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88-89

INDIANA UNIVERSITY OF PENNSYLVANIA  
SENATE CURRICULUM COMMITTEE B-2

PROGRAM PROPOSAL REVISION

Department: BIOLOGY DEPARTMENT

Person to Contact for Further Information: DR. LAWRENCE C. SCHARMANN (X-2582)

Curricular Program Affected: BACHELOR OF SCIENCES DEGREE in BIOLOGY EDUCATION

Desired Effective Semester for Change: SPRING SEMESTER (1987-88 Academic Year)

Approvals: Department Committee Chairperson Lawrence C. Schermann

Department Chairperson Walter W. Galletti

School Committee Chairperson Charles W. Bryan

School Dean Charles W. Bryan

A. DESCRIPTION AND ACADEMIC NEED

- A1. Proposed Catalog Listing Attached as Addendum; also, see RATIONALE FOR PROPOSED CHANGES (Page 6, 3-E).
- A2. Not Applicable (NA).
- A3. See INTRODUCTION (Page 1).
- A4. NA
- A5. See RATIONALE FOR PROPOSED CHANGES (Page 6).
- A6. NA
- A7. NA
- A8. See RATIONALE FOR PROPOSED CHANGES (Page 6, 3-C).
- A9. Proposed changes recommended, are consistent with the fulfillment of current (June, 1986) Pennsylvania Department of Education (PDE) Standards.

B. INTERDISCIPLINARY IMPLICATIONS

- B1. NA
- B2. Program proposal incorporates General Geology I (GS 121; 3 shrs) and General Geology I Lab (GS 122; 1 shr) to meet PDE standards for Secondary Biology certification and is consistent with General Science certification requirements at IUP, previously unmet.

B3. Meeting with Committee on Education (April 2, 1987); representatives present from potentially affected areas endorsed changes in Mathematics course requirement, Geosciences course requirements, and Professional Education sequence requirements.

B4. NA

C. EVALUATION

C1. NA

C2. NA

D. IMPLEMENTATION

D1. NA

D2. NA

D3. NA

D4. NA

E. MISCELLANEOUS

(See Attached Program Proposal)

REVIEW AND PROPOSED CHANGES FOR  
BACHELOR OF SCIENCES DEGREE in BIOLOGY EDUCATION

in relation to new  
(June 15, 1986)

PENNSYLVANIA DEPARTMENT OF EDUCATION  
CERTIFICATION STANDARDS

Approvals:

Undergraduate Curriculum Committee (Biology Education Subcommittee): February 12, 1987

Biology Department Faculty Members: February 20, 1987

Committee on Education (College of Education): April 2, 1987

Signed:

Lawrence C. Scharmann

Dr. Lawrence C. Scharmann  
Chairman  
Biology Education Subcommittee  
Undergraduate Curriculum Committee

Walter W. Gallati

Dr. Walter Gallati  
Chairman  
Biology Department

Charles W. Ryan

Dr. Charles Ryan  
Dean  
College of Education

REVIEW AND PROPOSED CHANGES FOR  
BACHELOR OF SCIENCES DEGREE in BIOLOGY EDUCATION

Submitted by:

Dr. Lawrence C. Scharmann

Coordinator  
Biology Education

INTRODUCTION

The Biology Education degree program at IUP is presently a strong one; however, to more fully comply with new Pennsylvania Department of Education (PDE) Standards for certification in secondary biology, the substantive "core" must more closely match the present biology majors (B.S. degree) "core", with specific elective options pertinent to establish and maintain a broad-based, high quality program of preparation demanded for preservice secondary biology teachers. The related cognate coursework in Chemistry, Mathematics, and Physics is well represented; however, we must incorporate an earth science course (GS 121, 3 shr.; GS 122, 1 shr.) similar to the requirement for a degree in general science education certification. This latter change will not only meet new PDE Standards, but in addition, lend credence to IUP's present policy of awarding certification in general science as a consequential extension of the completion of a single and specific science discipline (previously awarded despite not completing a geoscience course of study).

I would like to outline the potential proposed changes in the following manner:

- (1) A comparative listing of present curricular versus proposed curricular requirements and options;
- (2) A listing of the dimensions or new STANDARDS from PDE and where we fail to presently comply; and
- (3) A brief rationale for proposed changes in terms of specific benefits.

## I. CURRICULUM COMPARISON FOR BIOLOGY EDUCATION

PRESENT

## A. BIOLOGY (30 semester hours)

## 1. REQUIREMENTS (22 shrs.)

BI 103 - GENERAL BIOLOGY I (4)  
 BI 104 - GENERAL BIOLOGY II (4)  
 BI 110 - PLANT BIOLOGY (5)  
 BI 120 - ANIMAL BIOLOGY (5)  
 BI 361 - MICROBIOLOGY (3)  
 BI 480 - BIOLOGY ED. SEMINAR (1)

## 2. ELECTIVES (8 shrs.)

Any biology majors courses totaling 8 or more hours. Presently, BI 263 (Genetics) and BI 362 (Ecology) are highly recommended; students are advised but do not necessarily take these.

PROPOSED

## A. BIOLOGY (30 semester hours)

## 1. REQUIREMENTS (24 shrs.)

BI 105 - CELL BIOLOGY (4)  
 BI 110 - PLANT BIOLOGY (5)  
 BI 120 - ANIMAL BIOLOGY (5)  
 BI 263 - GENETICS (3)  
 BI 361 - MICROBIOLOGY (3)  
 BI 362 - ECOLOGY (3)  
 BI 480 - BIOLOGY ED. SEMINAR (1)

## 2. ELECTIVES (6 shrs.)

## (a) PHYSIOLOGY (3 shrs.)

Choice of one of the following:

BI 350 - CELLULAR PHYSIOLOGY (3)  
 BI 352 - COMPARATIVE ANIMAL PHYSIOLOGY (3)  
 BI 453 - PLANT PHYSIOLOGY (3)

## (b) EVOLUTION &amp; DEVELOPMENT (3 shrs.)

Choice of one of the following:

BI 269 - BIOETHICS & COEVOLUTION (3)  
 BI 271 - EVOLUTION (3)  
 BI 331 - ANIMAL DEVELOPMENTAL BIOLOGY (3)

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NOTE: With the deletion of General Biology (listed as exclusive to nonmajors), topics delineated previously at a more general level would now be required through the completion of more comprehensive semester-long specialized coursework.

## B. CHEMISTRY (16 semester hours)

## REQUIREMENTS:

CH 111 - GENERAL CHEMISTRY I (4)  
 CH 112 - GENERAL CHEMISTRY II (4)  
 CH 231 - ORGANIC CHEMISTRY I (4)  
 CH 351 - BIOCHEMISTRY (4)

## C. PHYSICS (8 semester hours)

## REQUIREMENTS:

PY 111 - PHYSICS I (3)  
 PY 121 - PHYSICS I LAB (1)  
 PY 112 - PHYSICS II (3)  
 PY 122 - PHYSICS II LAB (1)

## D. MATHEMATICS (3 semester hours)

## REQUIREMENTS:

MA 217 - PROBABILITY &  
 STATISTICS (3)

NO GEOSCIENCE  
 PRESENTLY REQUIRED

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TOTAL DEGREE REQUIREMENTS = 125 semester  
 hours

## B. CHEMISTRY (16 semester hours)

## REQUIREMENTS:

(NO CHANGES PROPOSED)

## C. PHYSICS (8 semester hours)

## REQUIREMENTS:

(NO CHANGES PROPOSED)

## D. MATHEMATICS (4 semester hours)

## REQUIREMENTS:

MA 121 - CALCULUS I (4)  
 (or equivalent)

OR

MA 216 - PROBABILITY & STATISTICS  
 FOR NATURAL SCIENCES (4)

## E. GEOSCIENCE (4 semester hours)

## REQUIREMENTS:

GS 121 - GENERAL GEOLOGY I (3)  
 GS 122 - GENERAL GEOLOGY I LAB (1)

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TOTAL DEGREE REQUIREMENTS = 130 semester  
 hours

2. PENNSYLVANIA DEPARTMENT OF EDUCATION STANDARDS: B.S. In Biology Education

<u>STANDARD</u>	<u>DESCRIPTION</u>	<u>PRESENT STATUS</u>	<u>PROPOSED STATUS</u>
I.	The program of study shall require studies of and experiences with living materials in laboratory and field experiences using investigation, inquiry, and experimental methods.	MET: BI 110 BI 120	MET: BI 110 BI 120
II.	The program shall require studies that provide analyses of the characteristics of organisms such as cellular biology, homeostasis, systematics, behavior, reproduction-embryology, genetics, evolution, and ecology.	MET: BI 103 BI 104	MET: BI 105 BI 263 Elective 2-b BI 362
III.	The program shall require the studies of the interrelationships of organisms with the biotic and abiotic factors in their environment.	MET: BI 103 BI 104 BI 361	MET: BI 105 BI 361 BI 362
IV.	The program shall require studies of and experiences in general chemistry, organic chemistry, biochemistry, physics, earth science, and mathematics as they relate to biology.	MET: CH 111 CH 112 CH 231 CH 351 PY 111 PY 112 PY 121 PY 122 MA 217	MET: CH 111 CH 112 CH 231 CH 351 PY 111 PY 112 PY 121 PY 122 MA 121 (or OR equiv.) MA 216 GS 121 GS 122
V.	The program shall require studies of and experiences in designing, developing, conducting, and evaluating laboratory activities using techniques, equipment, and facilities that meet current technological standards for such laboratories. These studies should include applications to science teaching, emphasizing computers as tools for (A) computation, (B) interfacing with lab experiences and equipment, (C) infor. process., (D) testing and creating models, and (E) describing processes, procedures, and algorithms.	UNMET: NO Geoscience  UNMET	MET: Elective 2-a MA 216

<u>STANDARD</u>	<u>DESCRIPTION</u>	<u>PRESENT STATUS</u>	<u>PROPOSED STATUS</u>
VI.	The program shall include studies of the interaction of biology and technology and the ethical and human implication of development such as genetic screening, cloning, organ transplants, etc.	MET: BI 263 (if taken) BI 480	MET: BI 263 BI 480 Elective 2-b (BI 269)
VII.	The program shall require studies of and experiences in using contemporary biology curricula and the innovations in instructional practice.	MET: ED 451 BI 480	MET: ED 451 BI 480
	NOTE: Biology Education faculty attempting to procure requisite funds to purchase computing facilities, as well as software. Priority to new faculty requests forthcoming when budget constraints permit.		
VIII.	The program shall require professional studies distributed over the areas defined in the general standard XIV. The student teaching experience should require the candidate to demonstrate competency in these areas.	MET: ED 441 ED 451	MET: ED 441 ED 451
XIV.	PROFESSIONAL EDUCATION CORE COURSEWORK (Administered by the Biology Department)	*MET: ED 242 ED 342 ED 441 ED 451 BI 480	*MET: ED 242 ED 342 ED 441 ED 451 BI 480

\* NOTE: The remaining professional core for pedagogy determined by the College of Education (For present courses, see Catalog Listing in Addendum)



### 3. RATIONALE FOR PROPOSED CHANGES

The proposed changes in the Biology Education Curriculum perform several important functions:

- A. Recommended changes meet (or in good part more comprehensively address) all of the new PDE Standards for the secondary biology preservice teacher;
- B. The proposed program of study is more closely aligned with the majors (B.S.) curriculum. Hence, it possesses a strengthened content knowledge base, consistent with recent national reform efforts in preservice teacher education;
- C. New proposed curriculum possesses generally greater flexibility should IUP ever adopt a five-year program of study similar to the University of Pittsburgh (et al.), also consistent with recent national reform initiatives;
- D. Biology education majors will have greater opportunities to experience content taught by faculty with specific expertise in specialization areas rather than relying on the general biology sequence to necessarily meet their broad-based preparatory requirements; hence, less distinction is made between biology versus biology education majors; and
- E. Proposed new curriculum possesses greater flexibility with respect to junior/senior transfer students, post-baccalaureate certification students, and specific interests (i.e., plant as an area of physiology instead of cellular or animal physiology, etc.).

The only real potential shortcomings of the proposed curricular changes, exist in subsections of STANDARD V (interfacing of laboratory experience ...) and STANDARD VII (contemporary biology curricula and instructional practice).

STANDARD V can be met by the Comparative Animal Physiology (BI 352) or Plant Physiology (BI 453) courses (faculty involved in these courses are presently using or plan to use the interfacing of laboratory equipment with computers). It can also be partially met (or augmented) by the Probability and Statistics (MA 216) option in mathematics.

STANDARD VII will be met, in part, upon the acquisition, over the next several years, of updated curriculum materials -- already begun by Drs. Slinger and Scharmann. However, the need to obtain 2-4 Apple II-GS/Apple II-E/IBM-PC computing systems and software packages must occur, if the Biology Department, in its ED 451 (Teaching of Science in the Secondary Schools) and BI 480 (Biology Education Seminar) wishes to demonstrate complete compliance with STANDARD VII (as well as STANDARD XIV).

ADDENDUM

BACHELOR OF SCIENCES DEGREE in BIOLOGY EDUCATION

Proposed Undergraduate Catalog Listing

Based Upon

Proposed Revision (February 20, 1987)

BACHELOR OF SCIENCE IN EDUCATION in BIOLOGY (Proposed Catalog Listing)

GENERAL EDUCATION: As outlined in General Education section with the following specifications: 50

Mathematics: MA 121 (or equivalent) OR MA 216  
Natural Science: PY 111/121 - PY 112/122  
Social Science: HI 104, PC 101  
Science/Math elective: (covered by BI 110, BI 120)

MAJOR: 30

Required Courses:	BI 105	Cell Biology	4 sh
	BI 110	Plant Biology	5 sh
	BI 120	Animal Biology	5 sh
	BI 263	Genetics	3 sh
	BI 361	Microbiology	3 sh
	BI 362	Ecology	3 sh
	BI 480	Biology Education Seminar	1 sh

Controlled Electives:

Physiology (3 sh): Choice of one of the following

BI 350	Cellular Physiology	3 sh
BI 352	Comparative Animal Physio.	3 sh
BI 453	Plant Physiology	3 sh

Evolution & Development (3 sh): Choice of one of the following

BI 269	Bioethics & Coevolution	3 sh
BI 271	Evolution	3 sh
BI 331	Animal Develop. Biology	3 sh

OTHER REQUIREMENTS: 50

Chemistry Sequence:

CH 111	General Chemistry I	4 sh
CH 112	General Chemistry II	4 sh
CH 231	Organic Chemistry I	4 sh
CH 351	Biochemistry	4 sh

Geoscience:

GS 121	General Geology I	3 sh
GS 122	General Geology I Lab	1 sh

Professional Education Sequence:

CM 301	Instructional Media	3 sh
ED 242	Pre-Student Teaching I	1 sh
ED 342	Pre-Student Teaching II	1 sh
ED 441	Student Teaching	12 sh
ED 442	School Law	1 sh
ED 451	Tchg. Science in Sec. Sch.	3 sh
EP 302	Educational Psychology	3 sh
EP 377	Ed. Tests & Measures	3 sh
FE 302	Hist. & Phil. of Education	3 sh