – 77 credits (26-28 UD)
BioSc 201 Principles of Biology (5)	(BIO 2101 General Biology (5))
	Take SPU BIO 2102 General Biology (5) and BIO 2103 General Biology (5)
BioSc 285 Media Solution and Preparation (2)	
BioSc 260 Tissue Culture and Stain (4)	
	Take SPU BIO 3325 Genetics (5)
BioSc 270 Immunology (5)	(BIO 3350 Immunology (3))
BioSc 215 Topics in Microbiology (5)	(BIO 3351 Microbiology (5))
BioSc 250 Molecular Biology (6) and BioSc 265 Recombinant DNA Techniques (6) and BioSc 275 Biotechnology Techniques (3)	(BIO 4325 Molecular Biology (5)) (BIO 4352 Cell Biology (5))

	Take one SPU physiology course: BIO 4413 Animal Physiology (5) or BIO 4415 Plant Physiology (5) or BIO 4418 Neurophysiology (5)
	Take SPU BIO 4361 Biochemistry (5)
	Take SPU BIO 4362 Biochemistry (5)
	Take SPU BIO 4615 Issues and Values in Biology (3)
	Take SPU BIO 4940 Internship in Biology (3-5)
BioSc 290 Internship (2)	
BioSc 295 Biotechnology Seminar (1)	(BIO 2940 Biotechnology Seminar (1))
Chemistry	Chemistry 34 credits (0 UD)
Chem 101 General Chemistry (5)	(CHM 1211 General Chemistry (5))
Chem 220 Basic Organic Chemistry (5)	(CHM 2371 Organic Chemistry (5))
ChemT 190 Gravimetric and Volumetric Methods (8) and ChemT 191 Electrical, Optical and Chromatographic Methods (8) and ChemT 192 Electrical, Optical and Chromatographic Methods (8)	(CHM 3325 Chemical Equilibrium and Analysis (5)) and (CHM 3226 Instrumental Analysis (5))
Mathematics	Mathematics 10-15 credits (0 UD)
Math 108 Intro. to Probability & Statistics (5)	(MAT 1360 Statistics (5))
	Take SPU MAT 1221(5) or MAT 1225/1226 (10)
	Total Major 119 – 126 credits (26-28 UD)
Foundations and Exploratory Requirements	Foundations and Exploratory Requirements
BusAd 252 Professional Communications (5)	(USEM 1000 (5))
	Take SPU Arts (5), Humanities (5) and Social Sciences (5) (In lieu of UCOR series)
	Take SPU UFDN 3100 (5) and UFDN 3101 (5)
	Take SPU Humanities (5) Take SPU Arts (5)
	Take SPU Social Sciences (10)
	Natural Sciences (fulfilled with major requirements)
	Total Non-Science Foundations and Exploratory Requirements 50 credits
	Take SPU Foreign Language

	Competency (0-15) (see catalog)
BusAd 112 Human Relations (2)	Take SPU Electives 0-11 credits
	TOTAL 180 - 191 credits (minimum 60UD)

Important notes regarding the above table:

All students earning a bachelors degree must complete a minimum of 60 upper division credits. In addition to the listed upper division Biology and Foundations requirements, SCC transfers are required to take ***22 - 27 additional UD credits as Major, Exploratory Curriculum or Elective courses.***

Students planning to transfer from SCC should choose BusAd 252 Professional Communications rather than ENG 101 Composition.

Admission to the biology major at SPU requires completion of one or more SPU biology courses with a minimum grade point average of 2.5. Students must earn a minimum grade of C- (1.7) in all major requirements for the BS (Option III) degree.

For the latest version of the SCC-SPU Biotechnology Articulation Agreement please contact either of the respective Biotechnology Programs.