Assessment of Student Learning
Department of Biology
Indiana University-Purdue University Indianapolis

Annual Report: 2005-2006

Prepared by Kathleen A. Marrs, Ph.D.
(Edited by Joseph L. Thompson)
June 2006

INTRODUCTION TO THE DEPARTMENT OF BIOLOGY

As of fall 2005, the Department of Biology consists of 19 full-time (15 tenured or tenure-track and 4 lecturers) faculty members and one full-time, visiting lecturer. In addition there are several others who have at least part-time roles in the Department and a larger number of officially appointed adjunct faculty members. The teaching mission is described below and remains as stated in the previous reports (See http://planning.iupui.edu/318.html).

ACADEMIC PROGRAMS

Undergraduate Degree Programs - the Bachelor of Science (B.S.).

The B.S. degree is designed for students who plan careers working in laboratory environments in academia or industry or those who plan to enter graduate school to pursue thesis-based degrees. The degree consists of 40 credits taken in the major. The course-based core requirements are identical to those of the B.A. degree. Students also take one course from each of the organizational areas as in the B.A., but must also take 4 laboratory courses and register for a minimum of 3 credits in undergraduate research and senior thesis (BIOL-K494). The remaining credits allow students to pursue an area in more depth. The B.S. also requires chemistry through the full two years of organic, a course in computer science, two semesters of physics, and two semesters of calculus. Slightly over half of the Biology graduates earn the B.S.

Undergraduate Degree Programs - the Bachelor of Arts (B.A.).

The BA degree in Biology is designed for students who wish to diversify their undergraduate curriculum by taking more course work in other disciplines or by seeking double majors. It is the recommended degree for students seeking admission to professional school. The degree consists of a minimum of 30 credit hours in the major, including the core comprised of the freshmen sequence *Concepts of Biology I & II* (BIOL-K101/BIOL-K103, 10 credits), *Genetics & Molecular Biology* (K322, 3 credits), and *Principles of Ecology & Evolution* (BIOL-K341, 3 credits). Students must also complete a lecture course from each of the levels of biological organization, molecular, cellular and organismal, and three laboratory experiences associated either with the upper-level core courses or the area electives. The undergraduate

program is completed with an integrating experience, either undergraduate research (BIOL-K493) or, more commonly, the Capstone course (BIOL-K490). Ancillary science requirements include freshmen chemistry, two semesters of organic chemistry lecture and one laboratory, a course in computer science, two semesters of physics, and math at the pre-calculus level. Approximately 45-50% of biology students graduate with the B.A.

Other Undergraduate Programs or Student Interests Served by Biology.

The Biology degree remains the most common path for students pursuing a career in medicine. A large proportion of freshmen students coming to Biology at IUPUI see themselves as pre-med majors. There is no degree in pre-med studies and most of these students are placed on a B.A. track, though some prefer the B.S. option. Recent professional standards changes have replaced the undergraduate degree in Physical Therapy with a Master's degree as the entry-level training. Biology has a pre-physical therapy track that allows students to fulfill the Biology degree requirements while picking up, as electives, the specific physical therapy pre-requisites.

Undergraduate students with interests in dentistry, optometry, veterinary medicine, and pharmacy are also among those counted as Biology majors. These programs are distinct from the medicine and physical therapy programs in that these programs do not require an undergraduate degree. However, students are placed on a degree track along with program pre-requisites in case they change their minds, choose to complete an undergraduate degree before applying, or are not admitted to the professional program. Pre-pharmacy student advising is more complex than the others because there are two Schools of Pharmacy in Indiana (Purdue University West Lafayette [PUWL] and Butler University) and each School has different pre-requisites. Advising is a complex issue in Biology.

Biology also contributes curricula and academic services to other programs in the School of Science (SOS). The new program in **Forensic and Investigative Sciences** (FIS) has a Biological option and Biology contributes a significant portion of the core curriculum. One member of the Biology faculty, Dr. Dring Crowell, was the primary author of the degree proposal and the proposal resulting in Commitment to Excellence (CTE) funding for the program. The Associate's and Bachelor's degree in **Biotechnology** were developed by a partnership between the SOS and local industry. Several Biology courses are part of the flexible curricula of these degrees. The degree proposals were prepared by Dr. N.D. Lees.

In the process of addressing the teaching needs of such diverse programs, Biology offers instruction in the traditional lecture and laboratory, recitations with some unique components, and most importantly, in the form of individualized instruction. At the undergraduate level, the senior capstone experience for B.A. students is available through individual faculty on a one-on-one basis. Bachelor of Science students satisfy the capstone experience by enrolling in undergraduate research and senior thesis. This allows the student to do a limited research project with a faculty member and write the results as a formal thesis. Many students have given presentations of their work at local and national conferences and symposia and some have been listed as co-authors on peer-reviewed publications. Graduate students in thesis programs also receive considerable one-on-one instruction from faculty.

Service Course Contributions.

An estimated 70-75% of the credit hours delivered by the Department of Biology fall into the category of service courses. All courses with an "N" prefix are courses for non-majors. Paramount in the group of courses are those that provide pre-requisite training for students in the health sciences. *Human Anatomy* (BIOL-N261, 5 credits) is the largest enrolling course in the department with 1050-1100 students enrolling each year. The primary clientele consists of students seeking entry to nursing and a few other health programs. *Human Physiology* (BIOL-N217, 5 credits) enrolls 800-850 students per year and serves the same population of students. The *Human Biology* sequence (BIOL-N212/BIOL-N215, 8 credits total) primarily serves dental hygiene, but is also required for some health programs and its individual courses are used as a biology literacy courses (general education). Other non-majors' courses provide science electives for the Schools of Liberal Arts and Business, provide appropriate content in biology for elementary education majors, or serve special programs in other schools. Finally, biology provides introductory level course work for a series of pre-agriculture programs where students would transfer to PUWL for completion. PUWL provides a part-time advisor housed elsewhere on the IUPUI campus to serve interested students.

Assessment activity within specific courses in the Department of Biology.

Please see the School of Science Assessment Report 2003-2004 for detailed, course-specific assessment measures in place for all courses in the Department of Biology. (http://planning.iupui.edu/318.html)

SCHOOL OF SCIENCE ASSESSMENT COMMITTEE GOALS 2005-2006

Our goal within the School of Science Assessment Committee for the 2005-2006 school year was to gather and analyze information related to each of our department's specific Student Learning Outcomes (SLOs). This project will be completed in a series of stages:

Stage 1: Identify Student Learning Outcomes (SLOs): The Biology Department created a set of SLOs in the 1998-1999 school year that represented the core knowledge and skills that would be emphasized by the faculty of Biology as students progressed through our courses. These SLOs are as follows:

1) Biology Department Outcomes Related to General Education Principles

"Biology graduates will have an understanding of fundamental concepts from each of the biological areas listed below, as well as the relationships among them, i.e. the continuum from the ecosystem to the molecular level. This does not imply that the student will be equally well versed in all areas, because the individual's interest in a particular part of Biology is expected to drive him or her to greater achievement in an area."

Principle 1: *Graduates will have knowledge of, and proficiency in, core communication and quantitative skills (writing, speaking, and quantitative reasoning).* Proficiency in writing and speaking is the ability to express in written and spoken words the products of critical, analytical, and creative thought. Quantitative reasoning is the ability to understand and express quantitative relationships in mathematical or other symbolic terms.

- Can express ideas clearly, concisely, and assertively in written and spoken language. Knows how to introduce the subject or problem, state its importance, express hypotheses, present experimental designs, technical information, results, and interpretations in a concise, logical, and clear organization, using proper sentence structure and correct spelling.
- Has a confident, forceful speaking delivery. Can answer questions from the audience knowledgeably.
- Is proficient in reading and listening with comprehension.
- Can frame questions effectively.
- Is competent at retrieving information pertinent to inquiries.
- Understands the nature of mathematical operations through calculus.
- Can set up problems as a series of logical mathematical expressions to arrive at answers.
- Can collaborate productively in a group as well as provide leadership.
- Is competent in the use of communication and learning technology.

Principle 2: *Graduates will be proficient in analytical, critical, and creative thinking.* Analytical thinking is the ability to separate a problem into its component parts and solve it. Critical thinking is the exercise of careful judgment and evaluation of a problem considering alternative views, hypotheses, and opinions. Creative thinking involves developing new ideas as opposed to imitating problem solving.

- Understands the difference between emotion, opinion, and critical thought.
- Understands what constitutes truth or certainty, and what counts as evidence.
- Can develop alternative hypotheses and solutions.
- Can analyze and interpret data (information), and draw logical conclusions.
- Understands the scientific method, inductive and deductive reasoning.
- Is able to apply findings and observations.
- Is able to identify and formulate problems.
- Can construct different approaches to solving problems.
- Is able to apply mathematical and computing tools to the formulation and solution of problems.
- Is able to generalize and apply acquired skills to new situations.
- Can understand and apply basic principles of statistical inference to decision making.
- Is able to critique one's own works and those of others.
- Is able to make informed personal responses to issues.
- Is able to generate ideas and evaluate them.

Principle 3: *Integration of Knowledge*. Integration of knowledge is the ability to unify different parts of one's knowledge and experience into a meaningful whole.

- Can unify and apply knowledge and experience from different disciplines.
- Is able to deal successfully with unusual circumstances.
- Understands the relationships between basic and applied research.
- Understands the basis for tech transfer.
- Can connect understanding of one's own discipline to other disciplines and issues of importance to society.

Principle 4: *Achievement of intellectual depth, breadth, and adaptiveness*. Intellectual depth and breadth involve the acquisition of profound knowledge in a specific area embedded in a broad context of general education. Intellectual adaptiveness is the ability to change goals and strategies under new circumstances.

- Is conversant with the major works and theses of other disciplines within and without science.
- Understands the interactive relationships between one's own area of expertise and others.
- Is able to effectively explain one's discipline to others.
- Is able to entertain and appreciate other points of view and experiences.
- Can understand and use ways of knowing and thinking from a variety of experiences.
- Has a working knowledge of a foreign language.
- Understands and respects the worth of intellectual and creative work.
- Has acquired the ability and desire for life-long learning.
- Is intellectually honest and able to work out ideas and feelings of one's own and test them against the ideas and responses of others.

Principle 5*: Understanding Society and Culture*. Understanding society and culture means understanding the ways human beings living together as a group interact with one another, understanding the concepts, habits, skills, arts and science, and values of different civilizations, and acquiring a refinement of thought, emotion, taste, and social consciousness.

- Understands the origins, similarities, and differences among world cultures, past and present.
- Knows something about the ideas and methods by which social and cultural change is explained.
- Understands how social structures, relationships, power, belief, and value are organized and change.
- Understands how economic and business systems and public policy work and change, and how possibilities are shaped by them.
- Understands the natural environment and its relationships to human activity.

Principal 6: *Values and Ethics*. Defined as the ability of students to make judgments with respect to individual conduct, citizenship, and aesthetics. A sense of values and ethics means the student:

- Has adopted a set of general ethical principles, and follows ethical guidelines for professional and societal behavior.
- Considers and respects the opinions and practices of others.
- Can make informed and principled choices regarding conflicting situations in their personal and public lives and can foresee the consequences of these choices.
- Consistently exercises responsibility for working within and perhaps leading their community.
- Understands the difference between freedom and license, and rights and responsibilities.
- Has a sense and understanding of aesthetics.

2) Biology Department Discipline-Specific Outcomes

I. Basic Knowledge

A. Molecular Biology: All topics relating to DNA, proteins, techniques relating to biotechnology and genetic engineering, etc.

B. Cell and Developmental Biology: All topics relating to cell structure and function, cell biology and biochemistry, development of cell types during growth of the embryo, use of cells and cell types to manufacture drugs, etc.

C. Physiology: All topics relating to the biochemical and physiological workings of a cell, tissue, organ, or organ system within a living plant, animal, or other organism.

D. Ecology: All topics relating to the affect of the environment and the ecosystem on the living organism.

E. Evolution: All topics relating to the descent with modification of organisms from common ancestors through the mechanism of natural selection.

II. Applied Skills

A. Application of the Scientific Method: All topics that require a student to apply scientific process skills (questioning, development of a testable hypothesis, experimentation) to a particular problem and devise a way to test or solve that problem. Students must analyze background literature, interpret data, possibly modify a hypothesis or idea, and present their findings in a written or oral report.

B. Laboratory Skills: All techniques and protocols pertinent to lab safety, use of laboratory equipment, collection and analysis of data, interpretation of findings, development of a laboratory report or notebook, and proper protocol for disposal of hazardous materials if appropriate.

Stage 2: Identify or Create methods to Measure the SLOs: I (Dr. Kathleen Marrs) asked faculty to respond to a questionnaire (attached) to determine whether they measured and how they measured the SLOs identified for our Department. I identified the major types of assessment activities that would be likely used in a lecture or lab format course. These choices included, but were not limited to:

M/C: Multiple choice exam
E: Essay/short answer exam
Q: Quiz
W: Writing assignment (lab report, research paper)
L: Laboratory exercise
P: Presentation to class
I: In-class (group or individual) activity - recitation or lecture
O: Other (please list in row mentioned)

Stage 3: Link the SLOs to Specific Curricular Components: I next asked faculty to respond to the questionnaire (attached) that related the Department of Biology's SLOs to the specific course that they taught. The first column asked faculty to respond on whether the SLO was specifically addressed in their course (yes/no). The second column asked faculty to indicate, if their answer had been "Yes" in the previous column, how they determined whether students understood that particular concept, using the choices identified above in Stage 2. The next several pages summarize this information.

(1) Assessment of SLOs for the Core Courses in Biology taken by ALL Biology Majors

	K101 Biology I Marrs	**K103 Biology II Yost**	**K322 Genetics Bard**	**K323 Genetics Lab Frey**	**K341 Ecology Wang**
1) *Molecular Biology*: how biomolecules carry out functions, control processes, and dictate inheritance		M/C	M/C; problems P, T/F, fill in the blank F	E	
a) Structure of nucleic acids, proteins, lipids, and carbohydrates	M/C, Q, L, I		M/C; P, T/F, F	E	
b) Synthesis and metabolism of biomolecules, e.g. DNA replication, mRNA transcription, proteins	M/C, Q, L, I		M/C; P, T/F, F	E, L	
c) Functions of biomolecules, e.g. DNA replication and recombination in the inheritance of genetic traits, roles of cholesterol and phospholipids in biomembrane	M/C, Q, L, I, W		M/C; P, T/F, F	E, L, W	
2) *Cell and Developmental Biology*: cell structure and function; mechanisms regulating the development of multicellular organisms		M/C, Q, L	M/C; P, T/F, F		
a) Cell membranes and receptors	M/C, Q, L, I	M/C, Q			
b) Cytoplasmic structure and function	M/C			E, L	
c) Nuclear structure and function	M/C, Q		M/C; P, T/F, F	E, L	
d) Extracellular matrix synthesis, structure, and function	M/C				
e) Cell responses to external signals, e.g. hormones, antigens, or growth factors	M/C, Q, L, I, W	M/C, Q, P	M/C; P, T/F, F		
f) Intracellular signaling pathways	M/C, Q	M/C, Q, P	M/C; P, T/F, F		

Core courses, continued	**K101 Biology I Marrs**	**K103 Biology II Yost**	**K322 Genetics Bard**	**K323 Genetics Lab Frey**	**K341 Ecology Wang**
g) Metabolic pathways	M/C, Q, L, I	M/C, Q, P	M/C; P, T/F, F	E, L	
h) Gamete formation and fertilization	M/C, Q, L, I	M/C, Q	M/C; P, T/F, F	E, L	
i) Cell division: mitosis and meiosis	M/C, Q, L, I	M/C, Q	M/C; P, T/F, F		
j) Cell differentiation, pattern formation, and morphogenesis		M/C, Q			
3) *Physiology*: how systems within an organism operate and interact to maintain short-term homeostasis of the individual and long-term survival of the species		M/C, Q, L, I			
a) Knowledge of animal and plant physiological systems, their interactions and control	M/C, Q, L, I	M/C, Q, L, I			M/C
b) Acclimation and adaptation of these systems to different physiological conditions, e.g. heat stress vs. cold stress, iso-osmotic vs. hypo-osmotic/hyper-osmotic environment	M/C, Q, L, I				E
					M/C
4) *Ecology:* how organisms interact with each other and their physical environment		M/C, Q			E
a) The growth of populations and the mathematical models, which describe that behavior					
b) The organization of species population into communities and levels of emergent characteristics		M/C, Q,			M/C

Core courses, continued	**K101 Biology I Marrs**	**K103 Biology II Yost**	**K322 Genetics Bard**	**K323 Genetics Lab Frey**	**K341 Ecology Wang**
c) Ecosystems dynamics and the evolutionary future of the biosphere					E
5) *Evolution*: how the incredible diversity of life on earth has evolved over the course of several billion years		M/C, Q			E
a) Origin of organic molecules and the evolution of life	M/C	M/C, Q			M/C
b) Mechanisms of natural selection and their effect on gene frequencies		M/C, Q			E
c) Evolution of cellular organization		M/C, Q	M/C; P, T/F, F		M/C
d) Evolution of functionally specific biomolecules for carrying out processes of heredity, growth and development, and homeostasis					E
e) Microevolution: organism survival and diversification as a function of adaptation		M/C, Q			
f) Variability of evolutionary rates					
II. Applied skills					M/C
1) *Application of scientific method*					E
Biology graduates will understand the theory of, and be able to apply, the scientific method in a biology setting. For this purpose, the scientific method is defined as:					

Core courses, continued	**K101 Biology I Marrs**	**K103 Biology II Yost**	**K322 Genetics Bard**	**K323 Genetics Lab Frey**	**K341 Ecology Wang**
a) Making an observation about a poorly understood phenomenon and researching available related information from textbooks, journals, databases	L, Q, I,				
b) Forming an hypothesis (a testable statement explaining the observation)	L, Q			L, W	M/C
c) Designing an experiment to test the hypothesis	L, Q				E
d) Analyzing and interpreting experimental data, and forming conclusions about accepting or rejecting the hypothesis	M/C			E, W, L	
e) Retesting the hypothesis, if necessary, so as to reinforce the conclusions					
f) Publication of results and/or oral presentation of the results and ideas through appropriate vehicles of communication				W	
2) *Biotechnology*					
Biology graduates will be competent in selected techniques and equipment commonly used in field and laboratory studies. The following are examples, but the list may change with the advent of new technologies.					
a) Microscopy	L, M/C, Q	M/C, Q, L		L	

Core courses, continued	**K101 Biology I Marrs**	**K103 Biology II Yost**	**K322 Genetics Bard**	**K323 Genetics Lab Frey**	**K341 Ecology Wang**
b) Culture growth of selected organisms, e.g. bacteria, fruit flies	L, M/C, Q			L	
c) Dissection		M/C, Q, L		L	E
d) Enzyme assays	L, M/C, Q			L	
e) Biological staining techniques	L			L	
f) Separation procedures for biological molecules, e.g. gel electrophoresis of protein or DNA, ultracentrifugation	L, M/C, Q			L, E	
g) Aseptic technique	L			L	

(2) Assessment of SLOs for the Elective Courses in Biology taken by most / many Biology Majors

	K324 Cell Biology Watson	**K325 Cell Biology Lab Frey**	**K331 Embryology Chernoff**	**K333 Embryo Lab Chernoff**	**K356/K357 Micro / Lab Lees / Marrs**	**K493 Research Randall**	**548 Biotech Randall**
1) ***Molecular Biology***: how biomolecules carry out functions, control processes, and dictate inheritance	M/C Exam	L, M/C, E	M/C, E		M/C, E	L, P, W (thesis)	
a) Structure of nucleic acids, proteins, lipids, and carbohydrates	M/C Exam	L, M/C, E			M/C, E		E, W, L
b) Synthesis and metabolism of biomolecules, e.g. DNA replication, mRNA transcription, proteins	M/C Exam	L, M/C, E			M/C, E		E, L, W
c) Functions of biomolecules, e.g. DNA replication and recombination in the inheritance of genetic traits, roles of cholesterol and phospholipids in biomembrane	M/C Exam	L, M/C, E	M/C, E		M/C, E	L, P, W (thesis)	
2) ***Cell and Developmental Biology***: cell structure and function; mechanisms regulating the development of multicellular organisms			M/C, E				
a) Cell membranes and receptors		L, M/C, E	M/C, E	L, M/C, W			
b) Cytoplasmic structure and function			M/C	L, M/C, W	M/C, E		

(Elective Courses, con't)	**K324 Cell Biology Watson**	**K325 Cell Biology Lab Frey**	**K331 Embryology Chernoff**	**K333 Embryo Lab Chernoff**	**K356/K357 Micro / Lab Lees / Marrs**	**K493 Research Randall**	**548 Biotech Randall**
c) Nuclear structure and function		L, M/C, E					
d) Extracellular matrix synthesis, structure, and function			M/C, E	L, M/C, W			
e) Cell responses to external signals, e.g. hormones, antigens, or growth factors	M/C Exam	L, M/C, E	M/C, E	L, M/C, W		L, P, W (thesis)	
f) Intracellular signaling pathways	M/C Exam	L, M/C, E	M/C			L, P, W (thesis)	
g) Metabolic pathways	M/C Exam		M/C		E		
h) Gamete formation and fertilization	M/C Exam		M/C, E				
i) Cell division: mitosis and meiosis	M/C Exam	L, M/C, E	M/C				
j) Cell differentiation, pattern formation, and morphogenesis	M/C Exam		M/C, E	L, M/C, W			
3) ***Physiology*:** how systems within an organism operate and interact to maintain short-term homeostasis of the individual and long term survival of the species	M/C Exam	L					
a) Knowledge of animal and plant physiological systems, their interactions, and control	M/C Exam						

(Elective Courses, con't)	**K324 Cell Biology Watson**	**K325 Cell Biology Lab Frey**	**K331 Embryology Chernoff**	**K333 Embryo Lab Chernoff**	**K356/K357 Micro / Lab Lees / Marrs**	**K493 Research Randall**	**548 Biotech Randall**
b) Acclimation and adaptation of these systems to different physiological conditions, e.g. heat stress vs. cold stress, iso-osmotic vs. hypo-osmotic/hyper-osmotic environment	M/C Exam					L, P, W (thesis)	
4) ***Ecology:*** how organisms interact with each other and their physical environment						L, P, W (thesis)	
a) The growth of populations and the mathematical models, which describe that behavior							
b) The organization of species population into communities and levels of emergent characteristics							
c) Ecosystems dynamics and the evolutionary future of the biosphere							

(Elective Courses, con't)	**K324 Cell Biology Watson**	**K325 Cell Biology Lab Frey**	**K331 Embryology Chernoff**	**K333 Embryo Lab Chernoff**	**K356/K357 Micro / Lab Lees / Marrs**	**K493 Research Randall**	**548 Biotech Randall**
5) ***Evolution*****:** how the incredible diversity of life on earth has evolved over the course of several billion years							
a) Origin of organic molecules and the evolution of life							
b) Mechanisms of natural selection and their effect on gene frequencies					M/C, E		
c) Evolution of cellular organization	M/C Exam						
d) Evolution of functionally specific biomolecules for carrying out processes of heredity, growth and development, and homeostasis	M/C Exam		M/C				
e) Microevolution: organism survival and diversification as a function of adaptation							
f) Variability of evolutionary rates							

(Elective Courses, con't)	**K324 Cell Biology Watson**	**K325 Cell Biology Lab Frey**	**K331 Embryology Chernoff**	**K333 Embryo Lab Chernoff**	**K356/K357 Micro / Lab Lees / Marrs**	**K493 Research Randall**	**548 Biotech Randall**
II. Applied skills							
1) *Application of scientific method*							
Biology graduates will understand the theory of, and be able to apply, the scientific method in a biology setting. For this purpose, the scientific method is defined as:							
a) Making an observation about a poorly understood phenomenon and researching available related information from textbooks, journals, databases				L, M/C, W		L, P, W (thesis)	
b) Forming an hypothesis (a testable statement explaining the observation)	M/C Exam		E	L, M/C, W		L, P, W (thesis)	
c) Designing an experiment to test the hypothesis	M/C Exam				M/C, E	L, P, W (thesis)	
d) Analyzing and interpreting experimental data, and forming conclusions about accepting or rejecting the hypothesis	M/C Exam	L, E	M/C, E	L, M/C, W	M/C, E	L, P, W (thesis)	
e) Retesting the hypothesis, if necessary, so as to reinforce the conclusions						L, P, W, (thesis)	

(Elective Courses, con't)	**K324 Cell Biology Watson**	**K325 Cell Biology Lab Frey**	**K331 Embryology Chernoff**	**K333 Embryo Lab Chernoff**	**K356/K357 Micro / Lab Lees / Marrs**	**K493 Research Randall**	**548 Biotech Randall**
f) Publication of results and/or oral presentation of the results and ideas through appropriate vehicles of communication						L, P, W, (thesis)	
2) *Biotechnology*							
Biology graduates will be competent in selected techniques and equipment commonly used in field and laboratory studies. The following are examples, but the list may change with the advent of new technologies.							
a) Microscopy	M/C Exam	L, E			L, E		E, L, W
b) Culture growth of selected organisms, e.g. bacteria, fruit flies	M/C Exam				L, E		E, L, W
c) Dissection	M/C Exam	L					
d) Enzyme assays	M/C Exam	L, E, M/C		L	L, E	L, P, W (thesis)	E, L, W
e) Biological staining techniques	M/C Exam	L, E. M/C		L	L, E	L, P, W (thesis)	E, L, W
f) Separation procedures for biological molecules, e.g. gel electrophoresis of protein or DNA, ultracentrifugation	M/C Exam	L, E, M/C				L, P, W (thesis)	E, L, W
g) Aseptic technique	M/C Exam			L	L, E	L, P, W (thesis)	E, L, W

Upon analysis, it appears that each of the Student Learning Outcomes identified by the Department of Biology is being addressed and assessed in some way. One possible weakness or deficiency is that our core courses overall, and many of our elective courses, seem weak in the area of the Application of the Scientific Method: "All topics that require a student to apply scientific process skills (questioning, development of a testable hypothesis, experimentation) to a particular problem and devise a way to test or solve that problem. Students must analyze background literature, interpret data, possibly modify a hypothesis or idea, and present their findings in a written or oral report." Some of our core courses allowed students to design investigations, develop hypotheses, and test (and re-test) results to draw conclusions – but not at a very detailed level, until the students reached their capstone experience. Perhaps this in not surprising, given that the students must first learn the core skills and techniques before they can begin developing experiments of their own. On another level, however, most national science organizations have stated a call for "doing science as science is done" – by experimentation. This is something our faculty will focus on as we consider the results of the present study.

Future Goals: To complete or continue our assessment project, some of the next steps in the Department of Biology would be to:

Stage 4: Collect Data to see whether the SLOS are accomplished in the long-term: Collect data from alumni and employers to determine our graduate's level of satisfaction with the skills and knowledge they obtained while at IUPUI.

Stage 5: Use data to make curricular changes Meet as a Curriculum Committee and Department to determine whether we are satisfied with the ways that we are meeting the SLOs we identified, and whether improvements can be made. Also, given the huge increases in information in biology in the past 10 years, a re-investigation of the skills and knowledge we are asking students to achieve might be re-examined to ensure that the focus of the curriculum is still relevant and current for the state of biology in this decade and beyond.

Stage 6: Assessment of Changes Repeat steps 3-6 to determine whether our curriculum has improved over time.

These goals will be started in the coming school years.

Prepared by Kathleen A. Marrs
March 24, 2006

Assessment of Student Learning
Department of Chemistry and Chemical Biology
Indiana University-Purdue University Indianapolis

Report for the Academic Year 2005-2006

Prepared by Barry B. Muhoberac, Ph.D.
(Edited by Joseph L. Thompson)
June 2006

INTRODUCTION

The Department of Chemistry and Chemical Biology offers academic programs leading to Purdue University Associate in Science (A.S.), Bachelor of Arts (B.A.), Bachelor of Science (B.S.), Master of Science (M.S.) and Doctorate (Ph.D.) degrees in chemistry. Both the Chemistry and Biological Chemistry options to the B.S. degree are accredited by the American Chemical Society Committee on Professional Training (ACS-CPT) and thus undergo regular review (program assessment) independent of action by the School of Science or University. Primary functions of the ACS-CPT are to facilitate the maintenance and improvement of the quality of chemical education, develop guidelines that define this quality, and review programs.

The Department currently has 12 tenured or tenure-track professors, 3 research staff, and 3 full-time and 2 visiting lecturers. There are approximately 150 undergraduate majors and 25 full-time graduate students in the Department.

OVERVIEW OF CHANGES IN THE DEPARTMENT

Over the 2005-2006 academic year, the Department of Chemistry has experienced a number of events that have the potential to significantly effect assessment and student learning outcomes (SLOs). First, the Department underwent a name change to the Department of Chemistry and Chemical Biology reflecting the enhanced emphasis on life sciences in the University and the Department. Second, the Department hired 3 new tenure-track faculty bringing new interests and expertise that is in the process of being assimilated into the Department. Third, the ACS-CPT recertified our current Biological Chemistry option for B.S. students with some adjustments in the corresponding degree program. Fourth, our Department underwent an external review in the spring semester with curriculum/course related information included in the review committee report, which is currently under examination and discussion by our faculty. Finally, the ACS-CPT has issued a set of proposed guidelines for revision of undergraduate chemistry programs nationwide which, among other changes, propose that previous core and advanced course requirements be replaced by “foundational” and “in-depth” course work. The ACS-CPT requests our feedback on the proposed changes and this too is under consideration by our Department.

Taken together, our Department's learning assessment and SLOs are being reconsidered as we assimilate new faculty as well as consider the recommendations of the external review and the impact of the ACS-CPT proposed guidelines.

INDIVIDUAL COURSE ASSESSMENTS
The following entries are provided by faculty in the Department of Chemistry and Chemical Biology describing assessments, innovations, and improvements at the level of individual courses.

CHEM-C100 *The World of Chemistry* – Gavin Kirton
This course is for the non-science major student where no previous knowledge of the subject is assumed. The course aims to expose the student to the fundamental concepts and terms of the subject and how chemistry is related to the many issues in society. Often the course is qualitative in content, but elementary math is sometimes used in the course to illustrate the nature of quantitative science. Some topics were covered or reviewed based on the current news. If possible, it would be of value to the student to also cover the topic of the chemistry of life, particularly with the number of nursing students enrolled.

Because of the large student assessment load in the previous year (5 quizzes and 4 exams) that consumed much class time, the load for 2006 was reduced to 4 quizzes and 3 exams. Traditionally, students do not perform well with short answer problems (describing concepts or calculation), and some questions were not attempted by students despite the possibility of partial credit. For this reason, the exam format in spring 2006 was modified to be largely multiple-choice with a small component of short/free answer questions.

CHEM-C100 *The World of Chemistry* (integrated Chemistry and Geology) – Jayanthi Jacob
This course is blocked for education majors and has been specifically adapted from CHEM-C100 (above) to meet their needs. Each class begins with an application of the concept to be covered for the day and often used videos to initiate discussion. Merging concepts and relevance form the basis of this course. There are three exams and a comprehensive final exam in this course. The exams are multiple-choice questions. In addition, there is a project that involves writing a lesson plan on a topic selected by the student from a list of topics provided. Students are assessed on comprehension and presentation of content. Since class attendance correlates with the overall student performance, this course also includes 10% of grade for class attendance. This class was able to meet the needs of elementary education majors as designed, and therefore no changes were instituted.

CHEM-C110 *The Chemistry of Life* – Marty O'Donnell
The Chemistry of Life is a one-semester course that covers both organic chemistry and biochemistry. The course is typically populated by allied health students plus students in other areas that need either a single course in science or a single course in chemistry. Most often CHEM-C110 is the final course a student will take in chemistry.

Two changes of note were made in the course over the past semester. In the past a comprehensive final has always been included in the course along with the "5th exam."

Typically, this has resulted in poor performance on one and/or the other part of the last exam. This has been especially problematic because the "5th exam" material covers two very important classes of biomolecules: the lipids and the nucleic acids. This past year the comprehensive final was eliminated, which allowed students to spend the needed time learning the material in the final two chapters.

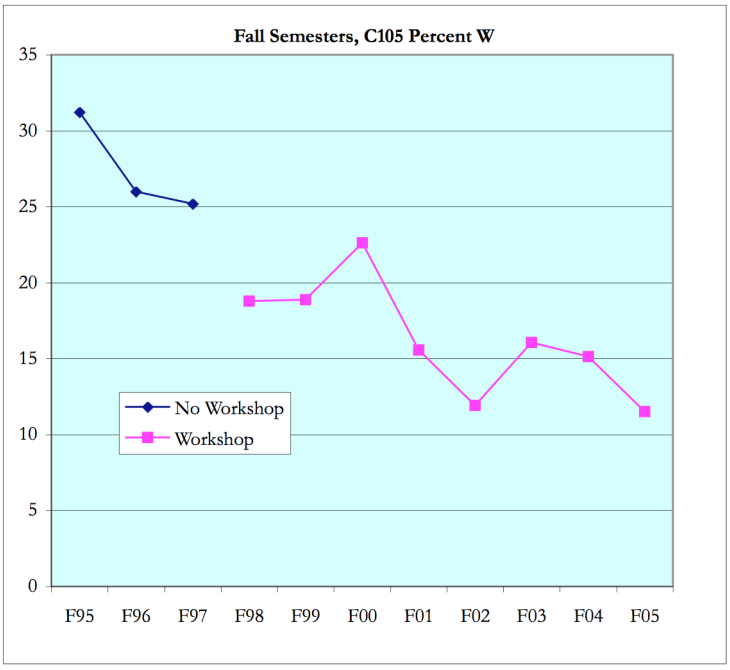
The second change that was made this past year was designed to achieve better class attendance. Twelve unannounced "in-class assignments" of 5 points each were given during the semester and the two lowest scores were dropped. These could be given at any time during the lecture and typically took only a couple of minutes total class time. Each assignment consisted of a single simple question over material that was on the overhead or board while the assignment was being completed. As such, this represented an easy 5 points per assignment provided the student was present in class and a total of 50 possible points overall. This represented 50 out of 450 points possible in the entire class and, as such, did not skew the final grade assignments.

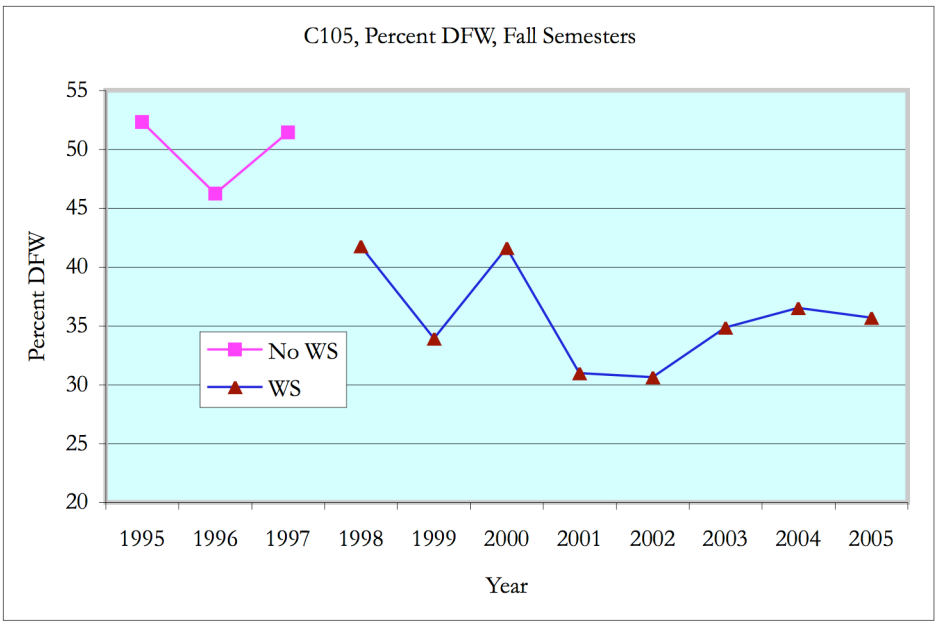
The students favorably received both of these changes.

CHEM-C105 *Principles of Chemistry I* – Jayanthi Jacob
Principles of Chemistry is a core course and part of a two-semester sequence (CHEM-C105 and CHEM-C106) taken by chemistry majors and most science majors. It has a wide spectrum of students in terms of their chemistry knowledge. Therefore, this course has built in two main components to facilitate learning for students with insufficient chemistry background: (1) Chem Skill Builder, online homework that is compulsory, carrying 7.5 % of the course grade and (2) Peer Led Workshops, that is also compulsory, carrying 11-18 % of the course grade. Since the classes are large, we also introduced in the fall the Classroom Performance System (CPS). CPS is a wireless response system that gives immediate feedback from every student in the classroom. Every student responds to questions with his/her individual wireless response pad and the results are displayed on the screen. This gives the instructor an indication of where the class stands in terms of understanding the concepts introduced in class and also gives an indication for the students where they stand in reference to the whole class. This is a useful tool for large classes where monitoring individual progress is difficult.

CHEM-C105 *Principles of Chemistry I* – David Malik and Jayanthi Jacob
Below is the CHEM-C105 annual statistics report, which provides performance trends in peer-lead team sections and additional learning interventions and scholarly activities.

Major continuing innovation: Peer Led Team Learning (PLTL) is a continuing program with sustained improvements in reducing DFW rates. The figure below shows the most recent results achieved in fall semester CHEM-C105 sections:





The current spring data significantly improves the student success rates compared to previous spring semesters. This is especially true for the W rate where there is a decrease in the W rate from an average of 22% to 15% (about 30% improvement) with the addition of the PLTL Program. The confidence level has now risen to over 99% percent that the statistics are different. The student success levels also reflect an improvement. Average student success rises from 53% to 60% (almost 15% improvement), but more importantly the improvement is statistically significant at the 94% confidence level.

Interactive Examinations: Examinations are offered on the computer over a multi-day period. This intervention responds for the need of flexibility for students who have outside expectations and activities. The system also provides immediate feedback.

Oncourse: A web page was created to enhance communication between the students and the instructors. The page is accessed through the schedule tab in Oncourse.

ChemSkillBuilder: On-line homework was added to the course (required work). This intervention gives students the opportunity to get immediate and targeted feedback as they work through the course material.

In-class response pads: We have currently implemented individual student response pads that allow immediate feedback to students. This feedback improves student participation and attendance.

GoFar Project intervention: Contrasting learning vs. performance orientation and educating students on how they approach studying science. Collaboration with Mark Hoyert.

Student Assessment of Learning Gains: This is a survey to determine student perceptions of course interventions and activities. The data from these surveys is currently being analyzed. We will then have a quantitative measure of the different activities.

RECENT PRESENTATIONS ON CHEM-C105 INTERVENTIONS

1. *Strategies for Improved Learning in Large General Chemistry Courses*, 40th International Union on Pure and Applied Chemistry Congress, Beijing, China, August 14 – 19, 2005.
2. *Large Lecture Classroom Strategies: Student Response Systems*, Indiana University Kokomo, October 3, 2005. Invited.
3. *Peer Led Team Learning and Other 21st Century Pedagogies,* Project Kaleidoscope: Sino-U.S. Undergraduate STEM Education Reform Conference, with Pratibha Varma-Nelson, Wuhan University, Wuhan, China, November 2 – 4, 2005. Invited Plenary Speaker.
4. *Can we predict the PLTL Leaders gains from personality inventories? An Analysis of the dimensions of PLTL Leader growth in academic and personal growth,* with Shilpi Bhargav, Shannon Sykes and Mark Hoyert. 19th Biennial Conference on Chemical Education, West Lafayette, IN, July 30 – August 3, 2006.
5. *PLTL Orientation Sessions: Making Students Successful Leaders*, with Shilpi Bhargav, Shannon Sykes, and Bonnie Stevenson. 19th Biennial Conference on Chemical Education, West Lafayette, IN, July 30 – August 3, 2006.

6. *Peer-led Team Learning Leaders: Contrasts in learning gains and perceived values of course interventions,* with Shannon Sykes. 19th Biennial Conference on Chemical Education, West Lafayette, IN, July 30 – August 3, 2006.
7. *PLTL Leaders: Transforming students into scholars*, with Shannon Sykes, Shilpi Bhargav, and Bonnie Stevenson, 232nd American Chemical Society National Meeting, San Francisco, CA, September 10 – 14, 2006.
8. *ACS Exam Measures of Impact of PLTL,* with J. A. Kampmeier and A. Fraiman, 232nd American Chemical Society National Meeting, San Francisco, CA, September 10 – 14, 2006.

SYMPOSIUM ORGANIZED

Symposium organized: *A Decade of Peer-Led Team Learning* (full day symposium), 232nd Fall National Meeting of the American Chemical Society, San Francisco, September, 2006.

COLLABORATORS

Mark Hoyert	Indiana University Northwest
Jack Kampmeier	Rochester University
Shannon Sykes	University College, IUPUI
Pratibha Varma-Nelson	Northern Illinois University

CHEM-S125 *Experimental Chemistry I – Honors* – Gavin Kirton
This course is for talented chemistry students. The suite of experiments was found to be suitable for the class. A change for this semester was that one experiment was extended by one class session to allow students to use the Pasco datalogger to obtain temperature data for calorimetry. Thus, the use of equipment in the lab more closely approximated the automated industrial setting. An error was found in the written procedures for calibrating the temperature probes, causing problems for many groups in the class. Changes were made to the Pasco procedures to correct for that error.

CHEM-C106 *Principles of Chemistry II* – Jayanthi Jacob
This course focuses heavily on problem solving skills. The exams have a multiple-choice component and a multi-step problem-solving component. Many students are not prepared for problem solving. So, I introduced take home quizzes. Students work out problems outside class and we discuss solutions to problems in the subsequent class. Following the success in CHEM-C105, the CPS wireless response system was introduced in the spring semester in CHEM-C106.

CHEM-C106 *Principles of Chemistry II* – Marie Nguyen
There are four exams throughout the semester. These contain both multiple choice formatted questions and questions in which students are required to show their work and support their answer. Thus, a determination of the understanding of specific topics can more easily be assessed. There are also four quizzes during the semester that precede each exam. These quizzes also require the students to show their work and/or explain their answer. This helps prepare them for the exams both with respect to the material they might expect to find on the exam and as to one of the formats of the exam.

Assessment is supplemented in this course through the use of short topic questions answered by students either individually or in groups and turned in during class. These questions are formatted in two different ways: either through the use of small blue books used for essay type questions or through the use of the student response pads (clickers). Typically, we use the blue books 8 to 12 times a semester out of the 30 class meetings while we will use the clickers 3 or 4 times each class meeting. The questions asked concern material currently under discussion in the class session. The blue books are collected and then returned to the students at the next class meeting having been checked that they were attempted. The method of working these problems is posted on Oncourse. This allows students to check their own work. The use of the clickers allows immediate feedback both to the students and to the instructor as to the understanding of the topic under discussion. Both of these formats serve two purposes: the students have to come to class to receive the points and they have to think during class.

The final that is given in CHEM-C106 is the American Chemical Society (ACS) standardized final exam. This exam covers topics from the first full year of General Chemistry and is a major student learning assessment mechanism. The students are thus responsible for the material they learned in the first semester of *Principles of Chemistry I*, CHEM-C105, along with the new material in CHEM-C106. Clearly long term retention of the material presented in these two courses is one of the goals of the year of introductory general chemistry.

CHEM-C343 and CHEM-C344 *Organic Chemistry Laboratory I & II* – James Hermanson
These courses are the laboratory components corresponding to the major's organic sequence (CHEM-C341 and CHEM-C342). I've taught organic chemistry laboratory courses at several different institutions. Therefore my position as a new faculty member at IUPUI gives me a unique opportunity to compare our program here (CHEM-C343 and CHEM-C344) with what I've seen at other schools. I was initially struck by the fact that basic introductory spectroscopy is taught in the labs and not in lecture at IUPUI. In addition I felt strongly that the time spent to teach this important topic (one lab period) was simply not adequate to effectively cover the material. During my first semester I also noted a high level of student frustration as they tried learn this material--in a very brief period of time--and then were expected to apply it to a fairly difficult, major, lab assignment. I also felt personal frustration trying to teach the material properly and felt strongly that we needed to change how this was done.

This past spring I made a major change in how I teach these labs--and this topic in particular. I designed my syllabus to include three lab periods for teaching spectroscopy theory and to provide time to practice what was learned. In addition, I redesigned the spectroscopy assignment (a difficult problem set) so that it was more likely to generate success, challenge students at the appropriate level, generate interest in the topic, and spawn feelings of conquering a difficult subject. It was my feeling that the assignment (as previously taught in lab) represented too large a percentage of the over grade for the course. Spectroscopy now contributes what I consider is a reasonable number of points to the overall possible total.

CHEM-C311 ***Analytical Chemistry Laboratory*** **– Gavin Kirton**
This course is designed to show the application to quantitative analysis of materials following much of the theory contained in the CHEM-C106/CHEM-C126 course and lab. The course focused on the laboratory experiments to introduce various modes of titrimetry and various chemistries of titration. The major change in the suite of experiments in fall 2005 was a modified Pasco datalogger experiment where 3 known titrations and 1 unknown were to be accomplished in two laboratory sessions. All groups were able to complete the experiment in the allotted time, and the EDTA titration experiment could be again included in the syllabus. The shortened Pasco experiment was more successful than in the previous semester. A change for summer 2006 was that the grading for the unknown in Pasco titrations was largely based on qualitative features of the titration curve. However, students still found difficulty in using the Pasco datalogger and in graphical analysis using DataStudio software. An additional problem, especially in Summer 2006, was that class results for the EDTA analysis of limestone were not accurate on the whole. The procedures for this titration will need to be checked or an alternative analyte may need to be chosen for future semesters.

Pre-labs were found to be successful in focusing the students on proper calculations and in thinking through the lab procedures. They also served as good study tools for the midterm and the final exam. A change for summer 2006 was that the midterm exam was increased from 50 to 100 points, comparable to the final exam because both take a full lecture period to administer.

CHEM-C325 ***Introduction to Instrumental Analysis*** **– Gavin Kirton**
This course is the B.A. version of CHEM-C410/CHEM-C411 (*Principles of Chemical Instrumentation* lecture and laboratory) taught for B.S. chemistry majors. It was operated in much the same way as in spring 2005. The procedures for the experiments were the same as for CHEM-C411 in the fall 2005, but because of a student research project with the capillary electrophoresis (CE) experiment, changes were implemented for CHEM-C325. The changes helped students to explore various parameters in running a CE experiment and to make conclusions about optimal separations. Some rewriting of the lab procedures were also undertaken to make the manual clearer to the student. It is hoped that a bound manual can be made available in future semesters for both CHEM-C325 and for CHEM-C411.

CHEM-C411 ***Principles of Chemical Instrumentation Laboratory*** **– Gavin Kirton**
A major change implemented in fall 2005 was to replace the 3-session electronic circuits experiment by a thin layer chromatography (TLC) experiment, because of a decision to not include a discussion about electronic circuits in the CHEM-C410 syllabus. Another reason for the change was that the written procedures assumed too much prior knowledge by the students in constructing circuits, and much time was wasted in troubleshooting incorrectly constructed circuits. The introduction of the TLC experiment made the suite of experiments identical to that of CHEM-C325. Because of new instrumentation, new procedures were also implemented for the High Performance Liquid Chromatography (HPLC) and Gas Chromatograph (GC) experiments. A CE experiment based on the separation of proteins was implemented.

Assessment of Student Learning
Department of Computer and Information Science
Indiana University-Purdue University Indianapolis

Report for the Academic Year 2005-2006

Prepared by Michelle R. Boshears
(Edited by Joseph L. Thompson)
June 2006

A. Introduction
   a. This report is based on and organized by the six-stage assessment process adopted by the 2005-2006 School of Science Assessment Committee to guide the assessment efforts employed by its seven academic departments.
   b. The stages of this process are as follows:
      i. Stage #1 → Identify the student learning outcomes (SLOs) of the department.
         1. These SLOs represent the knowledge, skills, and characteristics that the department wants its students to achieve by the time they successfully complete and graduate from the program.
         2. These SLOs should be precisely identified and defined by the faculty, clearly communicated to their majors, deliberately taught in classes, and carefully assessed to determine if they are becoming accomplished.
      ii. Stage #2 → Link the SLOs to specific curricular components.
         1. This stage represents the department's attempt to determine where in the curriculum (i.e., in what courses) are students provided with assignments designed to enable them to achieve the department's SLOs.
         2. This stage can also include an examination of the developmental nature of the SLOs (e.g., a department may require its students to perform the following cognitive tasks in introductory, intermediate, and advanced classes).
            a. Remember and understand the terms of the scientific method in an introductory class.
            b. Analyze and apply these terms in an intermediate-level methods class.
            c. Evaluate the research of others and create their own research project in an advanced senior capstone class.
      iii. Stage #3 → Identify or create methods to measure the SLOs.
         1. Methods may already exist within the curriculum to measure some of the department's SLOs (e.g., comprehensive final examinations, laboratory projects, term papers, oral presentations).

a. Some methods may need to be created (e.g., a senior-exit test of knowledge in the discipline, a skills-acquired template used to measure the competency of capstone students, a senior essay designed to measure how student attitudes or characteristics have changed as a result of their undergraduate education).

iv. Stage #4 → Collect data to determine if the SLOs are being accomplished.
    1. This stage requires departments to collect data generated by the methods identified in Stage #2 from the classes identified in Stage #3.
    2. This stage requires the department to collect data specific to the accomplishment of the individual SLOs—not just course grades—and aggregating this data across students.

v. Stage #5 → Use the data collected in Stage #4 to make curricular changes when they are deemed necessary.
    1. This stage requires departments to set performance standards for the SLOs that they can use to determine the percentage of their students who have accomplished the SLOs at various stages in the curriculum.
    2. For example, a department may develop a rubric to measure their students' ability to perform a senior-level research project. This rubric could contain the following performance levels: Excellent Performance, Acceptable Performance, and Unacceptable Performance. These levels would be anchored to specific performance indicators (e.g., for Excellent Performance, the written report would have to conform to the discipline's accepted writing style [APA-style in psychology] and it would contain no more than two errors of spelling, punctuation, capitalization, and grammar).
    3. If the aggregated data indicated that many students were performing at an unacceptable level for a particular SLO, the department would study its curriculum to see where that SLO is being addressed, and propose changes so that a greater percentage of future students would exhibit this SLO at an excellent or acceptable level.

vi. Stage #6 → Determine the impact of the curricular changes.
    1. If changes are made in the curriculum, this stage requires the department to wait for those changes to have a chance to take effect, and then return to Stage #4 where more data can be collected.
    2. These data can then be analyzed to determine their impact (i.e., to see if the changes produced the increased levels of performance in the SLOs sought by the department).

B. Stage #1
    a. In 1998, the Undergraduate Committee of the Department formalized eight learning outcomes that are specific to the goals the Department sets for its majors. These complement the more general outcomes enunciated in the Principles of Undergraduate Learning. They were published in the *Report on Assessment of Student Learning*, David Stocum, Dean, School of Science, June 19, 1998. The Department's Undergraduate Committee reevaluated these Student Learning Outcomes in 2001 based on new Association of Computing Machinery/ Institute of

Electrical and Electronics Engineers (ACM/IEEE) curriculum guidelines. Full faculty review and approval was received at the 2003 Summer Faculty Retreat.

i. Basic understanding of computing: Computer science majors will have a basic understanding of the theoretical foundations of computer science. These foundations and models of computing include principles of data structures (organizations of data so as to achieve the maximum performance), algorithms (precise techniques for solving problems), computer organization (functionalities and relationships of various components such as processor, memory, secondary storage, operating system and their interrelations), and theory of programming languages (different execution models of higher-level languages).
ii. Ability to analyze different data structures: Selecting an appropriate data structure is extremely critical for performance. Performance can be measured in terms of execution speed and/or computational resource requirements. Different problem characteristics benefit from the use of different data structures. Hence, it is of the utmost necessity to analyze the problem domain and select a suitable data structure from the set of well-known data structures such as linked lists, arrays, stacks, trees, hash tables, etc. All these data structures and operations on them are mathematically analyzable. Students will be familiar with various data structures and be able to select the most appropriate one for a given problem.
iii. Knowledge of a diverse array of computational algorithms: The precise technique, an algorithm, to solve any problem not only guarantees the correct solution, but also achieves it in an optimal fashion. Just like data structures, students will have an in-depth knowledge of a diverse array of computational algorithms and their mathematical analysis. Algorithms, which students will have learned, include searching, sorting, graph, and floating point computations.
iv. Basic understanding of computer architecture: The interrelations among structure and functionality of hardware (CPU, I/O, Memory, etc.) and software components (operating system, compilers, interpreters, etc.) will be known to computer science students. This understanding is of the utmost necessity for exploiting the capabilities offered by modern computer systems.
v. Ability to develop and design small-scale software projects: Mapping a problem into a specific architecture includes implementing the solution in a particular higher-level language. Advances in programming have facilitated the creation of large software systems, often needed for solving fairly complex real-world problems. Students will be able to apply the principles of Software Engineering to the entire software life cycle, i.e., problem specification, analysis, design, implementation, testing, verification and maintenance, and develop large software systems in at least one currently used high-level programming language.
vi. Knowledge of advanced and recent computing trends: Computer science, being a relatively young branch of science, is constantly changing. Students will possess knowledge of the advanced computing trends (in all different

aspects) and will have an ability to extrapolate this knowledge to quickly adapt to future advances.

b. These six SLOs plus the five Principles of Undergraduate Learning form the basis for the Department's student learning outcomes with which it measures student progress in its courses. Additionally, in view of the fact that some engineering students are present in these courses, the Department incorporated the Accreditation Board for Engineering and Technology (ABET) guidelines for computer engineering and ACM guidelines for computer science curricula into these SLOs. This change eased the movement of to stage #2, linking the SLOs to specific curricular components.

C. Stage #2

a. The Department's first SLO, "Basic Understanding of Computing," is addressed in depth in our gateway courses, CSCI 230 and CSCI 240.

i. **CSCI 230 Computing I (4 cr.)** The context of computing in history and society; information representation in digital computers; introduction to programming in a modern high-level language; introduction to algorithm and data structures; their implementation as programs. Specific student outcomes for this course are:

- Handle problem-solving techniques using computers.
- Program proficiently in a high-level programming language (C, Java, etc.).
- Translate algorithms into programs, compile, execute, and debug.
- Know concepts about Data Types and Memory.
- Use appropriate Data Structures and their use for data manipulation in memory.
- Design efficient algorithms design and algorithm complexities.

ii. **CSCI 240 Computing II (4 cr.)** P: CSCI 230. Continues the introduction of programming began in CSCI 230, with particular focus on the ideas of data abstraction and object oriented programming. Topics include programming paradigms, principle of language design, object oriented programming, programming and debugging tools, documentation, recursion, linked data structures, and introduction to language translation. Specific student outcomes for this course are:

- Write Shell-programming scripts in Unix O/S.
- Implement and test various operating system concepts in Unix.
- Design and implement simple Database systems using SQL.
- Write Functional and Logic Programming-based solutions as opposed to procedural programs.
- Design and simulate logic circuits.
- Design and simulate micro- and macro-level programs.
- Design various file handling techniques using a high-level language.

b. The Department's second SLO, "Ability to Analyze Different Data Structures," is addressed in depth our core component courses, CSCI 340 and CSCI 362.

i. **CSCI 340 Discrete Computational Structure (3 cr.)** Theory and application of discrete mathematics structures and their relationship to computer science. Topics include mathematical logic, sets, relations, functions, permutations,

combinatorics, graphs, Boolean algebra, digital logic, recurrence relations, and finite-state automata. Specific student outcomes for this course are:

- "*Mathematical reasoning*: Students must understand mathematical reasoning in order to read, comprehend, and construct mathematical arguments. Mathematical logic, serves as foundation for the subsequent discussions of methods of proofs. The technique of mathematical induction is conveyed through many different types of examples. Extensive explanation is provided to show why mathematical induction is a valid proof technique.
- *Combinatorial Analysis*: An important problem solving skill is the ability to count or enumerate objects. The discussion of enumeration begins with the basic technique of counting. The stress is on performing combinatorial analysis to solve counting problems, not on applying formulae.
- *Discrete Structures*: Students will be taught how to deal with discrete structures, which are abstract mathematical structures used to represent discrete objects and relations between these objects. These discrete structures include sets, permutations, relations, graphs, trees, and finite state machines.
- *Algorithmic Thinking*: In computer science, problem solving is done via the specification of an algorithm. After an algorithm has been described, a computer program can be constructed to implement it. The mathematical portion of this activity includes the specification of the algorithm, the verification that it works properly, and the analysis of the computer memory and time required to perform it.
- *Applications and Modeling*: Discrete mathematics has applications to almost every conceivable area of study. There are many application to computer science and data networking, as well as applications to such diverse areas as chemistry, botany, zoology, linguistics, geography, business, and the Internet. Modeling with discrete mathematics is an extremely important problem-solving skill, which students must acquire by constructing their own models in some of the exercises."

ii. **CSCI 362 Data Structures (3 cr.)** A study of the design and analysis of data structures and algorithms. Abstract data types: arrays, stacks, queues, lists, trees, graphs. Algorithms: sorting, searching, hashing. File structures: organization and access methods. Specific student outcomes for this course are:

- Knowing concepts of various data structures.
- Knowing merits and demerits of different data structures.
- Knowing algorithms to manipulate data structures.
- Being able to perform complexity evaluation for different algorithms.
- Having knowledge of using C++ Standard Template Library to compose algorithms.
- Understanding file structures in dealing with information saved in the secondary devices.

c. The Department's third SLO, "Knowledge of a diverse array of computational algorithms," is introduced to computer science students in multiple freshmen/sophomore courses including CSCI 230, CSCI 240, and CSCI 362. Algorithm design is an integral part of all computing courses. However, students wishing an in depth course can choose CSCI 463 as an elective:

> **CSCI 463 Analysis of Algorithms (3 cr.)** Techniques for analyzing and comparing algorithms. Average case analysis in sorting and searching; dynamic programming: greedy algorithms, amortized analysis, and applications; matrix algorithms: polynomials, discrete Fourier transforms, and fast Fourier transforms; parallel algorithms: examples in sorting, searching, graphs, and matrices; computational complexity, polynomial complexity classes. Specific student outcomes for this course are:
>
> - Discuss the importance of algorithms in the problem-solving process.
> - Identify the necessary properties of good algorithms.
> - Create algorithms for solving simple problems.
> - Use pseudo-code or a programming language to implement, test, and debug algorithms for solving simple problems.
> - Describe strategies that are useful in debugging.
> - Implement the most common quadratic and O(N log N) sorting algorithms.
> - Design and implement an appropriate hashing function for an application.
> - Design and implement a collision-resolution algorithm for a hash table.
> - Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.
> - Discuss factors other than computational efficiency that influence the choice of algorithms, such as programming time, maintainability, and the use of application specific patterns in the input data.
> - Solve problems using the fundamental graph algorithms, including depth-first and breadth-first search, single-source and all-pairs shortest paths, transitive closure, topological sort, and at least one minimum spanning tree algorithm.
> - Demonstrate the following capabilities: to evaluate algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in programming context.

d. The Department's fourth SLO, "Basic Understanding of Computer Architecture," is addressed in core-required course CSCI 402.

> **CSCI 402 Architecture of Computers (3 cr.)** Basic logic design. Storage systems. Processor organization: instruction formats, addressing modes, subroutines, hardware and microprogramming implementation. Computer arithmetic, fixed and floating point operations. Properties of I/O devices and their controllers. Interrupt structure. Virtual memory structure, cache memory. Examination of architectures such as microcomputers, minicomputers, vector and array processors. Specific Student outcomes for this course are:

- Demonstrate the understanding of the major building blocks and their role in the historical development of computer architecture.
- Use mathematical expressions to describe the functions of simple combinational and sequential circuits.
- Design a simple circuit using the fundamental building blocks.
- Understand the representation of the data.
- Know the principles of memory management and the role of cache and virtual memory.
- Understand the concepts behind Parallel Computer Systems.

e. The Department's fifth SLO, "Ability to develop and design small-scale software projects" is addressed in depth in CSCI 450.

CSCI 450 Principles of Software Engineering (3 cr.) Tools and techniques used in software development. Lifecycle concepts applied to program specification, development, and maintenance. Topics include overall design principles in software development; the use of structured programming techniques in writing large programs; formal methods of program verification; techniques and software tools for program testing, maintenance, and documentation. A primary goal of this course is to provide experience in team development of software. Specific student outcomes for this course are:

- Evaluate the quality of multiple software design based on key design principles and concepts.
- Select and apply appropriate design patterns in the construction of a software application.
- Analyze and evaluate a set of tools in a given area of software development.
- Create, evaluate and implement a test plan for a medium size code segment.
- Discuss the advantages and disadvantages of software reuse.
- Compare and Contrast the different methods and techniques used to assure the quality of a software product.

f. Students are given an opportunity to explore numerous applied computing concepts in a series of computing elective courses allowing exploration on the final learning outcome, "Knowledge of advanced and recent computing trends."

i. The curriculum encourages students to explore recent computing trends as early as their sophomore year, advising students to take at lease four computer science elative courses from among the following:

- **CSCI-N311 Advanced Database Programming, Oracle (3 cr.)** Focus on the concepts and skills required for database programming and client server development. Concepts will apply to any modern distributed database management system. Emphasis on developing Oracle SQLPlus scripts, PL/SQL server side programming, and Oracle database architecture. Students with programming experience in ODBC compliant languages will be able to practice connecting such languages to an Oracle database. Lecture and laboratory.

- **CSCI-N321 System and Network Administration (3 cr.)** Fundamental concepts of system administration. Design and administration of network servers and workstations. Focus on basic network concepts such as user account administration, resource allocation, security issues, and Internet service management. Lecture and laboratory.
- **CSCI-N335 Advanced Programming, Visual Basic (3 cr.)** Databases and VB, object-oriented design and practice, the component object model, inter-object communication, related RAD environments such as VB for Applications and ActiveX using the Windows API, and generating online help. Lecture and laboratory.
- **CSCI-N342 Server-Side Programming for the Web (3 cr.)** Designing and building applications on a Web server. Focuses on the issues of programming applied to Web servers. Emphasis on relational database concepts, data design, languages used on the server, transaction handling, and integration of data into Web applications.
- **CSCI-N343 Object-Oriented Programming for the Web (3 cr.)** Algorithm design and development within the object-oriented paradigm. Students will utilize Java to create Web-based application software with strong user interaction and graphics. In addition, students will utilize Oracle and SQL to learn introductory database design principles, coupling backend database operation to application software. Lecture and laboratory.
- **CSCI-N345 Advanced Programming, Java (3 cr.)** A Java language course designed for students familiar with programming and the World Wide Web. Focus on the unique aspects of Java, Applet, and GUI design, object-oriented programming, event-handling, multi-threaded applications, animation, and network programming. Lecture and laboratory.
- **CSCI-N351 Introduction to Multimedia Programming (3 cr.)** An integration of computing concepts and multimedia development tools. An introduction to the science behind multimedia (compression algorithms and digital/audio conversion). Use of authoring tools to create compositions of images, sounds, and video. Special emphasis given to using the Web as a multimedia presentation environment. Lecture and laboratory.
- **CSCI-N431 E-Commerce with ASP.NET (3 cr.)** Topics include basic Web controls, form validation, connecting to an Enterprise-level database, SSL, and sending email within an ASP.NET Web page. A significant software development final project creating a functional web store is featured. Lecture and laboratory.
- **CSCI-N435 Data Management Best Practices with ADO.NET (3 cr.)** A study of managing data in the .NET environment. Focus on strategies to efficiently manage data for large-scale projects. Topics include XML, DataSets, SQL, and error management. Lecture and laboratory.

- **CSCI-N443 XML Programming** Fundamentals of XML programming language. After mastering fundamental XML scripting syntax, the course focuses on narrative-centric and data-centric XML applications. Narrative content includes CSS, DTD and XSLT, and X-path, -link, and -pointer tools; data-centric content includes the DOM, Schemas and ADO/ASP. A required masterpiece project summarizes course competencies. Lecture and laboratory.
- **CSCI-N451 Web Game Development (3 cr.)** Study of basic game development principles with a focus on client-side Web delivers. Topics to include creation of sprite objects, user interaction concepts, basic intelligence concepts, game data structures, and basic game physics. Lecture and laboratory.
- **CSCI-N461 Software Engineering for Applied Computer Science (3 cr.)** This is a survey course covering software engineering concepts, tools, techniques and methodologies. The topics covered include software engineering, software process and its difficulties, software lifecycle models, project planning including cost estimation, design methodologies including structured design, data structure oriented design, object-oriented design, and software testing. This course is intended for non-majors and credit will not be awarded to Computer Science majors.

ii. In the junior and senior year, students choose six more computer science elective courses at a more advanced level. Students choose from among the following:
    - **CSCI 432 Security in Computers (3 cr.)** P: CSCI 403. An introduction to computing security to include Cryptography; identity and authentication; software security; operating system security; trusted operating system design and evaluation; network threats and defenses; security management; legal aspects of security; privacy and ethics.
    - **CSCI 435 Multimedia Information Systems (3 cr.)** P or C: CSCI 362, MATH 351/511. Multimedia information systems concepts, evolution of multimedia information systems, media and supporting device commonly associated, image databases, techniques for presenting visual information, video databases, multi-models, audio databases, text databases, multimedia information systems architecture.
    - **CSCI 436 Principles of Computer Networking (3 cr.)** P: CSCI 362. Survey of underlying principles, fundamental problems, and their solutions in designing computer networks. Laboratory projects include using network systems and network simulation environments. Topics include: motivations, networking topologies, layered open systems protocols, transmission capacity, circuit and packet switching, packet framing and error correction, routing, flow and congestion control, and inter-networking.

- **CSCI 437 Introduction to Computer Graphics (3 cr.)** P: CSCI 362, and MATH 351/511. An introduction to 3D programming with emphasis on game engine development using 3D graphics techniques and the standard and platform independent OpenGL library. Topics include: lighting, shading, texture mapping, coordinate systems and transformations, collision detection, 3D geometric and physically-based modeling and animation.
- **CSCI 438 Advanced Game Development (3 cr.)** P: CSCI 437. Advanced game design and development principles and technologies. Students will gain practical experience through extensive game development project. Topics include: character animation, special effects, user interface design, networking for computer games, game engine components and variations, game performance considerations, artificial intelligence, and ethics in computer games.
- **CSCI 441 Client-Server Database Systems (3 cr.)** P or C: CSCI 362. Database system concepts, data models database design, CASE tools, SQL, query processing and query optimization, transaction processing, reliability and security issues, database interactions on the world wide web.
- **CSCI 443 Database Systems (3 cr.)** P: CSCI 362. Fall. Relational database systems: architecture, theory, and application. Relational data structure, integrity rules, mathematical description, data manipulation. Standard SQL and its data manipulation language, engineering aspects of database design in industry, introduction to non-relational database systems.
- **CSCI 448 Biometric Computing (3 cr.)** P: CSCI 362 and STAT 416 or STAT 511. Biometrics is capturing and using physiological and behavioral characteristics for personal identification. It is set to become the successor to the PIN. This course will introduce computational methods for the implementation of various biometric technologies including face and voice recognition, fingerprint and iris identification, and DNA matching.
- **CSCI 452 Object-Oriented Analysis and Design (3 cr.)** P: CSCI 362. Spring. Introduction to the object-oriented paradigm in software development. Basic concepts: objects, classes, messaging, inheritance, methodologies. Analysis: defining objects, structures, attributes, services. Design: transforming the analytic model into the design model. Implementation: comparison of the support features provided by languages such as Smalltalk, C++, Eiffel, and CLOS. A significant design project is required.
- **CSCI 481 Data Mining (3cr.)** P or C: CSCI 240, MATH 351/511, STAT 511/416. An introduction to data warehousing and OLAP technology for data mining, data processing, languages and systems, descriptive data mining: characterization and comparison, association analysis classification and predication, cluster analysis mining complex types of data, application and trends in data mining.

- **CSCI 487 Artificial Intelligence (3 cr.)** P: CSCI 362. Study of key concepts and applications of artificial intelligence. Problem-solving methods, state space search, heuristic search, knowledge representation: predicate logic, resolution, natural deduction, nonmonotonic reasoning, semantic networks, conceptual dependency, frames, scripts, and statistical reasoning; advanced AI topics in game playing, planning, learning, and connectionist models.

D. Stage #3.

a. The Department uses a grading system as the fine-grained component of its approach to assessing learning outcomes. For certain courses, on selected exams, homework and programming assignments, a student's performance relative to each of the student learning outcomes are evaluated. The evaluations in each course are combined to form a measure of the student's performance relative to the General Principles of Undergraduate Learning. The primary purpose in performing this assessment is not to assign grades to individual students. Rather, it is to determine in what ways the Department can improve its instruction to better support its students' achievement of the goals embodied in the learning outcomes.

b. Three of the other vehicles that the Department employs to assess the quality of the delivery of its services are described below. These are coarse-grained measures.

i. Enrollment Data: The Department monitors, documents, and analyzes DWF rates and enrollment data throughout the registration cycle. It uses these latter data particularly for determining course offerings for services courses. Monitoring the data tells of student demands for learning in areas such as Web design and popular programming languages, such as Java and C#. The Department continuously adjusts Certificate Program course offerings based on student demand. For our major's courses, enrollment and DWF data are analyzed particularly for determining retention percentages. Low retention can be an indicator of a possible problem that needs further investigation. This information has influenced faculty hiring and assignment decisions as well as course delivery systems.

ii. Student Evaluations of Teaching: The Department extensively uses the information from these student questionnaires not only to assess the quality of instruction, but also the quality of specific course content.

iii. Faculty Reviews: As the need arises for specific courses, the responsible faculty committee (Graduate, Undergraduate, Service Course) examines their content, delivery, objectives and student performance in order to maximize the achievement of the program's objectives.

Assessment of SLOs in Core Required Courses

General Computer Science Student Learning Outcome	CSCI 230	CSCI 240	CSCI 340	CSCI 362	CSCI 402	CSCI 403	CSCI 495
1. Basic understanding of computing: Computer science majors will have a basic understanding of the theoretical foundations of computer science. These foundations and models of computing include principles of data structures (organizations of data so as to achieve the maximum performance), algorithms (precise techniques for solving problems), computer organization (functionalities and relationships of various components such as processor, memory, secondary storage, operating system and their interrelations), and theory of programming languages (different execution models of higher-level languages).	M/C, E, Q, and W	M/C, E, Q, and W					
2. Ability to analyze different data structures: Selecting an appropriate data structure is extremely critical for performance. Performance can be measured in terms of execution speed and/or computational resource requirements. Different problem characteristics benefit from the use of different data structures. Hence, it is of the utmost necessity to analyze the problem domain and select a suitable data structure from the set of well-known data structures such as linked lists, arrays, stacks, trees, hash tables, etc. All these data structures and operations on them are mathematically analyzable. Students will be familiar with various data structures and be able to select the most appropriate one for a given problem.			M/C, E, Q, and W	M/C, E, Q, and W			
3. Knowledge of a diverse array of computational algorithms: The precise technique, an algorithm, to solve any problem not only guarantees the correct solution, but also achieves it in an optimal fashion. Just like data structures, students will have an in-depth knowledge of a diverse array of computational algorithms and their mathematical analysis. Algorithms, which students will have learned, include searching, sorting, graph, and floating point computations.					M/C, E, Q, and W	M/C, E, Q, and W	
4. Basic understanding of computer architecture: The interrelations among structure and functionality of hardware (CPU, I/O, Memory, etc.) and software components (operating system, compilers, interpreters, etc.) will be known to computer science students. This understanding is of the utmost necessity for exploiting the capabilities offered by modern computer systems.					M/C, E, Q, and W	M/C, E, Q, and W	
5. Ability to develop and design small-scale software projects: Mapping a problem into a specific architecture includes implementing the solution in a particular higher-level language. Advances in programming have facilitated the creation of large software systems, often needed for solving fairly complex real-world problems. Students will be able to apply the principles of Software Engineering to the entire software life cycle, i.e., problem specification, analysis, design, implementation, testing, verification and maintenance, and develop large software systems in at least one currently used high-level programming language.							
6. Knowledge of advanced and recent computing trends: Computer science, being a relatively young branch of science, is constantly changing. Students will possess knowledge of the advanced computing trends (in all different aspects) and will have an ability to extrapolate this knowledge to quickly adapt to future advances.							M/C, E, Q, and W

M/C: Multiple Choice Exam
E: Essay/short answer exam
Q: Quizzes
W: Writing assignment
L: Lab Exercise
P: Presentation to class
I: In class (group or individual activity)
O: Other (please explain)

Stage #4: Collect date to see if the SLOs are being accomplished. The Department has collected examples of student work (exams, homework, projects, etc) for all undergraduate courses. External evaluations of student work and accomplishments will be conducted in 2007.

Stage #5: Use the data from Step #4 to make curricular changes. Curricular changes to the Bachelor of Science degree were made in 2004 based on an extensive review by the faculty and recommendations made by ACM/IEEE. Changes to the current SLOs are required now, to better represent the current degree program. The undergraduate committee has been charged to review and update the SLOs during the fall 2006 semester.

Stage#6: Repeat Stage #4 to determine if changes are effective. Following the external review and the updating of the SLOs, stage #4 will be repeated.

Assessment of Student Learning
Department of Earth Sciences
Indiana University-Purdue University Indianapolis

Annual Report: 2005-2006

Prepared by Chris W. Thomas, M.S., MTSC, Lecturer
(Edited by Joseph L. Thompson)
June 2006

This report describes how the Department of Earth Sciences within the School of Science assesses student learning. It explains how learning is measured at the introductory and advanced levels and describes some major curriculum changes that will impact assessment.

This report does not describe how individual instructors assess student learning (in terms of tests, quizzes, etc.) nor does it describe how students evaluated the ability of their instructor (instructor evaluations).

A. Introduction

This report is based on and organized by the six-stage assessment process adopted by the 2005-2006 School of Science Assessment Committee to guide the assessment efforts employed by its seven academic departments.

The stages of this process are as follows:

a. Stage #1 → Identify the student learning outcomes (SLOs) of the department.
   (1) These SLOs represent the knowledge, skills, and characteristics that the department wants its students to achieve by the time they successfully complete and graduate from the program.
   (2) These SLOs should be precisely identified and defined by the faculty, clearly communicated to their majors, deliberately taught in classes, and carefully assessed to determine if they are becoming accomplished.
b. Stage #2 → Link the SLOs to specific curricular components.
   (1) This stage represents the department's attempt to determine where in the curriculum (i.e., in what courses) are students provided with assignments designed to enable them to achieve the department's SLOs.
   (2) This stage can also include an examination of the developmental nature of the SLOs (e.g., a department may require its students to perform the following cognitive tasks in introductory, intermediate, and advanced classes).
      (a) Remember and understand the terms of the scientific method in an introductory class.
      (b) Analyze and apply these terms in an intermediate-level methods class.
      (c) Evaluate the research of others and create their own research project in an advanced senior capstone class.

c. Stage #3 → Identify or create methods to measure the SLOs.
   (1) Methods may already exist within the curriculum to measure some of the department's SLOs (e.g., comprehensive final examinations, laboratory projects, term papers, oral presentations).
      (a) Some methods may need to be created (e.g., a senior-exit test of knowledge in the discipline, a skills-acquired template used to measure the competency of capstone students, a senior essay designed to measure how student attitudes or characteristics have changed as a result of their undergraduate education).
d. Stage #4 → Collect data to determine if the SLOs are being accomplished.
   (1) This stage requires departments to collect data generated by the methods identified in Stage #2 from the classes identified in Stage #3.
   (2) This stage requires the department to collect data specific to the accomplishment of the individual SLOs—not just course grades—and aggregating this data across students.
e. Stage #5 → Use the data collected in Stage #4 to make curricular changes when they are deemed necessary.
   (1) This stage requires departments to set performance standards for the SLOs that they can use to determine the percentage of their students who have accomplished the SLOs at various stages in the curriculum.
   (2) For example, a department may develop a rubric to measure their students' ability to perform a senior-level research project. This rubric could contain the following performance levels: Excellent Performance, Acceptable Performance, and Unacceptable Performance. These levels would be anchored to specific performance indicators (e.g., for Excellent Performance, the written report would have to conform to the discipline's accepted writing style [APA-style in psychology] and it would contain no more than two errors of spelling, punctuation, capitalization, and grammar).
   (3) If the aggregated data indicated that many students were performing at an unacceptable level for a particular SLO, the department would study its curriculum to see where that SLO is being addressed, and propose changes so that a greater percentage of future students would exhibit this SLO at an excellent or acceptable level.
f. Stage #6 → Determine the impact of the curricular changes.
   (1) If changes are made in the curriculum, this stage requires the department to wait for those changes to have a chance to take effect, and then return to Stage #4 where more data can be collected.
   (2) These data can then be analyzed to determine their impact (i.e., to see if the changes produced the increased levels of performance in the SLOs sought by the department).

For the Department of Earth Sciences, each of these stages, where completed, is outlined in Appendix C.

B. Stage #1: Identify the student learning outcomes

The Department of Earth Sciences only has learning objectives for Bachelor of Science (B.S.) and Bachelor of Arts (B.A.) Geology majors. Appendix A explains general student outcomes for 100-level introductory course level.

Currently, no learning objectives exist for the B.S. in Environmental Science, nor do any objectives exist for non-majors taking 100-level courses. Appendix B explains the student learning outcomes for B.S./B.A. Geology majors. These are also listed in an abbreviated form in Appendix C (Column 1).

In 2006-2007, learning objectives will be established for the B.S. in Environmental Science, at least for students choosing the pathway managed by our Department (students can also pursue a path within the School of Liberal Arts or the School of Public and Environmental Affairs).

Additionally, the learning objectives on file for B.S./B.A. Geology majors are considered out of date. In 2005, the Department began an initiative to revise its advanced level (200-level and above) curriculum (i.e. B.S./B.A. majors). The goal of the redevelopment is to:

1. Create a 200-level curriculum that is designed around the Department learning outcomes. Require students to take all courses at the 200-level;
2. Allow students freedom to take advanced course in specific subdisciplines of their own choosing;
3. Assess students in the capstone course in activities designed around the Department learning outcomes.

This revision will hopefully be completed in 2007. Potentially, the revision will result in a set of objectives that covers both the B.S. in Environmental Science and B.S./B.A. in Geology.

C. Stage #2: Link the SLOs to specific curricular components

As outlined in Appendix C (Column 2), we have mapped the SLOs for B.S./B.A. Geology majors to specific requirements within our curriculum. In 2006-2007, the Undergraduate committee within the Department of Earth Sciences will review this document and determine its accuracy.

D. Stage #3: Identify or create methods to measure the SLOs

As outlined in Appendix C (Column 3), we have mapped the SLOs for B.S./B.A. Geology majors to methods we use to measure whether students can accomplish these objectives. In 2006-2007, the Undergraduate committee within the Department of Earth Sciences will review this document and determine its accuracy.

E. Stage #4: Collect data to determine if the SLOs are being accomplished

We are not at a stage where we can collect data to determine if the SLOs are being accomplished. Instead, in Appendix C (Column 4), we have outlined ways we could possibly measure whether the objectives are met by students.

Appendix A: Assessment at the Introductory Level

Most students who enroll in a 100-level earth science course are non-science majors who do not intend to complete a major or minor in the sciences. GEOL-G110 *Physical Geology*, is a prerequisite for students advancing in a Bachelors of Science or Bachelors of Environmental Science. GEOL-G107 *Environmental Geology* is a prerequisite for the Bachelors of Environmental Science. The Department of Earth Sciences does not have a tailored rubric for learning at the introductory level and no common exam is given across multiple sections of the same course. Therefore, these courses can be best measured against the Principles of Undergraduate Learning (PULs).

The Department of Earth Sciences excels at providing students numerous outlets to demonstrate their ability to meet the IUPUI PULs. Across the 100-level curriculum, service learning projects, research projects, field experiences, and lab experiences allow faculty to broadly assess whether students are meeting the PUL goals, and allow students to demonstrate learning in multiple ways. For example:

- Nearly 200 students participated in a variety of field experiences, including Mammoth Cave, Indiana State Museum, Southside Landfill, Falls of the Ohio State Park, Shades State Park, McCormick Creek State Park, Muscatatuck Park, and Southwestway Park.
- Over 300 students (specific to earth science courses) participated in service learning at a variety of sites around central Indiana. Students submitted a paper that required them to integrate their knowledge as well as their understanding of society and culture.
- Students in several courses completed a research paper that demanded mastery of library research. The project topics required an understanding of society and culture to geologic problems. Topics included choosing an environmental problem within Indiana, assessing the costs and benefits of building a landfill, and determining the risks of disposing waste ash from coal-fired power plants.
- Over 150 students completed a one credit laboratory linked into a lecture course. Environmental Geology, Physical Geology, and Historical Geology include optional laboratories. These laboratories permit students to apply and integrate knowledge and practice critical thinking skills.

PUL	Service Learning	Research Project	Field Experiences	Lab Experiences
Core Communication and Quantitative Skills	x	x		x
Critical Thinking		x		x
Integration and Application of Knowledge	x	x	x	x
Intellectual Depth, Breadth, and Adaptiveness		x		x
Understanding Society and Culture	x	x	x	
Values and Ethics	x		x	

Appendix B: Assessment at the Advanced Level

Courses above the 200-level are typically taken by earth science majors only. In 1999, the Department determined students should meet the following learning outcomes upon graduation:

1. Know fundamentals of biological evolution as revealed by the fossil record
2. Relate geologic timescales and Earth history
3. Understand Geologic timescales and Earth history
4. Understand processes of the rock cycle
5. Explain fundamental processes of deformation of Earth's crust
6. Know fundamental processes of deformation of Earth's crust
7. Apply advanced technologies of our discipline
8. Model and spatially describe Earth processes

Each of these outcomes is broken down into further detail not provided here. These outcomes were used as a basis for creating a senior capstone course in earth science, GEOL-G495 *Senior Thesis*.

The Department currently assesses student learning through the following requirements:

- **Reporting Skills in Geosciences.** This course, GEOL-G205, requires students to develop Core Communication and Quantitative Skills relevant to geosciences. Students learn to master advanced library research skills, report writing skills, and presentation skills.
- **Advanced Laboratory and Field Work.** Students are required to complete a several week field camp, as well as enroll GEOL-G206, *Advanced Physical Geology Laboratory*, GEOL-G303, *Geologic Mapping and Field Methods*, and GEOL-G420, *Regional Geology Field* Trip--courses specifically designed to advance students' critical thinking skills as well as their integration and application of knowledge.
- **Courses in Subdisicplines of Earth Science.** A majority of the upper-level courses in geology are designed to give students intellectual depth and breadth in specific subdisciplines of geology. These courses require research projects that demand critical thinking and integrating and applying knowledge from a variety of courses. Laboratories and field work permit students additional opportunities to integrate and apply their knowledge.
- **Senior Experience.** The senior experience is designed to ensure students meet the IUPUI PULs as well as meeting the Department learning outcomes. Students have the option of completing an internship, senior thesis, or senior capstone course. In 2005-2006, the capstone course was not offered. All students chose to complete a senior thesis.

PUL	Reporting Skills in Geoscience	Advanced Laboratory and Field Work	Courses in Subdisicplines of Geology	Senior Experience
Core Communication and Quantitative Skills	x	x		x
Critical Thinking		x	x	x
Integration and Application of Knowledge	x	x	x	x
Intellectual Depth, Breadth, and Adaptiveness	x	x	x	x
Understanding Society and Culture				
Values and Ethics	x	x		

Senior Experience

As stated above, students have three options for meeting the senior experience requirements. In its current form, only the senior capstone course ensures students meet both the IUPUI PULs and Department learning outcomes. The success of the capstone course (offered in 1999 and 2003) is noted in the 2003-2004 School of Science Assessment Report (http://planning.iupui.edu/318.html). Students who do not complete the capstone complete an internship or senior theses. In these two cases, a student is not globally assessed, but instead assessed for their ability to critically think and integrate and apply knowledge specific to a subdiscipline of geology. Many of the students presented the results of their research in poster and oral presentations at a regional meeting of the Geological Society of America, or at campus-wide meetings specific to undergraduate research or earth science.

Additionally, faculty members are asked to assess each student completing a thesis or internship against the School of Science Template for Assessment of the Capstone Experience.

Appendix C: Planning for Learning and Assessment

As described above, the Department of Earth Sciences has not collected specific data that assesses learning. Instead, in coordination with the School of Science Assessment Committee, we have started to outline a matrix that starts the process for measuring learning and assessment.

1	2	3	4	5	6
What general outcome are you seeking?	**How would you know it** (the outcome) **if you saw it?** (What will the student know or be able to do?)	**How will you help students learn it?** (in class or out of class)	**How could you measure each of the desired behaviors listed in #2?**	**What are the assessment findings?**	**What improvements have been made based on assessment findings?**
Apply advanced technologies of our discipline	The student can complete basic tasks in GIS software, use a total station to take measurements, and use one major piece of lab equipment	Specific classes address use of GIS software and a Total station. Student research and internships usually require students to learn a discipline-specific piece of lab equipment. **Classes:** Several classes offered in Department of Geography (G338, G436, G438); G206 Advanced Physical Geol Lab; G303 Geologic Mapping and Field Methods; G410 Undergraduate Research.	In a capstone class, have students work in teams to complete a project that requires them to individually use equipment and as a group use a variety of lab equipment. A student's research project report would demonstrate their knowledge of research methods.		

1	2	3	4	5	6
What general outcome are you seeking?	**How would you know it** (the outcome) **if you saw it?** (What will the student know or be able to do?)	**How will you help students learn it?** (in class or out of class)	**How could you measure each of the desired behaviors listed in #2?**	**What are the assessment findings?**	**What improvements have been made based on assessment findings?**
Model and spatially describe Earth processes	The student could plot data and interpret a topographic map and geologic map, be able to add data layers and map features to a GIS map, be able to create and interpret common graphical data methods	At the 200-level, students learn how to interpret common graphical data methods, and interpret topographic maps. A specialized course would teach students to build a GIS map. The field camp course instructs students in developing maps. Student research projects require students to develop maps and graphical data. **Classes:** G119 Fundamental of Earth History Lab; G120 Physical Geol Lab; G206 Advanced Physical Geol Lab; G303 Geologic Mapping and Field Methods; G323 Structural Geology; G420 Regional Geology Field Trip; G595 Data Analysis in Geosciences.	In the advanced courses, students will need knowledge of maps and graphical data to complete assignments. Maps and reports created from student research demonstrate their ability to master this outcome. Additionally, a capstone class team project would address use of spatial descriptions and plotting and interpretation of graphical data.		
Professionally write and design scientific presentations and reports	The student can enter the workforce of a consulting firm and meet their expectations for report and presentation development.	Students are required to take a course in geoscience writing, which provides instruction and practice in report and presentation writing. **Classes:** G107 Environmental Geology; G205 Reporting Skills in Geosciences; G495 Senior Thesis in Geology.	A student's capstone report or research report would demonstrate their ability to professionally write and present. Additionally, feedback from employers would measure the ability of graduates.		

1	2	3	4	5	6
What general outcome are you seeking?	**How would you know it** (the outcome) **if you saw it?** (What will the student know or be able to do?)	**How will you help students learn it?** (in class or out of class)	**How could you measure each of the desired behaviors listed in #2?**	**What are the assessment findings?**	**What improvements have been made based on assessment findings?**
Understand the processes of the rock cycle	Students can differentiate between basic categories of Earth material, and given a new set of data, interpret how the rock cycle in conjunction with the hydrosphere, lithosphere, and atmosphere functioned over time.	100-200 level courses address the basic concepts of the rock cycle and how different processes lead to the production of the Earth material found within Earth's crust. At the 300-400 level, students more narrowly focus on specific aspects of the cycle. Field methods and field camp courses allow students to practice interpretations in the field. **Classes:** G110 Physical Geology; G109 Fundamental of Earth History; G206 Advanced Physical Geol Lab; G221 Earth Materials; G222 Petrology; G303 Field Methods; G334 Principles of Sedimentation and Stratigraphy.	If the student were provided a set of unknown rock samples or taken to unknown location, they would be able to explain the physical interactions that produced the set of Earth material present. Students are given projects in various courses, the capstone course, and student research projects that measure this outcome.		
Know fundamentals of biological evolution as revealed by the fossil record	The student understands the process of evolution, knows events in the fossil record, can identify basic fossils found in the Midwest, and can use fossils to interpret Earth history and past environments.	Students are required to take a historical geology course, a physical geology laboratory, and have the option of taking a paleontology course. **Classes**: G109 Fundamentals of Earth History; G209 History of the Earth; G304 Principles of Paleontology.	If the student were provided a set of unknown rock samples with fossils or taken to unknown location, they would be able to use the fossils to interpret the history of past life and environments.		

1	2	3	4	5	6
What general outcome are you seeking?	**How would you know it** (the outcome) **if you saw it?** (What will the student know or be able to do?)	**How will you help students learn it?** (in class or out of class)	**How could you measure each of the desired behaviors listed in #2?**	**What are the assessment findings?**	**What improvements have been made based on assessment findings?**
Relate and Understand geologic timescales and Earth history	The student knows basic events in Earth history and the geologic time scale. The student understands the geologic timescales present in the Midwest, and given a new situation could interpret the geologic timescale or sequence of events of a set of Earth material.	Students are required to take a historical geology course and a physical geology laboratory. Geologic timescales are repeated at different levels across most upper-level courses. They also have the option of taking a course on Indiana Geology and timescales **Classes:** G110 Physical Geology; G120 Physical Geology Lab; G206 Advanced Physical Geol Lab; G109 Fundamentals of Earth History; G209 History of the Earth; G303 Field Methods.	If the student were provided a set of unknown rock samples or taken to unknown location, they would be able to separate out different geologic timescales and events present at one location.		
Know and Explain fundamental processes of deformation of Earth's crust	The student can relate geologic phenomena (mountains, faults, volcanoes) to the processes that created them; the student can classify similar geologic features based on the plate tectonic processes that caused them. The student can define the dynamic processes of Earth's crust.	At the introductory level, students learn the processes of plate tectonics in several courses and learn the technical aspects of the processes in more detail in advanced courses. They also apply their knowledge in introductory labs and practice applying their knowledge with field trips. **Classes:** G110 Physical Geology; G120 Physical Geology Lab; G206 Advanced Physical Geol Lab; G109 Fundamentals of Earth History; G209 History of the Earth.	The student could explain all the processes of plate movement on a world map, and identify major geomorphic features that formed as a result. Additionally, in the field, a student could identify features attributed to deformation in the Earth's crust.		

Assessment of Student Learning
Department of Mathematical Sciences
Indiana University-Purdue University Indianapolis

Annual Report: 2005-2006

Prepared by Robert D. Rigdon, Ph.D.
(Edited by Joseph L. Thompson)
June 2006

Continuing Course Assessment

As stated in prior assessment reports (see http://www.planning.iupui.edu/64.html - 05), the Department of Mathematical Sciences has put in place assessment methods for MATH-M118 *Finite Mathematics*, MATH 111 *Algebra*, and MATH 163 *Integrated Calculus and Analytic Geometry I*. This year we started collecting similar data for MATH-M119 *Brief Survey of Calculus*. These courses now include a developmental course (MATH 111), two service courses (MATH-M118 & MATH-M119) that are taken by a wide cross-section of students, and an introductory major course (MATH 163) that is also taken by students in disciplines that require a considerable level of mathematical sophistication. The assessment process that was adopted entails dividing the material for a particular course into topics (which correspond to course outcome objectives). Exam scores for individual students are broken down into subscores on each topic. The variation in scores from student to student, from section to section, and from year to year can then be analyzed.

For example, we can identify:

- Topics that give students the most trouble
- Topics that produce the greatest variation in performance from student to student
- Topics that produce the greatest variation in performance from section to section

In this way, the Department can better identify particular weaknesses and strengths of students, instructors, and books. Also, instructors and course coordinators can try to develop more consistent ways of presenting the topics that prove to be more problematic for students and instructors.

The chart in Appendix A illustrates the sort of comparison that analysis of the data makes possible. It compares the average scores on all final exams in MATH-M119 on each of 12 topics with the average scores from one section. Of course, such data allows us to inform instructors of the topics on which their students need improvement.

As another example of the use of the data, the composite data for MATH-M118 (not shown) shows that (as we would hope) average scores have been going up and the variation among sections has been going down over the past few semesters. This probably reflects, at least in

part, a greater uniformity in testing since the Department has gone to computer testing in this course.

Last year's report (http://www.planning.iupui.edu/334.html) gives additional examples of analyses that can be made.

Progress in the Assessment of the Programs of the Department

Appendix B contains a recent reformulation of the common learning objectives of the programs of the Department of Mathematical Sciences.

Achievement of objective 4 (from Appendix B) is assured by the requirements for the majors. (The exact mechanism depends on the student's option.) Procedures are being set up to assess the achievement of objectives 5, 6, 7, 8, 9, 11, 12 by examining the transcripts of all math majors. This, of course, involves determining which courses (or combinations of courses) satisfy given objectives.

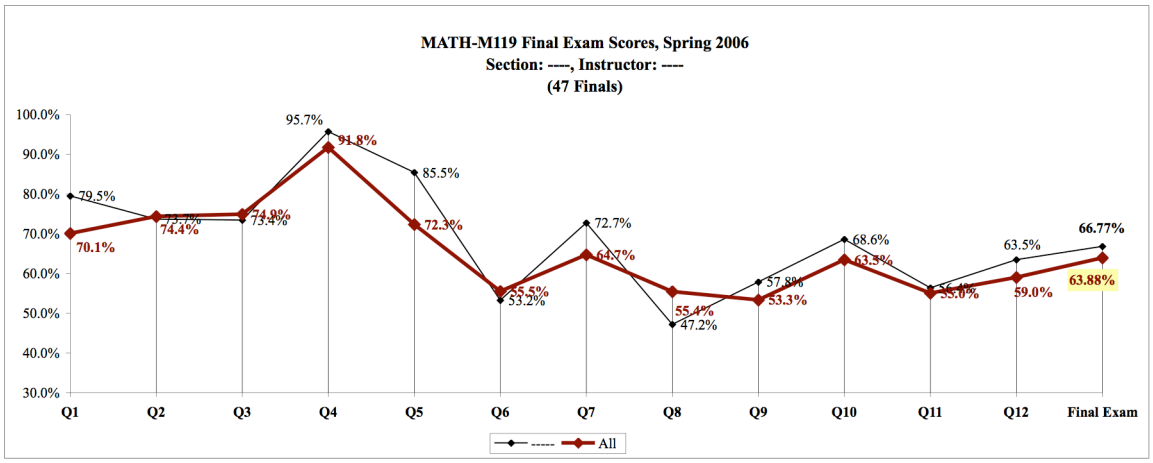
A start on assessing the achievement of objectives 1, 2, 3, 10 has been made. As indicated in previous reports (http://www.planning.iupui.edu/64.html - 05), we have developed an assessment form for MATH 351, *Elementary Linear Algebra*, in which a course instructor indicates the extent to which the math majors in his section have achieved some of these objectives in MATH 351. (For many mathematics majors, MATH 351 is their first upper-division math course.) This feedback can be used to determine not only areas of strength and weakness of individual students, but also can be used to assess the success of our lower-level courses in preparing our majors for their upper-division courses. We are developing similar forms for some other upper-division courses that will allow us to gage a student's progress achieving the objectives.

Assessing the achievement of objectives 1, 2, 3, and 10 is also accomplished to some extent through the capstone assessment form. All capstone mentors complete a Department capstone assessment form (originally exhibited in our 2000-2001 report; see Appendix C) that is based on the template developed by the School of Science Teaching and Learning Committee (now the School of Science Assessment Committee). The questions asked on the capstone assessment form essentially assess attainment of the PUL objectives while also assessing achievement of some of the discipline-specific objectives. We are using this form both to assess how well the capstone experience is serving its intended purpose (requiring students to show growth in all the PULs, and in discipline-specific outcome goals) and as an assessment tool to assess how well our programs are achieving their goals. The results continue to show that a high percentage of our students:

a) are skillful problem solvers
b) show mastery of diverse mathematical ideas
c) show ability to communicate ideas of their discipline orally and in writing
d) show ability to apply knowledge from one area of own discipline to another
e) show ability to apply knowledge from mathematics to other disciplines.

Appendix A

Sample comparison of the average scores on all final exams in MATH-M119 on each of 12 topics with the average scores from one section:



Appendix B

Overview of the common goals of the various options

Student Learning Discipline-Specific Outcome Objectives

1. To develop problem-solving skills

2. To learn abstract reasoning in a mathematical context

3. To be able to understand and critically analyze mathematical arguments

4. To acquire a deeper knowledge of at least one area of mathematics

5. To acquire an understanding and appreciation of connections between different areas of mathematics

6. To become familiar with the principal modes of discovery in mathematics

7. To gain experience in the careful analysis of data

8. To be exposed to some of the powerful applications of mathematics to other subjects

9. To be exposed to a variety of technological tools, such as computer algebra systems, statistical packages, and computer programming languages

10. To communicate mathematical ideas precisely and clearly, both orally and in writing.

11. To be exposed to courses in several of the following areas:
    - analysis (not including differential equations)
    - differential equations
    - discrete math (other than algebra and geometry)
    - algebra
    - geometry
    - probability & statistics
    - deterministic modeling
    - stochastic modeling

12. To be exposed to a number of contrasting but complementary points of view:
    - continuous and discrete,
    - algebraic and geometric,
    - deterministic and stochastic,
    - theoretical and applied.

Appendix C

Capstone Assessment Template

	Needs Improvement	Meets Minimum Standards	Good	Excellent	Not Applicable
Shows ability to formulate problems, solve them, and interpret their solution					
Shows understanding of the nature of proof					
Show mastery of diverse mathematical ideas					
Shows ability to communicate mathematical ideas orally and in writing					
Gives experience in applying knowledge from one branch of mathematics to another and from mathematics to other disciplines					
Makes efficient use of technological tools and scientific resources (e.g., journals)					
Shows knowledge of contemporary and ethical issues in science and their relation to society					
Displays appreciation of the historical development of (an area of) mathematics					

Assessment of Student Learning
Department of Physics
Indiana University Purdue University Indianapolis

Report for the Academic Year 2005-2006

Prepared by Brian A. Woodahl, Ph.D.
(Edited by Joseph L. Thompson)
June 2006

Introduction

The Department of Physics grants the Bachelor of Science (B.S.), Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in physics from Purdue University. The B.S. degree emphasizes preparation for graduate studies in physics, and for careers in private firms and national labs and agencies. In addition to traditional physics, there is also an option in the B.S. program for a Biophysics concentration; students specialize in life-sciences courses. Students can also satisfy the Indiana certification requirements to teach physics in secondary school by completing the teaching option. The M.S. degree provides more rigorous training in mathematics and physics, preparing students for employment in government and industry. The Ph.D. degree prepares students for a career in research and employment in academia, government or industry. Several Department of Physics faculty members also participate in the Medical Biophysics program, which offers a Ph.D. through the IU School of Medicine.

Teaching Mission of the Department

The Department of Physics has a relatively small number of majors, so a large part of our mission is to provide support courses for the rest of the University. PHYS 152 / PHYS 251 is a calculus-based sequence for science and engineering majors and serves as a first course in physics for our majors. PHYS-P201 / PHYS-P202 is an algebra-based sequence for pre-professional students. PHYS 218 / PHYS 219 is an algebra-based sequence for engineering technology students. The Department also offers a two-semester astronomy sequence (AST-A100 and AST-A105) suitable for all University students. In addition, two conceptual physics courses are taught: PHYS P100 (for allied health technologists) and PHYS-P200 (for primary education majors).

Current Student Learning Objectives (SLOs)

Development of a unified core curriculum for the Schools of Science and Liberal Arts resulted in a number of general education learning objectives (see http://common.iupui.edu/home.html). The general education objectives and the manner in which they were implemented in the Department of Physics for the past few years are given in Table I.

Table I: Education Objectives and Methods

General Education Objective	Implementation in the Department of Physics
Knowledge of, and proficiency in, communication and core skills.	Laboratory reports, capstone report. Classroom and Capstone presentations. Literature research, web-based learning. Essay questions on homework and exams.
Proficiency in critical, analytical thinking and creative problem solving.	All physics courses require students to retrieve, evaluate, and interpret information from textbooks, lectures, journals, seminars, and/or Internet sources. Students must solve physical problems and draw mathematically-based conclusions through clear and logical reasoning from course assignments, laboratory exercises, and independent study.
Achievement in intellectual depth, breadth, and adaptiveness.	Extensive knowledge in physics and mathematics is required in all physics courses. Many School and University requirements (e.g., social, biological, other physical sciences, and the humanities) also require students to demonstrate these traits.
Proficiency in the integration and application of knowledge.	Upper-division courses and the capstone experience require students to integrate knowledge from numerous fields of mathematics and science to solve complex physical problems.
Understanding the individual's role within society.	In discussion of the historical development of physics (e.g., discovery of atomic structure, Manhattan Project), our courses provide opportunities for students to consider ethical issues. These range from the roles that science and technology play in society to the necessity of unbiased assessment and reporting of scientific data.

External Evaluation

The Department has just completed its ten-year cycle, external review. During the past spring semester, the Department was evaluated by an external committee composed of members from four universities and one industrial company. A final report of the committee's findings is expected later this summer. If re-direction in the areas of assessment is required, the Department will need to develop new and possibly different ways of measuring SLOs accomplishments.

Re-Identifying SLOs and New Courses

The size of the Department has increased by 40% in the past year and a half -- five new faculty members have been added. In conjunction with the external evaluation committee's report and the infusion of new faculty, a re-evaluation of the physics courses to be offered and how these new courses would be linked to a new (and possibly different) set of SLOs will be the upcoming challenge for the 2006-2007 period.

Introductory Physics Courses

Physics 152/251 (calculus-based): Beginning in 1994, the development of a new teaching pedagogy was initiated by a member of the Department (Dr. Gregor Novak). His effort was joined shortly thereafter by a new faculty member (Dr. Andrew Gavrin). The result is a nationally recognized teaching pedagogy called "Just-in-Time Teaching" (JiTT). A text was published with that title by Prentice Hall in 1999 and was co-authored by Novak, Gavrin, and collaborators from two other institutions. These teaching methods continue to be utilized by the recent addition of new faculty members. Assessment carried out since 1994 on this course sequence has been done based on retention data and nationally accepted standardized tests. The results of this program continue to be very good.

Physics P201/P202 and 218/219 (algebra-based): These two course sequences are currently undergoing a major revision. Dr. Gavrin received a 2004 "Course Transformation Grant" funded by IUPUI's Commitment to Excellence funds through the office of Dean W. Plater. This course transformation will entail the primary goal that lectures will be replaced by a combination of multimedia resources and increased recitation and "workshop-style" meetings. Drs. Gavrin, Kemple, Ross, Vemuri, and Woodahl are responsible for this effort. It is expected this course transformation project to be the focus of assessment activities over the next several years. Although the courses will not be offered in the fully revised form until the fall 2007 semester, the Department is presenting parts of the redesign during fall of 2006. With this, the Department has begun work on selecting and developing appropriate assessment instruments.

Assessment of Physics 490

In 1999, the Department revised the capstone course, PHYS 490, with explicit learning goals spelled out and new student assessment tools put in place to match these goals. In previous years, the assessment of the 490 projects was entirely between the student and his or her research advisor. Under the new system, students must to submit a written report to a committee composed of the student's advisor and two other faculty members, and to make an oral

presentation to a group of faculty and student peers. This last requirement may be met by giving a presentation within the Department or at an appropriate scientific meeting or research symposium. In recent years, three students have completed the capstone experience. They were each rated according to criteria on the School of Science Capstone Assessment Template. The results for the past academic year (fall 2005 to spring 2006) are summarized below.

	Needs Improvement	**Meets Minimum Standards**	**Good**	**Excellent**	N/A
Shows ability to formulate problems, solve them, and interpret their solution			1	1	
Shows understanding of the scientific method			2		
Displays overall comprehension of own discipline			1	1	
Shows ability to communicate ideas of discipline					
(1) orally			1	1	
(2) in writing				2	
Gives experience in applying knowledge					
(1) from own discipline to other disciplines		1		1	
(2) from one area of own discipline to another area		1		1	
Makes efficient use of					
(1) technological tools			1	1	
(2) scientific resources (e.g., journals)				1	
Shows knowledge of contemporary and ethical issues in science and their relation to society	1			1	
Displays appreciation of the historical development of (an area of) the discipline		1			1

Assessment of Student Learning
Department of Psychology
Indiana University-Purdue University Indianapolis

Report for the Academic Year 2005-2006

Submitted by Drew C. Appleby, Ph.D.
June 9, 2006
(Edited by Joseph L. Thompson)

A. Executive Summary.
   1. This document reports the progress of the IUPUI Department of Psychology as it traverses the six stages of the assessment process established by the 2005-2006 School of Science Assessment Committee.
   2. The Department had previously accomplished the first stage of the process by articulating a set of student learning outcomes (SLOs) for its majors.
   3. The Department accomplished the second stage by identifying the classes in its curriculum where students are required to complete assignments designed to enable them to achieve the Department's SLOs. The results of this process can be summarized as follows.
      a. IUPUI psychology majors have abundant opportunities during the course of their undergraduate careers to engage in assignments that target the Department's SLOs.
      b. Although the number of assignments targeting each SLO varies greatly, even the least-often-targeted SLO was still targeted 15 times.
      c. The levels at which the SLOs were targeted (i.e., basic, developing, and advanced) varied widely among SLOs, and psychology majors may find it difficult to achieve some of the SLOs at the advanced level in which they are required to evaluate or create information.
   4. The Department accomplished the third stage partially by asking its capstone students to use a standard 4.0 (A to F) scale to grade themselves on their accomplishment of each of the SLOs. This process revealed that:
      a. Graduating psychology majors are confident in their ability to demonstrate the Department's SLOs.
      b. The fact that graduating seniors are least confident in their ability to perform research is somewhat dismaying because of the strong scientific orientation of the Department.
   5. The Department has not accomplished stages four, five, or six.

B. This report is based on and organized by the following six-stage assessment process used by the School of Science Assessment Committee to guide the assessment efforts employed in the seven academic departments of the IUPUI School of Science.
   1. Stage #1 → Identify the student learning outcomes (SLOs) of the department.

a. These SLOs represent the knowledge, skills, and characteristics that the department wants its students to achieve by the time they successfully complete and graduate from the program.
b. These SLOs should be precisely identified and defined by the faculty, clearly communicated to their majors, deliberately taught in classes, and carefully assessed to determine if they are becoming accomplished.

2. Stage #2 → Link the SLOs to specific curricular components.
   a. This stage represents the department's attempt to determine where in its curriculum are students provided with assignments designed to enable them to achieve the department's SLOs.
   b. This stage can also include an examination of the developmental nature of the SLOs. For example, a department may require its students to perform the following cognitive tasks in introductory, intermediate, and advanced classes.
      (1) Remember and understand the terms of the scientific method in an introductory class.
      (2) Analyze and apply these terms in an intermediate-level methods class.
      (3) Evaluate the research of others and create their own research project in an advanced senior capstone class.
3. Stage #3 → Identify or create methods to measure the SLOs.
   a. Methods may already exist within the curriculum to measure some of the department's SLOs (e.g., comprehensive final examinations, laboratory projects, term papers, oral presentations).
   b. Some methods may need to be created (e.g., a senior-exit test of knowledge in the discipline, a skills-acquired template used to measure the competency of capstone students, a senior essay designed to measure how student attitudes or characteristics have changed as a result of their undergraduate education).
4. Stage #4 → Collect data to determine if the SLOs are being accomplished.
   a. This stage requires departments to collect data generated by the methods identified in Stage #2 from the classes identified in Stage #3.
   b. This stage requires the department to collect data specific to the accomplishment of the individual SLOs—not just course grades—and aggregating this data across students.
5. Stage #5 → Use the data collected in Stage #4 to make curricular changes when they are deemed necessary.
   a. This stage requires departments to set performance standards for the SLOs that they can use to determine the percentage of their students who have accomplished the SLOs at various stages in the curriculum.
   b. For example, a department may develop a rubric to measure their students' ability to perform a senior-level research project. This rubric could contain the following performance levels: Excellent Performance, Acceptable Performance, and Unacceptable Performance. These levels would be anchored to specific performance indicators (e.g., for Excellent Performance, the written report would have to conform to the discipline's accepted writing style [APA style in psychology] and it would contain no more than two errors of spelling, punctuation, capitalization, and grammar).

c. If the aggregated data indicated that many students were performing at an unacceptable level for a particular SLO, the department would study its curriculum to see where that SLO is being addressed, and propose changes so that a greater percentage of future students would exhibit this SLO at an excellent or acceptable level.

6. Stage #6 → Determine the impact of the curricular changes.
   a. If changes are made in the curriculum, this stage requires the department to wait for those changes to have a chance to take effect, and then return to Stage #4 where more data can be collected.
   b. These data can then be analyzed to determine their impact (i.e., to see if the changes produced the increased levels of performance in the SLOs sought by the department).

C. Stages accomplished and not accomplished by the Department of Psychology.
   1. Stage #1 → Identify the student learning outcomes (SLOs) of the department.
      a. This stage was accomplished in 2001 when the Undergraduate Committee of the Psychology Department created a set of seven student-learning outcomes (Appendix A).
      b. All seven of these SLOs are based on the fundamental knowledge, skills, and attitudes underlying the Principles of Undergraduate Learning that all IUPUI students strive to achieve.
      c. The substance and depth of the first four SLOs distinguish psychology majors from their peers who major in other disciplines.
   2. Stage #2 → Link the SLOs to specific curricular components.
      a. This was accomplished during 2005-2006 school year.
      b. The Psychology Department wrote a self-study (Appendix B) and underwent a full external program review in 2005 (see Appendix C for a response to the report generated by this process). The program review team commented very positively on a number of aspects of the Department's undergraduate program (e.g., the Department's clear and effective focus on undergraduate education, Dr. John Kremer's PSY-B104 textbook and the financial foundation that it has created, the academic advising program, the *Orientation to a Major in Psychology* PSY-B103 class, the Department's four concentration tracks, the strong capstone program, and the fact that a critical mass of students are involved in research and other productive curricular and extracurricular activities sponsored by the Department).
      c. The review team made two suggestions to the Department about curricular assessment.
         (1) The first was generated by a concern that the current undergraduate curriculum allows students too much freedom in their ability to fulfill the "core" component of the curriculum. This component contains twelve courses from which psychology majors are required to choose six. Six of these twelve courses represent "social" areas of psychological specialization (i.e., Social Psychology, Industrial/Organizational Psychology, Abnormal Psychology, Theories of Personality, Tests and Measurement, and Life Span Development). The remaining six courses represent "biological" areas of psychological specialization (i.e., Behavioral Neuroscience, Brain Mechanisms of Behavior, Motivation,

Cognition, Learning, and Perception). This suggestion is currently being discussed in the Department's Undergraduate Committee.

(2) The second suggestion from the review team was for the Department to perform a curriculum audit that would enable it to identify the courses in the undergraduate curriculum in which each of the Department's student learning outcomes was targeting. Thus, the review team set the stage for the second step in the six-step assessment process as adopted by the 2005-2006 School of Science Assessment Committee. The manner in which this stage was carried out is described in Appendix D.

d. The following conclusions can be drawn from the results of this curriculum audit.

(1) Conclusion #1 → <u>IUPUI psychology majors have abundant opportunities during the course of their undergraduate careers to engage in assignments that target the Department's SLOs</u>.

(a) A total of 498 assignments in the 49 audited classes require the accomplishment of at least one of the SLOs.

(b) This means each class that can satisfy a Department graduation requirement contains an average of 10 assignments that target the Department's SLOs.

(2) Conclusion #2 → <u>Although the number of assignments targeting each SLO varies greatly, even the least-often-targeted SLO was still targeted 15 times.</u>

(a) The most often targeted SLOs—followed by their number of assignments in parenthesis—were Application (47), Content (45), Writing Skills (44), and Technological Competence (40).

(b) The least often targeted SLOs were Collaboration Skills (28), Speaking Skills (22), Diversity (20), and Career Exploration (15).

(3) Conclusion #3 → <u>The levels at which the SLOs were targeted varied widely among SLOs, and psychology majors may find it difficult to achieve some of the SLOs at the Advanced Level where they are required to evaluate or create information</u>.

(a) The following SLOs were targeted at the Advanced Level in five or fewer classes: Understand Others (5), Career Exploration (5), Technological Competence (4), Ethics (3), Speaking Skills (2), and Diversity (2).

3. Stage #3 → Identify or create methods to measure the SLOs.

a. This stage was only partially accomplished during the 2005-2006 school year.

(1) Students in all but one of the fall 2005 psychology capstone courses were asked to "grade" themselves on each of the 15 debundled student learning outcomes of the Department to gain student perceptions of how well they are accomplishing what the Department wants them to accomplish as a result of successfully completing a Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) degree in psychology.

b. Stage #4 → Collect data to determine if the SLOs are being accomplished.

(1) Psychology majors gave themselves grades on a standard 4.0 grading scale that indicated they believed they were above average (i.e., at the "B" level) in their accomplishment of all of the SLOs except one (Research), which was only .02 points below a "B" at 2.98.

(2) Conclusion #1 → <u>It appears that graduating psychology majors are confident in their ability to demonstrate the Department's SLOs.</u>

(3) Conclusions #2 → The fact that graduating seniors are least confident in their ability to perform research is somewhat dismaying because of the strong scientific orientation of the Department.

4. Stage #5 → Use the data collected in Stage #4 to make curricular changes when they are deemed necessary.
   a. This stage has not yet been accomplished.
5. Stage #6 → Determine the impact of the curricular changes.
   a. This stage has not yet been accomplished.

Appendix A

The Department of Psychology's Student Learning Outcomes

The IUPUI Department of Psychology
Seven Student Learning Outcomes (SLOs)

All seven of these SLOs are based on the fundamental skills and abilities underlying the Principles of Undergraduate Learning that all IUPUI undergraduates strive to achieve. The substance and depth of the first four distinguish psychology majors from their peers who major in other disciplines. When students have completed their requirements for a Bachelor of Arts or Bachelor of Science degree in psychology from the School of Science, they should . . .

SLO #1 → Content of Psychology

. . . show familiarity with the major concepts, theoretical perspectives, empirical findings, and historical trends in psychology.

SLO # 2 → Research in Psychology

. . . understand and be able to use basic research methods in psychology, including design, data analysis, and interpretation.

SLO #3 → Application of Psychology

. . . understand and generate applications of psychology to individual, social, and organizational issues.

SLO #4 → Ethics in Psychology

. . . understand and abide by the ethics of psychology, including those that encourage the recognition, understanding, and respect for the complexity of socio-cultural and international diversity.

SLO #5 → Personal Development, Relationship Building, and Career Planning

. . . understand themselves and others, acquire effective collaboration skills, and develop realistic ideas about how to pursue careers in psychology and related fields.

SLO #6 → Communication Skills, Information Competence, and Technological Proficiency

. . . be able to write and speak effectively, demonstrate information competence, and utilize technology for many purposes.

SLO #7 → Critical and Creative Thinking and Problem Solving

. . . use critical and creative thinking in the scientific approach to problem solving.

Appendix B

The Undergraduate Section of the Department of Psychology 2005 Self Study

2005 IUPUI Undergraduate Psychology Program Self Study

Table of Contents

Program Overview

This section describes the mission of the program and the strategies that the department uses to accomplish this mission, the distinctive features of the program, and the program's set of student learning outcomes.

Program Mission and Strategies

The mission of the Indiana University-Purdue University Indianapolis (IUPUI) undergraduate psychology program is to produce graduates who possess the knowledge and skills necessary to accomplish their post-baccalaureate aspirations. The program uses the following strategies to accomplish this goal.

- Articulate a set of *student learning outcomes* for its majors that are a comprehensive synthesis of IUPUI's Principles of Undergraduate Education and the American Psychological Association's Undergraduate Psychology Majors' Competencies.
- Create effective *recruitment and retention strategies* to attract and retain students whose level of academic preparedness is sufficiently high to enable them to fulfill the requirements of the program, and to graduate with a BA or BS in psychology.
- Provide students with a *well-balanced and scientifically rigorous curriculum* that offers students multiple opportunities to acquire the skills necessary to gain meaningful employment immediately after graduation or to continue their education in graduate school.
- Provide IUPUI's non-psychology majors with *service courses* that fulfill their programs' requirements and/or provide them with accurate, current, and applicable psychological knowledge and skills.
- Offer students *multiple opportunities to engage in undergraduate research* by requiring psychology majors to acquire a set of fundamental statistical and research design skills, enabling them to earn academic credit for research activities, offering them faculty and financial support to engage in these activities, and providing them with opportunities to communicate the results of their research to the immediate and larger scientific communities.

- Provide students with a *comprehensive set of support services* designed to enable them to become aware of, value, and use the department's resources in their attempts to accomplish their academic and career-planning goals.
- Employ a *Director of Undergraduate Studies* whose duties are to insure the continued growth and viability of the program; to advocate for its needs during departmental resource decisions; and to serve as its official representative to the School of Science, the university, and the external community. The Director of Undergraduate Studies is assisted by a *Director of Student Development* whose duties are to directly oversee the successful functioning of the department's Advising Office, Peer Advising Program, orientation, student organizations, career-planning activities, and celebratory events.
- Develop and use an *assessment system* that includes a clearly articulated and operationally defined set of student learning outcomes, multiple methods to determine the extent to which students actually accomplish these outcomes, and mechanisms to use the data gained from these methods to make evidence-based changes in the curriculum when these changes are warranted.

Distinctive Program Features

Vertical Integration. The vertical integration of the undergraduate and graduate programs allows qualified psychology majors to perform research with graduate faculty and to earn an undergraduate track concentration in an area associated with one of the department's three graduate areas (Industrial/Organizational Psychology, Clinical Rehabilitation Psychology, Behavioral Neuroscience, and the Psychology of Addictions). Practica and co-curricular activities offer majors a broad range of opportunities to practice their laboratory and classroom skills through collaboration with professionals in the community.

An Innovative Introductory Psychology Course. B104 Introduction to Psychology as a Social Science is a truly innovative course. It enrolls approximately 3500 students per year in classes of no more than 45 students. It stresses active and collaborative learning, a high level of student-faculty interaction, and the use of cutting-edge technology to facilitate and assess learning. It uses the computerized testing system that is described below.

Computerized Testing System. The department has made significant investments in technology for instructional purposes. Three of our courses that enroll approximately 4000 students each year use a web-based testing program (IQuiz) that evaluates students with a variety of items (including essays) and is available almost any time of the day, seven days a week. IQuiz allows faculty to create, edit, deliver, grade, and analyze tests and frees up faculty time in class for more interactive and creative efforts. It gives students prompt feedback and multiple opportunities to demonstrate mastery learning. The department's software programmer also designs computerized laboratory simulations and interactive learning exercises available to students in the classroom and at home.

*Orientation and Capstone Career-Preparation Experiences***.** Most psychology majors begin their undergraduate experience with B103 Orientation to a Major in Psychology during which they explore the nature of psychology and investigate the professional options for which a degree in psychology can prepare them. They complete their undergraduate careers by choosing one of

three capstone experiences: a research project, a practicum experience, or a scholarly seminar. The orientation course and capstone options respect the diversity of students' career paths after they leave the university. Most alumni enter the job force immediately after graduation, while a smaller number are admitted to graduate school.

Sense of Community. The department is committed to fostering a sense of community among its students, which is a challenging task at a large, urban, commuter campus. Evidence of our commitment is the support of a staff-level position of Director of Student Development (DSD). The DSD teaches, advises, and supports our majors, and encourages them to take full advantage of opportunities at the university and in the community. The DSD coordinates a variety of academic/social functions (e.g., an annual open house, an alumni career day, and a brunch for graduating seniors and their families) and keeps in touch with our students through a department newsletter, an active listserv, and a comprehensive website (http://www.psynt.iupui.edu).

The Department's Student Learning Outcomes

The American Psychological Association's Board of Educational Affairs created a Task Force on Undergraduate Psychology Major Competencies in 1999. The Director of Undergraduate Studies was a member of this group's advisory board and in 2001 was invited to join as one of the group's members. The following set of student learning outcomes (SLOs) is the result of the deliberations of the Undergraduate Committee. All seven of these SLOs are based on the fundamental skills and abilities underlying the Principles of Undergraduate Learning that all IUPUI undergraduates strive to achieve. The substance and depth of the first four distinguish psychology majors from their peers who major in other disciplines.

SLO #1 Content of Psychology: to show familiarity with the major concepts, theoretical perspectives, empirical findings, and historical trends in psychology

SLO #2 Research in Psychology: to understand and use basic research methods in psychology, including design, data analysis, and interpretation

SLO #3 Application of Psychology: to understand and generate applications of psychology to individual, social, and organizational issues

SLO #4 Ethics in Psychology: to understand and abide by the ethics of psychology, including those that encourage the recognition, understanding, and respect for the complexity of socio-cultural and international diversity

SLO #5 Personal Development, Relationship Building, and Career Planning: to understand themselves and others, acquire effective collaboration skills, and develop realistic ideas about how to pursue careers in psychology and related fields

SLO #6 Communication Skills, Information Competence, and Technological Proficiency: to write and speak effectively, demonstrate information competence, and utilize technology for many purposes

SLO #7 Critical and Creative Thinking and Problem Solving: to use critical and creative thinking in the scientific approach to problem solving.

Recommendations from the Previous Review and Departmental Responses

This section lists the recommendations from the most recent program review committee, describes the degree to which these recommendations have been implemented since that review, identifies two future trends in undergraduate psychology, and makes a request for assistance from the current evaluation team to address these trends.

Recommendations of the 1997 Program Review Committee

The recommendations for the undergraduate program from the 1997 program review committee dealt primarily with two issues: assessment and academic advising. The review committee gave the undergraduate program's curriculum an excellent overall evaluation and commented on its many strengths. Their recommendations focused on the assessment of our curriculum, which involves creating methods to answer the following two questions: What is it that we expect of our students, and how do we know that the students have met our expectations? The committee suggested that we pay particular attention to competence in critical thinking and the ability to think in complex ways about diversity. They also recommended that we routinely assess if our students are being provided with the knowledge and skills they will need to obtain successful employment or succeed in a graduate program.

The review committee gave a number of specific recommendations to improve advising, which had been one of the weak components of our program at that time. The committee suggested that advisors and in fact, all faculty, receive periodic academic updates, and that advisors should be tested on their advising knowledge. Furthermore, the department should attempt to target student populations with specific needs and provide access to alumni who could provide career expertise. The committee also suggested that more emphasis and departmental resources be given to advising, and outside sources of information be sought and utilized. For students, they suggested mandatory advising sessions at various points throughout their academic careers, and possibly the development of an "electronic portfolio" which would include a method of monitoring their progress toward graduation. Finally, the committee suggested that the department institute a means of assessing the effectiveness of our advising system.

Departmental Responses to the Committee's Recommendations

Assessment. The Undergraduate Committee has partially addressed the recommendations regarding assessment. It has accomplished the first part of this recommendation (What is it that we expect of our students?) by creating a set of student learning outcomes (SLOs) for the undergraduate program based on a synthesis of IUPUI's Principles of Undergraduate Education and the American Psychological Association's recently created Undergraduate Psychology Majors' Competencies (see section below). The department is in the preliminary stages of accomplishing the second part of this recommendation (How do we know that our students have

met our expectations?) by attempting to create a senior exit test that can be initially used to determine the degree to which our graduating seniors have mastered the content of our curriculum. Later iterations of this test can be created to measure at what level of critical thinking this knowledge exists (i.e., Do our students simply memorize the content of our curriculum or do they truly comprehend it and are they capable of applying, analyzing, synthesizing, and evaluating it in complex situations such as those involving diversity). Our efforts to increase our students' ability to think in complex ways about diversity have produced significantly higher ratings by psychology majors than for all other majors in the School of Science on the following three items from the university's latest survey of current students.

- Faculty incorporate into their curriculum and classroom discussions issues that relate to the diversity of human experience and culture.
- I participated in classroom discussions and activities that included contributions from students with diverse backgrounds and perspectives.
- I noticed the influence of multicultural and diverse perspectives in campus artwork, sculpture, or décor.

Another curricular recommendation involved the suggestion to routinely assess our students to determine if they are being provided with the knowledge and skills they will need to obtain successful employment or gain entrance to a graduate program. This has been partially accomplished through a survey of our graduates that investigated the extent to which they believe they receive adequate career advising. Further investigation of this issue should involve the identification of the specific knowledge and skills that potential employers and graduate school admissions committees value and the assessment of the presence or absence of this knowledge and these skills in our graduates.

Advising. The perception of the quality of both prescriptive advising (i.e., helping students to select classes to fulfill requirements) and developmental advising (i.e., helping students to clarify and prepare for their post-baccalaureate goals) has been assessed with an alumni survey and the quality of both types of advising has increased steadily since the last program review. This increase could be due to several of the suggestions made by the previous program review committee that have been put into effect. First, the department sponsors a luncheon at the beginning of each semester to which all faculty and peer advisors are invited. This event enables advisors to become acquainted and provides an opportunity for advisors to share strategies and concerns and to receive updates about advising issues and procedures. Second, the peer advisors are required to enroll in B422 Professional Practice in Psychology in which they are tested on their advising knowledge. One student population with specific needs that has been targeted by the advising program is evening students who are now offered two Advising Nights each semester. The department now provides its students access to alumni who share their career expertise in the form of panels of graduate students who present information in our required orientation class (B103 Orientation to a Major in Psychology), guest speakers in our Psi Chi Open Discussion series, and alumni who participate in the annual School of Science Career Day. The National Academic Advising Association has recognized the department's emphasis on and support for the peer advising program when they selected it as an example of a Best Practice in a Peer Advising Program and invited the Director of Student Development to describe the program in a forthcoming issue of their *Exemplary Practices in Peer Advising* monograph. It should also

be noted that several academic departments from within the university and at least two departments from other universities have visited the Peer Advising Office to learn how it operates. Although psychology majors are still only required to have one meeting with their advisor, this appears to be working successfully for the vast majority of students. The university is in the process of developing an institution-wide "electronic portfolio" project. Once this project exits the pilot stage, the department may wish to introduce it in the B103 Orientation to a Major in Psychology class.

Two Future Trends in Undergraduate Psychology and a Request for Assistance to Address These Trends

Two future trends in undergraduate psychology. In an attempt to identify the future trends in undergraduate education in psychology that could impact the future success of the program, the Director of Undergraduate Studies surveyed a group of colleagues that included the past two presidents of APA, the present and past editors of *Teaching of Psychology*, and several past presidents of the Society for the Teaching of Psychology. The results of this survey were quite clear. The two most often mentioned trends were (1) departments' use of APA's Undergraduate Psychology Major Competencies to construct unique sets of departmental student learning outcomes (e.g., critical thinking) and (2) the establishment of sets of assessment strategies to determine the extent to which program graduates have actually accomplished these outcomes. It is clear that without assessment, colleges and universities can only describe the educational opportunities they provide their students. Without assessment, they cannot provide persuasive proof to their sponsors, their clientele, or themselves that their graduates have successfully utilized these opportunities to develop into the knowledgeable, skillful, ethical, and responsible life-long learners that higher education is designed to produce.

The steps in the assessment process. The first step in assessment for any academic program is to determine its student learning outcomes (i.e., what it wants its students to know and to be able to do as a result of successfully completing its program). The second step is to operationalize these outcomes so their degree of achievement can be measured. The third step is to link these outcomes to specific components of the curriculum. The fourth step is to collect data within the context of these components that can be used to determine if these outcomes are being achieved. The fifth step is to use the information collected during the fourth step to make data-informed changes to the curriculum when these changes are deemed necessary. Our department has completed step one of this process but, with the exception of some isolated instances (notably B104 Psychology as a Social Science), it has not progressed beyond step one.

A request for specific advice from the Program Review Committee. Data collected after the recent departmental retreat indicate that assessment is a very low priority for the majority of the faculty. Unless the culture of our department changes, it is unlikely that assessment will occur at the level that it should, and our department may very well suffer in the future because of its inability to respond in a proactive manner to this trend. Several members of the Undergraduate Committee who are committed to the concept of assessment have proposed a senior exit test of psychological knowledge (Student Learning Outcome #1) that could be administered to seniors enrolled in the department's senior capstone courses. Using a rubric to evaluate the methodological competence of capstone students (e.g., the ability to perform a literature review,

use APA style to write psychological reports, and use appropriate statistical methods to analyze data) could be used to assess the accomplishment of Student Learning Outcome #2. The Director of Undergraduate Studies is eager to receive specific suggestions from the Program Review Committee that can be used to gradually transform assessment into a more accepted and higher-priority component of the department's culture. Once this is accomplished, moving on to the next four steps in the assessment process will be possible.

Teaching

This section describes the curricula for the major, the minor, and the track concentrations psychology majors can earn. It also describes the service courses the department provides for students in other majors.

Curriculum for the Undergraduate Major

There have been no changes in degree requirements since the last external review, but considerable effort has been expended to implement certain aspects of the undergraduate curriculum for majors. The five sets of psychology requirements for a Bachelor or Arts (BA) or Bachelor of Science (BS) degree in psychology, each of which requires 40 hours, are identified in the following sections. Appendix UG-1 contains the rationale for this curriculum that is provided to students as they enter the program and Appendix UG-2 contains the general education component of the psychology major.

- **Introductory Sequence** (seven credits, three courses): Orientation to a Major in Psychology (B103), Psychology as a Social Science (B104), and Psychology as a Biological Science (B105).

- **Research Methods** (six credits, two courses): Statistics (B305) and Introductory Laboratory in Psychology (B311).

- **Core Courses** (18 credits, 6 courses chosen from a list of 12 courses that include both the social and the biological aspects of psychology): Tests and Measurement (B307), Life Span Development (B310), Behavioral Neuroscience (B320), Perception (B334), Cognition (B340), Learning (B344), Motivation (B356), Introduction to Industrial/Organizational Psychology (B358), Social Psychology (B370), Abnormal Psychology (B380), Brain Mechanisms of Behavior (B398), and Theories of Personality (B424).

- **Psychology Specialization** [six credits; two different-numbered upper-level (300 or above) courses)].

- **Capstone** (three credits, one course): BS students must choose from a list of capstone labs; BA students are allowed to use a capstone lab, but may choose a capstone practicum or a capstone seminar instead.

There are several strengths of the curriculum. The curriculum features the four categories of courses (introductory, methodology, content, and integrative) recommended by the American Psychological Association in its *Handbook for Enhancing Undergraduate Education in*

Psychology. It goes beyond these categories by also requiring two specialization courses that enable students to focus their baccalaureate degree in a particular area of psychological specialization. It requires students to develop a strong introductory foundation by completing three introductory classes and a strong methodological foundation by completing two methods classes. It provides majors with a wide variety of choices in the way they complete their core and specialization classes, including choices from both the social and biological aspects of psychology. It provides students with a choice of integrative experiences as they chose from a laboratory, practicum, or seminar capstone course. It also provides students with opportunities to develop their writing, collaboration, and integrative skills, which are reflected in the following three results from the latest institutional survey of current students that revealed psychology majors rated themselves significantly higher on the following ability than did the majors in all the other six School of Science programs.

- Write clearly and effectively
- Work with other students in groups or teams
- Integrate what you have leaned with personal experience

When asked to respond to the same items, alumni rated themselves significantly higher on:

- Speaking clearly and effectively
- Applying what I have learned in college to issues and problems I face every day
- Finding new ways to use my skills and knowledge as I encounter new situations and problems
- Putting ideas together in new ways
- Making informed judgments when faced with ethical dilemmas
- Making choices about my conduct based on thoughtful reasoning about what is appropriate

The following three findings from the most recent university alumni satisfaction survey support the overall strength of the psychology curriculum and the courses that psychology majors take outside their major. Psychology alumni rated each of the following statement higher than alumni in all of the other six School of Science departments.

- The quality of teaching by the faculty in your major department
- The quality of teaching by other faculty at IUPUI
- The overall quality of education you received at IUPUI

There are also several concerns about the curriculum. The first is that there no faculty available to teach Perception, a core course; it is only rarely offered. The second is an anticipation of a retirement at the end of the current school year that will affect our ability to offer another core course, Theories of Personality and also the Capstone Laboratory in Personality. Hiring priorities should address these needs for our undergraduates. Another concern was revealed by the results of the latest institutional survey of current students that revealed that psychology majors rated themselves significantly lower on the following two skills than majors in the six other School of Science programs.

- Solving mathematical problems
- Understanding a statistical report

Although these findings present a potential concern for the department, it should be noted that mathematical skills are stressed more in the Mathematics, Physics, Chemistry, and Computer Science Departments than they are in the Psychology Department.

Track Concentration Curricula

The specialization courses were conceived to promote a presence of the graduate program in the undergraduate program. Tracks, or concentrations, tied to the graduate programs (biopsychology, industrial/organizational psychology, and clinical rehabilitation psychology) needed course development and hiring of appropriate faculty. In addition, the former Psychobiology of Addictions Track has been replaced by two psychobiology tracks; these are: Behavioral Neuroscience and Psychology of Addictions. A new core course (B398, Brain Mechanisms of Behavior) was added for the Behavioral Neuroscience Track. Capstones were added too. Capstone Honors Research (B499) can count for a capstone for any of the tracks. For the I/O Track, a new capstone was added (B462, Capstone Practicum in Industrial/Organizational Psychology). The new Capstone Laboratory in Clinical Rehabilitation Psychology (B481) and Capstone Practicum in Clinical Rehabilitation Psychology (B482) can count for either the Clinical Rehabilitation Psychology Track or the Psychology of Addictions Track. There are two new specialization courses: Introduction to Counseling (B386) can apply to either the Clinical Rehabilitation or Psychology of Addictions Tracks, and Introduction to Clinical Rehabilitation Psychology (B322) counts as a specialization for Clinical Rehabilitation.

Tracks are optional for our majors. The first student to complete requirements for a track graduated in May, 2001. There were 10 graduating students who completed a Track in all of 2003, and 15 completed a Track in May of 2004. Currently there are 143 students who have applied for a track, with 77 in Clinical Rehabilitation, 21 in Psychology of Addictions, 23 in Industrial/Organizational Psychology, and 22 in Behavioral Neuroscience.

Curriculum for the Undergraduate Minor (18 credit hours) (see Appendix UG-3)

Service Courses: The department offers seven courses in which at least 50% of the enrollees are non-psychology majors. These courses are B104 Psychology as a Social Science, B105 Psychology as a Biological Science, B305 Statistics, and B310 Lifespan Development, B360 Childhood and Adolescence, B370 Social Psychology, and B380 Abnormal Psychology. These courses enroll approximately 8,500 non-psychology majors each year.

B104 Psychology as a Social Science. Approximately 3500 students take B104 each year. This is about 40% of the annual credit hours for the Department of Psychology. Prior to 1993, this course was taught in large lecture halls and had an annual DWF rate of 35%. Part-time faculty taught most sections of the course and rarely stayed with the department for more than four semesters. Student satisfaction was low.

Twelve years ago, the instructional format of the course was changed. Course enrollment was reduced to a maximum of 50 students. To accommodate the increase in the number of sections, testing was taken outside of the classroom and the number of weekly sessions was reduced from two to one. The role of the student in the classroom was changed from passive listening and note-taking to an active learning format. The role of the instructor changed from lecturer to facilitator. Support sessions with peer mentors were provided on a voluntary basis. Computerized exams were implemented. This change enabled students to take tests as their schedules

permitted, an important feature for our students who have heavy responsibilities outside of school (e.g., families and full-time employment).

At the time of the last review in 1997, student satisfaction for the course had risen (from 3.9 to 4.2) and the average exam scores had improved .4 of a letter grade. However, the DWF rate had remained nearly constant (33%); the percentage of Ds had declined but the number of Ws increased by a similar percentage. The internal portion of the 1997 review recommended the following for future development: Analyze the reasons for the DWF rate, increase the number of course activities available over the internet, develop the writing component of the course, increase the conversations about the course among faculty and mentors, help students learn how to apply psychological principles, and more carefully apply theory and research on learning to course activities.

Analysis of 400 Students in 1999. Prior to this time, we assumed that the high student failure rate was due to the course structure. The drastic changes in course content (reduced material) and course structure (small classes, two opportunities to take each test, active learning format) failed to significantly change the DWF rate. In 2000, the activities (class attendance, homework completion, test taking, and course completion) of 400 students were carefully tracked. We were able to identify 70% of the students who failed the course by week 4 of the semester with a simple index: Failure to attend over 50% of the class or complete 50% of the assignments. In addition, 99% of the students who completed over 80% of the homework passed the course. We concluded that student motivation was an important predictor of student success and that we could identify these at-risk students very early in the semester. A second, more qualitative study uncovered three motivational factors. (1) Students had a variety of idiosyncratic obstacles that prevented completion of course activities. (2) They also had incorrect expectations about the effort required to be successful in the course. (3) Homework assignments were uninteresting and easily manipulated.

Course Format Options. Numerous developments in the course structure have focused on three components of motivation: obstacles in students' lives, initial student expectations, and development of interesting homework options. (1) To help students effectively deal with a crowded schedule (students on average work 23 hours/week), a "Recitation Substitution" program enabled students to attend any of the 30 other sections to substitute for a missed class. The use of computers for testing enables faculty to easily give make-up exams. (2) Many students have a low expectation for the amount of work that it takes to succeed in this course. Specifically, students thought that class attendance was not important, homework was not perceived as valuable, and a passing grade could be earned simply by completing the homework. To quickly communicate the importance of course activities, an administrative withdrawal policy was implemented. If a student misses more than two of the first four classes, that student is removed from the course with financial aid implications. (Recently, this policy has been adopted as an IUPUI academic policy.) Second, the first test (of 5) was divided into two shorter tests, each covering half of the material. This procedure provides students with feedback on course performance within the first two weeks of the semester and enables faculty to intervene early to help these students. (3) Additional homework assignments were added to provide more options for students and to better meet the four critical thinking skills adopted for the course. Two course structure options (traditional and mastery) were developed to experiment with different

motivational ideas. “Traditional” is the typical course structure requiring class attendance and homework in which students lose points for not coming to class and failing to complete homework. In the “Mastery” approach, students are given multiple opportunities to achieve, but must obtain the class and homework points to take the exams.

Five Interactive Computer Exercises on the Internet. In addition to the standard paper and pencil study guide, five interactive computer exercises were developed to teach students the three critical thinking skills that are the focus of this course: Applying psychology to life and comparing and connecting concepts, theorists, and theories. The exercises are available through the internet and provide immediate feedback on course concepts. Students may make multiple attempts to reach criteria.

Writing Activities for Assignments and Exams. IUPUI, like many universities, is emphasizing students’ writing skills. Every introductory psychology exam has two essays worth approximately 15% of the exam score. Four undergraduate and graduate students grade the 20,000 essays. The essays require students to compare and connect concepts and apply them to novel examples.

Several other important features of the course are described in Appendix UG-4.

Staff Development. Probably, one of the biggest areas of change has been the increased participation of full-time faculty. Until Fall 02, part-time faculty taught most sections of the course, but they had a high turnover rate. For Fall 02, a lecturer position was added and the department chair assigned more full-time faculty to this course. Currently, part-time faculty teach only 25% of the sections, the reverse of previous years. In addition, two full-time faculty are working on the course as their primary assignment and a third faculty member regularly provides input and participates in most course decisions. The day-to-day operation of the course and updating of databases is assigned to part-time undergraduate students. The departmental computer programmer provides technical support and develops all of the software.

Evaluation. Students in B104 are similar to the students taking other psychology classes. The average student is 22 and works 23 hours per week. The average age of students in other psychology classes is 25 and they work 22 hours per week. Students report that they study 3.9 hours per week on the course, which is similar to the 3.7 hours reported by students in the other psychology courses. Students anticipate that they will earn an average grade of 3.3 (3.0 = “B”) in the course which is almost identical to the 3.2 average grade for other psychology courses.

In regard to student satisfaction, Introductory Psychology uses an “Active Learning” survey and the following items overlap with the “Lecture” form used by most of the Department (see Table 1 in Appendix UG-5). Only one item, “I am developing my writing skills” is below the average of other psychology courses.

The DWF rate has decreased from approximately 35% at the start of the review period to 25% over the last three semesters. An analysis of this rate for gateway courses in comparable departments found a similar decline, although not in the same semesters. Although the changes

in the course may have affected the DWF rate, available evidence does not afford this conclusion.

Most students believe that the course requires at least as much work as other psychology courses and that the time they invest pays off for both learning and test performance. Many students recognize the advantages of the deeper learning strategies embedded in the group recitation exercises. Other students want a more basic approach to class sessions. Testing procedures are judged to be helpful not only for accommodating a busy schedule but also as providing good feedback to improve test performance. One comment recognized one of the most important goals of the faculty, "Everyone wanted me to succeed, but they didn't do the work for me."

The following are believed to be the strengths of this course.

- High percentage of course sections taught by full-time faculty;
- High use of technology to efficiently utilize available classroom and teacher resources, to provide immediate feedback to students, and to help students manage their overcrowded schedules; and
- Multiple homework and learning options help students learn different critical thinking skills and help students match their learning styles with course activities.
- Disseminate course data in scholarly journals.

The following are areas in need of improvement.

- Integrate Structured Learning Assistance program more carefully into the course objectives.
- Insure good instructional quality in the 25% of sections currently taught by part-time faculty.
- Increase student support in online sections of the course.
- Build assessment into the routine operation of the course.
- Improve the stability of the part-time faculty.

B105 Psychology as a Biological Science

This course completes the introductory sequence for psychology majors along with B104, Introduction to Psychology as a Social Science, and B103, Orientation to Psychology as a Major. The emphasis of the course is the biological side of psychology, including research methods, behavioral neuroscience, sensation and perception, altered states, learning, memory, cognition, motivation, and emotion. B105 serves a prerequisite for the more biologically based 300-level core courses, including Behavioral Neuroscience (B320), Cognition (B340), and Learning (B344).

Along with psychology majors, undergraduate and graduate non-degree students from many different majors enroll in this course regularly. Enrollment of at least 1000 students per year is the norm, and the course is offered both semesters, as well as in the summer every year. Full-time, tenured faculty teach the three large sections (60-150 students) offered each semester during the day, whereas research faculty from the Psychobiology of Addictions group teach the two evening sections. Although faculty members generate their own syllabi, the same textbook is used for all sections.

There has been a continuity in teaching over the past 5 years, and faculty strive to provide information that will stimulate students to think critically. Students are exposed to scientific inquiry and research findings, as well as to the important theories in biological psychology. Faculty have incorporated the IUPUI Principles of General Education into the course goals to varying degrees, and two of them have incorporated writing assignments into their class requirements. The most recent institutional data indicate a modest, but steady decrease rate in DWF rate in B105 (25.2% in 2000, 24.8% in 2001, and 22.4% in 2002).

B105 is still taught as a traditional lecture-style course, so the main concern is a lack of active learning by the students. The major source of assessment for this course continues to be multiple-choice exams, given during class and generated by the individual faculty. Individual faculty generate their own syllabi, which raises concerns about standardization of material covered across sections.

B305 Statistics

PSY B305 is a standard introduction to statistical concepts / descriptive and inferential statistics course, which is required of all majors and is prerequisite to the department's research methods course (B311). Aside from being required for the psychology major, several other undergraduate programs encourage students to take B305 in fulfillment of a quantitative requirement. In addition, the course serves as a foundational requirement for several popular graduate programs, such as Social Work and Physical Therapy. Pre-requisites for the course include completion of an introductory psychology course and a math course that minimally qualifies for the School of Science core mathematics requirement (Finite Math in IUPUI's curriculum structure). Completion of a basic desktop computing class is also recommended.

Due to the demand for this course by both psychology undergraduates and undergraduate and graduate students from other programs, the department typically offers nine sections per year (4 in the fall semester, 3 in the spring semester, and one in each of two summer sessions). Most sections accommodate up to 50 students, although one fall section, which is based entirely in a computer lab, enrolls a maximum of 30. Over the three academic years, 2001-02 through 2003-04, B305 enrolled just under 1,000 students. One-third of those students (33%) were psychology majors, thus qualifying B305 as a service course, even though it is required for psychology majors.

Historically, B305 has been taught by a consistent core of faculty, whose years of experience and consistency of approach provided a strong foundation for student learning. One faculty member who taught six sections per year recently retired, and another who often teaches three will be retiring shortly. Other faculty who teach the course include several very strong applied researchers who bring to the classroom a solid working knowledge of statistics. More recently the department has been transitioning teaching responsibilities to a new group of core faculty who, although lacking the depth of experience, are bringing fresh approaches to the classroom, and most notably, a greater focus on appropriate use of statistical computer applications, such as SPSS and Excel. As a service course, B305 is often a very attractive alternative among statistics courses offered throughout the campus. The psychology faculty teaching this course focus first

on conceptual understanding primarily as associated with inductive and deductive scientific reasoning, second on application to psychological, social science, and health science research, and third on the mathematical foundations.

One concern expressed by faculty teaching the subsequent research methods course, was that many students did not learn how to use standard software in PSY B305. The two faculty who taught most sections did not feature statistical software in their pedagogy. That has changed substantially over the past year. The depth and breadth of use is not standard across sections and not all faculty who currently teach the course are satisfied with the level of student preparedness in this area.

The consistency of content across sections of B305 has historically been achieved by having relatively few faculty teach the course. On several occasions, faculty who teach B305 as well as the Tests and Measurement and Research Methods courses have had discussions about more intentional integration of the curriculum. The general view is that the status quo works well.

B310 Life Span Development

This course covers human development from conception until old-age and death. The emphasis of the course is exposing students to major trends in physical, cognitive, and social development through theory-based research findings. Kathy Johnson, a tenured developmental psychologist, coordinates the course.

Life Span is a core course in the psychology major and is also considered a service course. It is a popular class with psychology majors, and is a required or suggested course for several other programs on IUPUI's campus. Our most recent data from Fall 2002 – Spring 2004 show that about 1500 students enrolled in this class during that two-year period. The most common majors reported by these students were: University College (35%), general studies (13%), psychology (12%), and nursing (9%). As a 300-level course, it requires three credits of psychology as a prerequisite.

Each semester four sections of this course are offered. Shenan Kroupa, a full-time Trustees Lecturer with a Ph.D. in developmental psychology, teaches the two largest sections. The remaining sections are taught primarily by associate faculty who possess a Ph.D. in developmental psychology, educational psychology, or school psychology. Any graduate student who teaches this course must have completed a teacher-training seminar with Kathy Johnson and these students are closely mentored throughout the semester.

Kathy Johnson and Terri Tarr, another developmental psychologist at IUPUI, created a common set of specific learning objectives in 1999, which are linked to the IUPUI Principles of Undergraduate Learning. These objectives provide a framework for classroom activities and assessment of student learning. All students use the same textbook and take the same computerized examinations. Each exam is available for a two-week or three-week period. The basic elements of the course syllabus and the course point structure also are standardized.

Because B310 is included on the "S" (Social/Behavioral Sciences) list for students in the School of Liberal Arts and the School of Science, "Writing Across the Curriculum" is emphasized.

Thus, the process of writing is stressed through informal, in-class writing as well as through required writing assignments. The instructor's guide includes course regulations, a master syllabus, a schedule of testing dates, and suggestions for writing-related and other projects.

Because of changes in other programs (such as Nursing) we have seen a significant drop in enrollment. Changes, such as being part of "Writing Across the Curriculum," have minimized these enrollment declines.

B360 Childhood and Adolescence

Two sections of B360 are taught each semester as web-based courses. It has been a very popular course, and there has been a large waitlist every semester since it has been offered in this format (e.g., there were enough people on the waitlist during Spring 2005 to fill a third section of the class). It has enrolled approximately 230 non-psychology majors each year for the past two years. The course was developed by a team of three developmental psychologists and initially piloted by a full-time faculty member. Since Fall, 2002, the course has been taught by associate faculty with support from advanced undergraduate teaching assistants.

This class is very popular with students, as indicated by the fact that we cannot offer enough sections of the course to meet student need. The course provides an opportunity for students to gain a deeper understanding of issues pertaining to infant, child, and adolescent development, and in some respects serves as a specialization course that follows B310 (Life Span Development). The web-based format enables integration of multimedia-based learning supports (digital video, audio, links to developmental laboratories, etc.) that enhance student learning. The course is writing intensive and students appreciate the flexibility of web-based testing through timed examinations.

The strength of this class produces its major concern. At the present time, we do not have enough faculty and teaching assistants to keep up with student demand for this class.

B370 Social Psychology

B370 has enrolled approximately 550 students (400 non-psychology majors) per year for the past two years. During that period, two of the department's two and a half social psychologists retired (D. W. Rajecki and Oliver Tzeng). Leslie Ashburn-Nardo was hired to replace Rajecki, and that produces a total of one and a half social psychologists in the department (Bob Bringle is half time in the Psychology Department and half time in University College). One section of B370 is being offered during the current semester. This course has traditionally been one of the department's highest enrolling non-introductory classes.

At one time there were a total of five social psychologists in the department and Applied Social Psychology was one of the department's graduate programs. Since the elimination of that program, the department has steadily lost its strong contingent of social psychologists. With only one full-time social psychologist in the department, it will be difficult to meet the demand of students for B370, which has been the third most popular Core class for psychology majors during the past two years as well as attracting 73% non-psychology majors.

B380 Abnormal Psychology

B380 is the most highly enrolled non-introductory class in the department and has enrolled approximately 1,100 students (950 non-majors) each year for the past two years. At the current time, six sections of B380 are offered every semester, one of which is a web-based class.

B380 is a well-enrolled and well-taught class that has been one of the traditional strengths of the department. There appear to be no concerns about B380 at the present time.

Student Development

The department enables students to develop academically by providing them with rigorous classes and challenging research opportunities, but there is more to student development than academics. Students should also be provided with opportunities to strengthen their social skills, develop leadership abilities, form a sense of community with their faculty and peers, explore their post-baccalaureate aspirations (i.e., graduate school or employment), and create strategies to achieve these aspirations. The department's realization of the importance of these opportunities culminated in the creation of a new staff position (Director of Student Development or DSD) and the hiring of Mikki Poynter in this capacity in 1997. Mikki spear-headed the creation and implementation of many of the following methods to facilitate student development and, after her departure from the program in 1999, these methods have been continued and expanded by her successor (Cynthia Williams) and Drew Appleby, who was hired to fill the newly created faculty position of Director of Undergraduate Studies (DUS).

Orientation

During a one-day orientation, new and transfer students come to campus to learn about the university and register for classes. Until 2000, the only students who came to the Psychology Department were those directly admitted to the School of Science as psychology majors. Those who selected psychology as their major, but who were not admitted to the School of Science, were not advised by psychology advisors. The DUS worked with the Orientation Program personnel to change this procedure so that he was able to spend approximately one hour orienting <u>all</u> incoming students who selected psychology as their major. This procedure remained in place and was working very well until the summer of 2004 when it reverted back to the way it was before 2000.

Until 2004, the department's orientation program was very strong. Each incoming psychology major was able to spend approximately 2 hours with the DUS, the DSD, and at least one peer advisor. Incoming students and their parents were pleased with the personal treatment they received and the department received no complaints from orientees.

The orientation system has devolved to its original state. The department is no longer allowed to orient all incoming psychology majors and our orientation time has been decreased from 2 hours to only 1 hour, which also includes registration. Those incoming psychology majors who have not been admitted to the School of Science are advised by University College advisors and are never allowed to have direct contact with personnel from the department in which they wish to major. This has often resulted in student being placed into inappropriate psychology courses.

Academic Advising

The department has made significant changes to its academic advising program in the past decade. During the early 1990s, one of the department's office staff members acted as the primary advisor for all psychology majors. Although she was highly valued by students for her caring attitude and availability, the department realized the need for a more formal and professional academic advising system and it began to recruit faculty to act as formal academic advisors. The department also created an advising office in 1997, and the undergraduates who staff this office are selected with care, trained to be peer advisors during a credit-bearing class (B422 Professional Practice in Psychology), and provided with periodic performance appraisals. These peer advisors serve as the initial step in the department's advising process. They are capable of answering many students' questions (e.g., what courses fulfill graduation requirements and how to use IUCARE, the university's online advising program). Advisors also perform a research project every semester based on student development theories (e.g., Schlossberg's mattering theory). The results indicate that students who receive academic advising from faculty and/or peer advisors feel as if they "matter" more than students not utilizing the advising system. Cynthia Williams has presented at the National Conference of NACADA in Ottawa, and the Peer Advising Program has been recognized by NACADA as one of the exemplary peer advising programs in the United States. A description of the program will be published in an upcoming *Peer Advising Monograph*.

The advising office has progressively helped more students each academic year. Starting with about 800 students in 1999, that number has increased to about 2300 students in 2004. Satisfaction with advising in the department is increasing. An alumni survey conducted by Joan Lauer and D. W. Rajecki showed that the satisfaction of psychology majors with both course-planning advising and career advising exhibited a statistically significant increase from 1995 to 2001 (see Appendix UG-6 for the full report).

The peer advisors struggle with the amount of theory they need to learn while they are working in the office and advising. The recruitment of new peer advisors is sometimes challenging. Although an all-advisor meeting is held at the beginning of each semester to introduce the new peer advisors to the faculty advisors, this meeting has not always been successful in providing faculty advisors with advising updates or issues that have arisen during the past semester.

B103 Orientation to a Major in Psychology

B103 is a one-hour course that familiarizes psychology majors with the department's curriculum, faculty, organizations, resources, and programs. It also enables them to discover and explore the career opportunities an undergraduate education in psychology can provide. The successful completion of B103 enables students to better understand their strengths, weakness, and values and to identify, clarify, and create a plan to accomplish their post-baccalaureate goals. Many students choose psychology as their major before they fully comprehend its nature (e.g., that it is a research-based science). B103 has been designed specifically to insure that they are fully aware of the nature of their major and what they can do with it after graduation.

Students appreciate B103 because it allows them to develop a coherent schema of their major, an awareness of what they can accomplish with their bachelors degree in psychology, a familiarity with the campus and departmental resources that can help them to accomplish their professional aspirations, and a plan to achieve these aspirations. The following student comments capture these accomplishments.

- "If it weren't for this class, I would be graduating next year with absolutely no idea where to go from there, and expecting to get the job I want without having a clue of how to get it. I have 'blossomed' in B103, and I think I've finally found my niche in psychology."
- "B103 was like four years of advising appointments rolled into a sixteen-week course. For the first time in my academic career I feel like I have a sense of where my education should be leading me. I am now ready to reach my goal."
- "B103 taught me what it takes to be in the field of psychology instead of just having psychology as my major**.**"

Students must expend a great deal of effort to accomplish the learning outcomes of B103 and they are often disgruntled that they earn only one hour of academic credit for their efforts. The amount of work that is required to accomplish its learning outcomes is probably more than should be required in a one-hour course.

Student Organizations

The department sponsors both a chapter of Psi Chi and a psychology club. Although this sometimes produces challenging decision-making situations, it also allows twice as many psychology majors to become involved in leadership roles. These organizations have created constitutions and have expanded their membership, performed more service and academic work, and raised more money every year since 1997 (e.g., their financial situation went from a $250 carryover between academic years in 2000 to $2800 in 2004 and the number of Psi Chi inductees now average approximately 30 per year). A generous alumni donation allowed the department to establish a need- and merit-based Psi Chi scholarship in 2004. Both organizations work together and have performed service work at Wheeler Mission, volunteered during the United Way Day of Caring, and host a family during the holidays each year. The department's listserv has been a successful method to bring the clubs' opportunities and activities to the attention of all psychology majors. The listserv is most likely responsible for the fact that current psychology majors report they are more satisfied with the availability of "information about volunteer service activities" than majors in any of the other School of Science departments according to the most recent university survey of continuing students.

Psi Chi and Psychology Club are two of the most active student organizations on the IUPUI campus. They involve a large number of students and promote a sense of community that is rare in a commuter campus. The number of students involved in these organizations is steadily increasing, and the activities they sponsor play a major role in the lives of IUPUI psychology majors.

A chronic concern faced by the clubs—and similar student organizations all over the country—has been inconsistent student leadership (i.e., ineffective or inactive officers). An acute financial problem surfaced during the fall semester of 2004 when it was announced that (1) IUPUI student

organizations are no longer allowed to apply for money from the university's student governing body and (2) they may no longer sell food to raise funds. These two changes have produced is a very serious problem for our clubs because they have relied on financial support of student government and the money they raise with their weekly popcorn stand to fund the activities they sponsor (e.g., Open Discussions) and their induction ceremonies.

Civic Engagement

The IUPUI Institutional Portfolio (www.iport.iupui.edu) describes and evaluates three major themes inherent in the goals for the IUPUI campus: effective student learning, excellent research and scholarship, and exemplary civic engagement. The university defines civic engagement as "active collaboration that builds on the resources, skills, expertise, and knowledge of the campus and community to improve the quality of life in communities in a manner that is consistent with the campus mission" (IUPUI Accreditation Self-Study 2003). Salient features of this self study included the high value of community-based learning experiences for students and faculty; the need for each department to plan activities and identify ways that community-based learning is in alignment with unit mission; and to come to consensus on unit goals and requirements for community-based learning. In addition, it was recommended that departments make concerted efforts to integrate service learning into courses and a common freshman experience. In general, the report noted little evidence that civic engagement is accepted as scholarly activity.

Compared with other undergraduates and School of Science majors, psychology majors report significantly greater awareness and availability of volunteer service opportunities. Psi Chi and Psychology Club are involved in a variety of community-based service activities (e.g., adopting a family for Christmas, participating in the IUPUI Day of Caring, and volunteering at Wheeler Mission). Service learning is a component of the following courses: one typical section of B104 (Introduction to Psychology as a Social Science), one special section of B104 for Service Learning Scholars, B340 (Cognition), and B462 (Capstone Practicum in Industrial/Organizational Psychology). Each semester, approximately 30 students serve as mentors to students enrolled in B104 and approximately 20 serve as mentors in B103. This cohort of peer mentors is comprised of dedicated and capable students who have a strong interest in psychology as a major.

Although the IUPUI campus has attracted positive national attention for commitment to civic engagement as part of its campus mission, our department does not promote service learning across the curriculum. A clear articulation of how and when civic engagement supports the mission of the department is needed.

Undergraduate Research

Description

Research collaborations between Department faculty and undergraduate students have historically come in three forms: (1) volunteer arrangements outside the framework of academic credit, and (2) departmental courses that formalize the relationship and allow for academic credit offerings (i.e., B292, B492, B497, B499), and (3) and a department program known as SPUR (Support for Undergraduate Research). However, in the last year, two courses that were

essentially the same (i.e., B497 and B499) have been combined under the B499 heading and merged with the SPUR program under the aegis of an honors research program. Thus, the latter two mechanisms are now linked.

In terms of formal course offerings, B292 and B492 both involve doing readings and becoming involved in a faculty member's research. Although similar in format, students involved in B492 are likely to be more deeply involved in research and/or more autonomous. For B499, students conduct an independent research project for honors credit with oversight by a faculty mentor and a second reader who constitute a two-person supervisory committee. Independent research projects are intended to be "start-to-finish" affairs that take two academic semesters to complete, but this varies somewhat in practice based on the nature of the project (i.e., difficulty, required knowledge, and skill) and the mentor's previous work in the area.

The SPUR program provides support for undergraduate honors thesis research and student completion fulfills the capstone research requirement. This program consists of cohorts of 5-10 students engaged in an individual research project under the guidance of a department faculty member. Efforts are made to recruit qualified undergraduates in the spring. Interested students who fail to meet criteria for honors research eligibility may apply to SPUR and be granted admission following an interview with one of the SPUR coordinators. Two faculty members coordinate cohort recruitment, meeting dates and activities, and an end-of-the-year poster presentation. They also co-teach a biweekly Capstone Honors Seminar that is taken by all students involved in the SPUR program. Over the course of an academic year, students develop a research proposal, apply for research funding, carry out the research, and present results in a departmental poster session in the spring. The goals of the Capstone Honors Seminar are to (1) enhance critical thinking skills, (2) promote independent scholarship, (3) facilitate the creation of an outstanding honors thesis, and (4) promote the development of professional skills, particularly the ability to present ideas effectively through both speaking and writing. The seminar also promotes a sense of community and facilitates student progress by creating a forum for problem-solving, idea-sharing, and feedback. Some meetings are devoted to the graduate school application process. Required seminar activities place a high emphasis on interdisciplinary connections across the sub-domains of psychology as well as related fields in business, medicine, and the life sciences. A final function of the SPUR program is to provide financial support for undergraduate research. Originally, participating students were eligible to receive funding from the department. Students are now required to submit a research proposal to a university-level program titled Undergraduate Research Opportunity Program (UROP). These funds can be used to subsidize not only project direct costs, but also student travel to professional conferences and a stipend simply for engaging in the work. Students who apply for a UROP grant in good faith, but who do not receive funding, are supported by the Department in the amount of $500.

Strengths

There are several strengths associated with the department's undergraduate research. First, there are a number of ways for students to get involved in research and each one offers some advantage. With regard to volunteer arrangements, involvement levels can be negotiated to suit each individual student, and they are particularly appropriate for those who do not have firm ideas about what they wish to study, do not wish to engage in additional "academic" activities such as reading or writing that the formal courses entail, or those requiring schedule flexibility. Research involvement that occurs within the context of a department course not only provides

academic credit, but also a more structured and extensive exposure to the research process. B499 provides the deepest level of involvement and the greatest amount of control over the nature of the work, as well as honors research credit. No doubt as a result of these many options, substantial numbers of undergraduates have chosen to become involved in research with a psychology faculty mentor. Second, many department faculty are active in working with undergraduates on research. Over the last 7 years, a substantial proportion of department faculty has been involved in undergraduate research. At least 18 faculty members have worked with one or more undergraduates in their research labs, at least 13 have supervised students via one of the department's formal courses focused on research, and at least 15 have mentored students through the SPUR program. Third, faculty-undergraduate collaborations have been productive and beneficial to students and faculty alike. The SPUR program has consistently attracted a strong cohort of top undergraduate students, and many students have used it as a springboard for obtaining admission to graduate school. At least 11 faculty members have presented with an undergraduate student co-author, and at least 9 have published a journal article or book chapter with one. Finally, there is relatively good financial support for undergraduate research through the combination of UROP and SPUR. In particular, it is unusual that undergraduate students can receive a stipend in addition to reimbursement for costs.

Concerns

At the same time, there are also some areas for improvement. First, the options for undergraduate research could be better understood by students and faculty. Many students (and some faculty) do not have a clear sense of the options or the advantages and disadvantages associated with each. Second, there is considerable heterogeneity with regard to the content and conduct of independent research projects. Although some guidelines exist, it is not clear to what extent department faculty are aware of them and/or abide by them. This is particularly apparent in the SPUR program, where student projects vary drastically in scope and starting point. Some faculty members require students to formulate and conduct an independent project whereas others allow students to conduct a variation of an existing study or analyze an archival data set. Finally, there is some lingering ambiguity with regard to the goals of the SPUR component of the honors research program. While there is widespread agreement that SPUR meetings facilitate research progress and represent an important symbol of the department's commitment to research, there is no consensus among the faculty as a whole with regard to its specific mission or what exactly should be required of participating students and faculty.

Enrollment Management

Enrollment management refers to the process that begins when a department attempts to recruit students who are qualified to succeed in their program. This process continues as the department makes efforts to retain these students in their program, to graduate them from their program, and to facilitate their placement into the job market and graduate programs. This section describes the program's attempts to manage its enrollment and the data that is available to support the success of these efforts.

Recruitment

The department uses a comprehensive four-part recruiting plan that involves targeting both external and internal potential psychology majors (PPMs) in either a direct or an indirect manner. External PPMs are students who are not currently enrolled in the university (e.g., high school students). Internal PPMs are IUPUI students who have not yet been accepted by the School of Science as psychology majors (e.g., University College students who declare psychology as their academic interest). Direct strategies are those that involve direct contact with PPMs (e.g., face-to-face conversations with Explore IUPUI attendees) and indirect strategies are those that target individuals who can influence the collegiate decisions of PPMs (e.g., the department's annual conference for high school psychology teachers). A list of these activities that have been implemented during the past six years is given below.

- External-Direct Strategies
  a. The Director of Undergraduate Studies (DUS) visits a number of local high schools each year to give either or both of the following presentations: What Can I Do With A Major in Psychology? Why Your Freshman Year in College Will Not Be 13th Grade.
  b. High school psychology classes visit the department, eat lunch with the DUS, and visit one of his classes.
  c. Faculty, staff, and students participate in fall Explore IUPUI Day and spring Campus Day where they speak with attendees, provide them with printed recruitment materials, and give formal presentations and informal demonstrations.
  d. The DUS sends personal letters to Explore IUPUI and Campus Day attendees.
  e. The DUS sends personal letters to a variety of PPMs whose addresses are sent to him by the Admissions Office and the School of Science.
- External-Indirect Strategies
  a. The DUS hosts the annual conference of the Indiana High School Psychology Teachers Association to which all the Indiana high school psychology teachers are invited.
  b. The DUS attends the annual IUPUI Guidance Counselor Breakfast.
- Internal-Direct
  a. The DUS sends letters to all University College students who have indicated an interest in a psychology major inviting them to speak to an advisor in the Psychology Department about the procedure for applying to the School of Science to become an official psychology major.
  b. The DUS makes presentations to large groups of incoming freshmen during summer orientation.
- Internal-Indirect
  a. The DUS makes presentations to University College advisors about how to advisee PPMs (e.g., What jobs are available to a psychology major with a bachelor's degree and how to prepare psychology majors for graduate school).
  b. The DUS has made presentations to the Admissions Counselors about the type of information that can be used to effectively recruit high-ability PPMs.
  c. The DUS makes presentations to the parents of incoming freshmen during summer orientation.

The department's recruiting efforts have several strengths.

- One strength of the department's recruitment effort is that there is a single person in the department who is officially responsible for coordinating and overseeing these efforts.
- Another strength is that the faculty have demonstrated a willingness to help with recruiting by participating in university-wide efforts (Campus Day and Explore IUPUI) and presenting mini-colloquia on their areas of expertise during the high school psychology teachers conference.
- Another strength is the willingness of the Graduate Administrative Assistant (Susie Wiesinger) to coordinate the recruiting efforts (e.g., Explore IUPUI) of the graduate program with the DUS. Susie's competence, positive attitude, and high level of energy have been very beneficial to undergraduate recruiting efforts.
- The department is utilizing the expertise of the university's Public Relations personnel to improve its recruiting strategies (e.g., to target high-ability PPMs and to increase the impact of its printed and on-line recruiting tools).

One concern in the area of recruitment is that the department has not yet created a technique to measure the effectiveness of its recruiting strategies. There are simply too many variables that affect where a student will attend college that attempting to attribute any one of them (e.g., a high school visit or a personal letter) as the causative factor for their attendance would be spurious.

Retention Rates

Retention rates for psychology majors during the period between 1998 and 2002 are given below. Retention rate is defined as the percentage of students who either return the following year (fall semester to fall semester) or who graduate.

	Beginning Freshmen	Other Freshmen	Soph	Jun	Sen	All
1998	33%	48%	64%	68%	75%	68%
1999	41%	66%	64%	64%	70%	66%
2000	50%	62%	64%	74%	77%	72%
2001	52%	70%	61%	73%	77%	71%
2002	58%	47%	59%	71%	74%	68%

The most noteworthy aspect of student retention in the department is the increase in the retention of beginning freshmen admitted to the School of Science, which has risen steadily each year from 33% in 1998 to 58% in 2002. While most retention rates across classes are variable from year-to-year, it does appear that the one group of students showing the greatest increases in retention are beginning freshman. It is difficult to isolate one factor that may be producing this increase, but the university's increasing admissions standards, the department's recruiting efforts to attract well-qualified students, the department's emphasis on offering its incoming students a "full-service" orientation program, the department's attempt to enroll new freshmen in B103, and the constant improvements in B104 (which is one of the first courses that psychology majors take) are five good candidates. Another important factor to consider is that the university has increased its admittance standards steadily during this five-year period.

Degrees Conferred

The department has averaged 111 graduates each year for the past five years.

	Total	BA	BS
2000	113	54	59
2001	129	70	59
2002	105	60	45
2003	106	51	55
2004	100	49	51
2005	125	64	61

The fact that the department graduates more than twice as many students each year as it enrolls as freshmen is unusual, but speaks well of its ability to attract high quality upper-class transfer students and to provide these students with the resources they need to graduate. If the department continues to increase the retention of its freshman and continues to attract high quality upper-class transfers, then graduation rates should begin to increase above the current 111 average.

Placement

Results from the survey of 2001 and 2002 psychology alumni conducted by the Office of Information Management and Institutional Research Office indicates that 97% of this group are either working full- or part-time (89%) or are not working and not looking for work (8%). 82% of this group indicate that their jobs are either directly related (30%) or somewhat related (52%) to their psychology major, and 85% said that their IUPUI education prepared them either very well (27%) or somewhat well (58%) for their current jobs. 94% reported that their IUPUI education has enhanced their future employment prospects either very well (67%) or somewhat well (27%). 93% of our alumni report that they are employed in Indiana.

Results from the same survey indicate that 22% of our recent alumni are continuing their education (14% in a full-time degree program, 5% in a part-time degree program, and 3% in classes only). 80% of these alumni who are continuing their education are seeking a master's degree and 20% are seeking a doctorate. 92% of these alumni would either strongly encourage (56%) or encourage (36%) another person to attend IUPUI.

The DUS performs an annual email survey of psychology majors to determine where they have been employed or accepted into graduate programs. Appendix UG-7 identifies the jobs psychology majors have reported accepting. These jobs fall into three main categories, which involve the use of clinical, research, or business skills. Most psychology majors who responded to the survey report that they are employed in jobs that require business, managerial, or leadership skills. Approximately half of psychology graduates who continue their education do so in psychology graduate programs. The other half pursue graduate programs in a variety of other areas including medicine, law, social work. See Appendix UG-8 for a listing of the schools and graduate programs that have accepted our alumni.

It appears that a bachelor's degree in psychology from IUPUI can prepare its owner with a variety of skills that are valued by employers and graduate school admissions committees.

If the department wishes to obtain a more accurate picture of its graduates' employment and graduate school status, it must use a more effective method than an informal email survey. Obtaining an official mailing list of graduates from the School of Science to create a formal and personal survey sent by the DUS to each graduating senior would be a more effective method to collect this type of data.

Vision for the Future

Curriculum and Degree Programs

The Psychology Department exists within the School of Science (SOS). As such, it is quite comfortable teaching psychology as a science, and the scientific method is discussed in many courses. However, many of our students do only what is required to become acquainted with research. All psychology majors are required to serve for a minimum of two hours as participants in department-approved research projects in each of their introductory classes (B104 and B105). They are also required to take statistics (B305) and the introductory lab (B311). BS students are required to take one more lab as a capstone. BA students can choose a lab or non-lab course for their capstone experience. There is a laboratory component in many courses majors take in some other SOS departments, and perhaps we should follow suite. One possibility is to require each major to complete one more lab than is now required. Another possibility is to modify some core courses so that they have a small laboratory component. Yet another possibility, should the first two be deemed prohibitively expensive, is to modify the B.A. requirements such that these majors must have an additional research-oriented course and, for this, they can choose between a capstone lab or Tests and Measurement (B307).

Service Courses

B104 Introduction to Psychology as a Social Science. Hire a course coordinator to continue the development of this course. Expand methods to teach students how to write essays and apply psychological principles.

B105 Introduction to Psychology as a Biological Science. In the future, the goal is to convert the traditional lecture-style B105 into a course where students play a more active role in learning. Future plans for B105 include going to computerized-testing, which would allow for consistency across sections, as well as opening up more class time for active learning exercises. Another goal is to incorporate more technology into the course, utilizing a variety of computer-based exercises to help students master the material similar to what is used in B104, and also to offer internet-based sections for independent learners. An additional goal would be enhanced integration of introductory material covered in B105 with the upper-level core and specialization courses. Finally, additional means of assessment, including assessment of reasoning and writing skills,

need to be included in the future, as research has shown that increased types and number of assessment opportunities during the semester in freshman courses improves success rates and retention (IUPUI Office of Information Management and Institutional Research).

B305 Statistics. B305 could be improved through more intentional integration with the other components of the undergraduate quantitative/research curriculum; more coherent attention to desired technology-related learning outcomes and better support mechanisms for students who begin with deficits. One potential support toward this end would be to assign responsibility to one faculty member for coordination of the quantitative/research curriculum. That individual should also be a standing member of the Department's Undergraduate Committee.

B310 Life Span Development. Life Span Development is a very successful course. Our vision for the future largely includes maintaining its success. Thus, our goal is to:

- Continue to offer at least four sections of this course to serve both our majors and non-majors.
- Continue to employ properly credentialed full-time instructors and to maintain standardization across sections.
- Continue to emphasize the Specific Learning Objectives linked to the IUPUI Principles of Undergraduate Learning.
- Continue our participation in "Writing Across the Curriculum."
- Search for additional means to maintain or increase enrollment.

B360 Childhood and Adolescence. The success of this web-based course necessitates that the department find ways of offering at least one additional section of this course each semester. One possibility is for one associate faculty member (who was part of the original development team) to serve as course coordinator, supervising 3-4 teaching assistants who handle most of the weekly assessment and record keeping responsibilities. The course coordinator would develop new assignments, create grading rubrics, and ensure consistency of assessment and feedback to students across multiple sections.

B370 Social Psychology. Given the shortage of full-time social psychologists to cover this popular course, the department has been forced to rely on part-time adjunct instructors in recent years to meet enrollment demands. As a result, there is discontinuity among sections in terms of content, textbook, and course objectives. In the future, one possible solution is to designate a course coordinator and to standardize the course, similar to the approach taken by B310 Lifespan Development several years ago. This would provide students across sections a more comparable experience. The undergraduate program must keep this situation in the forefront when future hiring decisions are debated.

In addition, given the course's popularity among both majors and non-majors, it might be helpful to develop in the future sections designed specially for majors vs. non-majors. It has been noted that grade distributions in some sections tend to be bimodal in nature—with psychology majors

faring better than non-majors. Social psychology could easily be approached from two different perspectives. On one hand, the course has many applications for everyday life and could be useful to students of diverse educational backgrounds; thus, the focus of the course for non-majors could be on applications. On the other hand, majors could benefit from learning more about social psychology from a research perspective; thus, the focus of the course for majors could be on classic and contemporary research in social psychology.

Student Development

*Orientation***.** The department must convince the university's Orientation Program staff to allow psychology personnel to orient all incoming students who select psychology as their major, regardless of whether they have been admitted into the School of Science. Those whose entering credentials are not sufficiently high to be accepted into the School of Science are those who are most risk of academic failure and/or dropping out. These are the students who are in most need of a strong and supportive orientation from their major department.

Academic Advising. Academic advising is perceived as a strong component of the undergraduate program, but it could be strengthened even further. Putting an advising assessment program into place can help the department to build on its advising strengths and strengthen its advising weaknesses. Web-based advising is being investigated by the Advising Office. Another potentially valuable advising tool is an academic planner/calendar that could be given to all psychology majors at the beginning of each school year and which would include the contents of *IUPUI Psychology Department Advising Handbook*, which is given to all incoming freshmen as a handout during orientation.

B103 Orientation to a Major in Psychology. An experimental section of B103 will be offered next year to freshmen psychology majors. This will be part of the university's Bridge Program that begins two weeks before school officially starts and is designed as an intensive orientation for new students that will help them to successfully "bridge" the gap between their senior year in high school and their freshman year in college. This section will become an official Freshman Learning Community section that requires its instructors to cover the material contained in the university's official Learning Community Template. This additional material may necessitate that the class be increased from one to two credit hours to adequately cover the material that is currently requires, plus the addition of the new template material.

Student Organizations. Psi Chi and Psychology Club are financially vulnerable at this time. In the future, the clubs must establish consistent ways to raise funds that are not dependent upon the decisions of other university organizations. The clubs should also establish service projects that continue from year to year and become a tradition. The club training books are being updated so that new club officers have better understanding and resources to start the year. The luncheon for outgoing and incoming officers that was held last year for the first time should also be continued so that a more effective level of transitional communication among officers can be established.

The clubs are also interested in establishing a site on the department's homepage to provide information about club events and to solicit new members.

Civic Engagement. A culture of civic engagement is inclusive and integrative of teaching, research, and service. A theoretical framework that articulates clearly how these endeavors intersect with each other and the community would be a place to start. We need not look farther than our department for leadership.

Research

The Department has been committed to undergraduate student involvement in research since its strategic change in the early 1990s that emphasized research in general. Undergraduate research involvement is considered a departmental strength and a source of pride by most faculty members. There are a number of objective indicators that support these beliefs. Several faculty members have research programs that are not only heavily reliant on undergraduate support, but thrive on it as well. The following are ways for the department to build upon its strength in undergraduate research.

- Increase recognition of students who complete independent research projects within the department.
- Provide additional monetary incentives for students to become involved in research.
- Provide additional incentives for faculty to work with undergraduate students (e.g., stipends, travel funding) at the department and school levels.
- Clarify SPUR's mission and align its activities accordingly.
- Publicize the guidelines for independent research projects conducted by undergraduates to clarify and standardize these procedures.

Enrollment Management

Recruiting. Continue to spread the word about the strengths of the department to both internal and external audiences. Work with the School of Sciences newly appointed Associate Dean for Outreach and Recruitment to secure financial and secretarial support for the department's recruiting efforts.

Retention. Investigate ways to spread the increased freshman-to-sophomore retention rates to the sophomore, junior, and senior years.

Graduation Rates. Continue to monitor the number of psychology majors who graduate each year to determine if the recent decrease is a genuine trend.

Placement. Begin to use an official alumni survey to more accurately determine what types of jobs our alumni accept and what types of graduate programs accept them. Use this information to recruit alumni to participate in department sponsored career- and graduate school-related events.

Assessment. The first step in assessment for any academic program is to determine its student

learning outcomes (i.e., what it wants its majors to know and to be able to do as a result of successfully completing its undergraduate program). The second step is to operationalize these outcomes so that they can be assessed. The third step is to collect data that can be used to determine if these outcomes are being achieved. The fourth step is to use the information collected during the third step to make data-informed changes to the curriculum. Our department completed step one of this process, but with the exception of some isolated instances (notably B104 Introduction to Psychology as a Social Science), it has not progressed to the second, third, or fourth steps. Data collected after the recent departmental retreat indicate that assessment is a very low priority for the majority of the faculty. Assessment requires careful planning, hard work, and a substantial time commitment, and unless the culture of our department changes, it is unlikely that assessment will occur at the level that it should. Several members of the Undergraduate Committee who are committed to the concept of assessment proposed a senior exit test of psychological knowledge (Student Learning Outcome #1) that could be administered by IQUIZ to all students who are enrolled in a senior capstone course, but this proposal was not been met with support when it was presented to the faculty . Using a rubric to evaluate the methodological competence of capstone students (e.g., the ability to perform a literature review, use APA style to write psychological reports, and use appropriate statistical methods to analyze data) could be used to assess the accomplishment of Student Learning Outcome #2 (methodological competence).

New Faculty Hires. The members of the Undergraduate Committee should be strong advocates for the undergraduate program when decisions related to the hiring of new faculty positions are made. Most of the faculty who have retired recently have taught predominantly undergraduate courses so it is imperative for new faculty hires to be willing and able to teach at least some undergraduate courses.

Appendix UG-1

Rationale for the Undergraduate Curriculum Provided to Students When They Enter the Program

The IUPUI Psychology Department's Undergraduate Curriculum

Most students believe they understand their curriculum if they know what courses to take and when to take them. Although it is certainly important to know the answers to these questions, psychology majors should also be acutely aware of the answers to three other questions: Why should I take these courses? How will these courses change me? Who can I become as a result of successfully completing these courses? The point of this paper is to help you, as a prospective or current psychology major, to understand that your curriculum is not just a list of courses you must complete to receive a degree; it is a coherent set of transformational experiences carefully designed to provide you with the opportunities to develop the knowledge, skills, attitudes, and characteristics you will need to become the person you aspire to be.

The word curriculum is derived from the Latin word *currere,* which means "to race" (Costello, 1993, p. 340). In modern English, curriculum means "a group of related courses, often in a special field of study" (Costello, 1993, p. 340). The topic of this paper is the IUPUI Psychology Department's undergraduate curriculum, which is defined as the set of psychology courses you must complete to earn a BA or BS in psychology. The psychology faculty has carefully crafted this particular course of study over the past three decades to enable psychology majors to accomplish a set of crucial goals. Many students take the original Latin derivation too literally by viewing their curriculum as a race they must rush through as quickly as possible so they can graduate in the shortest period of time. If the goal of a college education were to finish it as quickly as possible, then this would be an appropriate strategy. But that is not its goal. The goal of a college education is to prepare a person to lead a fulfilling personal, social, and professional life after graduation. This paper is an attempt to bring your attention to this fundamental discrepancy by explaining how your curriculum can help you achieve your post-baccalaureate aspirations (i.e., the attainment of admission into graduate school, a satisfying career, and/or a fulfilling personal life). If you read it carefully and comprehend it fully, it will help you become more 'mindful" (Langer, 1989) of the purpose and nature of the psychology courses you are required to take so you can engage in these courses in an active, thoughtful, and goal-oriented manner, rather than simply attempting to "get them out of the way" as quickly and mindlessly as possible. In other words, it will help you to experience a greater sense of control over your undergraduate education, and the benefits of a greater sense of psychological control have been empirically proven (Rodin & Langer, 1977).

The Psychology Department's Undergraduate Committee has identified the seven following student-learning outcomes (SLOs) that its majors will accomplish if they take full advantage of the opportunities their curriculum provides. The development of this combination of SLOs is congruent with the fundamental goal of education in psychology, which is "to teach students to think as scientists about behavior" (Brewer, 1993, p. 169).

1. Content of Psychology → Students will show familiarity with the major concepts, theories, findings, and history of psychology.
2. Research in Psychology → Students will understand and use psychological research methods (i.e., design, data analysis, and interpretation).
3. Application of Psychology → Students will understand and generate applications of psychology to individual, social, and organizational issues.
4. Ethics in Psychology → Students will understand and abide by the ethics of psychology, including those encouraging the recognition, understanding, and respect for socio-cultural complexity and international diversity.
5. Personal Development, Collaboration, and Career Planning → Students will understand themselves, acquire effective collaboration skills, and develop realistic ideas about how to pursue careers in psychology and related fields.
6. Communication Skills, Information Competence, and Technological Proficiency → Students will write and speak effectively, demonstrate information competence, and use technology successfully.
7. Critical and Creative Thinking and Problem Solving → Students will use critical and creative thinking in the scientific approach to problem solving.

The attainment of these SLOs is based on the acquisition and demonstration of the fundamental knowledge and skills underlying IUPUI's Principles of Undergraduate Learning that all undergraduates strive to achieve. The substance and depth of the first five SLOs

distinguish psychology majors from their peers who major in other disciplines. The psychology curriculum is divided into five sets of courses, and the successful completion of each of these sets serves to enable psychology majors to develop one or more of the department's SLOs. The remainder of this paper will explain how they do so.

Introductory Courses

The purposes of introductory courses are to introduce you to the content, methods, and applications of modern psychology; to help you become familiar with the department's faculty, student organizations, resources, and programs; and to help you discover and explore the career opportunities an undergraduate education in psychology can provide. There are three introductory courses: B103 Orientation to a Major in Psychology, B104 Introduction to Psychology as a Social Science, and B105 Introduction to Psychology as a Biological Science. The successful completion of B103 enables you to better understand your strengths, weakness, and values and to identify, clarify, and create a plan to accomplish your post-baccalaureate goals. Many students choose psychology as their major before they fully comprehend its nature (e.g., that it is a research-based science). B103 has been designed specifically to insure that you are fully aware of the nature of your major and what you can do with it after you graduate. In B103 you will also begin to strengthen the written and oral communication skills you will need in all of your remaining psychology courses.

B104 and B105 introduce you to the complete spectrum of areas of specialization that exist within psychology. B104 covers topics that represent the social science side of psychology (i.e., personality, lifespan development, social psychology, abnormal psychology, psychotherapy, intelligence, and industrial-organizational psychology. B105 covers topics that represent the biological science side of psychology (i.e., behavioral neuroscience, motivation, emotion, memory, sensation, perception, cognition, language, and consciousness). Both courses cover learning, psychological research methods, and the history of psychology because of the crucial importance of these topics for all psychologists. The successful completion of the three introductory courses paves the way for you to continue your study of psychology with a fundamental awareness of its basic principles, concepts, theories, specializations, methods, and applications and with an understanding of how a psychology major can prepare you for your future. Another important outcome of the successful completion of these introductory courses is that it will allow you to make informed decisions when you select your subsequent psychology courses.

Methods Courses

The purpose of methods courses is to provide you with opportunities to learn and apply the methods used by psychologists during their scientific investigations of behavior and mental processes. These courses encourage critical and creative thinking during the scientific approach to problem solving because they require you to provide plausible explanations for psychological observations, comprehend and critique the findings of previous research, produce novel hypotheses derived from the existing psychological literature, create ethical research designs to test these hypotheses, and provide logical explanations for the results of your research. You will also demonstrate information competence (as you perform bibliographic searches) and use technology successfully (as you use computer software to analyze the data you collect).

There are two required methods courses: B305 Statistics and B311 Introductory Laboratory in Psychology. B305 focuses on the fundamentals of statistical analysis, which enable you to organize and summarize data (descriptive statistics) and to interpret and draw conclusions from data (inferential statistics). B311 requires and builds upon the statistical knowledge gained in B305 as it introduces you to experimental methods in psychology, the ethics of research, and experimental report writing. The successful completion of these two courses is crucial to the further success of a psychology major. Those students who aspire to graduate school will use the skills they acquire in these courses to design and perform the research projects that will serve as evidence to graduate admissions committees of their ability to conduct themselves as scientific psychologists. Those who do not use this knowledge to perform research will employ it to understand and evaluate the research of others. As you progress from your introductory courses to your more advanced courses, you will be required to read, comprehend, and critique original psychological research (i.e., primary sources such as articles in professional journals) rather than

learning from secondary sources such as textbooks in which the authors have done all the interpreting and critiquing for you. If you have not mastered the vocabulary and techniques from your methods courses—and/or not carried it with you into your core courses—the results section of a journal article will appear to you as if it was written in an alien language from a planet outside our galaxy.

Core Courses

The purpose of core courses is to provide you with a broad and deep exposure to the main content areas that define the discipline of psychology. You will select six courses from a set of twelve that represent the biological and the social science of psychology, including both basic principles and applied areas. These twelve courses are B307 Tests and Measurement, B310 Life Span Development, B320 Behavioral Neuroscience, B334 Perception, B340 Cognition, B344 Learning, B356 Motivation, B358 Industrial/Organizational Psychology, B370 Social Psychology, B380 Abnormal Psychology, B398 Brain Mechanisms of Behavior, and B424 Theories of Personality. I encourage you to choose a coherent set of core courses that will provide you with the knowledge and skills you will need to achieve your post-baccalaureate aspirations. Suppose you are preparing to become a school psychologist whose job will be to test the cognitive capabilities of children in order to determine if their ability to learn falls within the normal range. In this case, B307, B310, B340, B344, and B380 would provide an excellent foundation. The addition of B320—which provides a basic knowledge of how the anatomy and physiology of the nervous system controls behavior and mental processes—would enable you to identify and understand the effects of the drugs that your young clients may be taking either legally (e.g., Ritalin or Prozac) or illegally (e.g., alcohol or marijuana). No matter which career you hope to pursue, the core courses you take will enable you to understand how psychology can be applied to a wide variety of individual, social, and organizational issues and encourage you to recognize, understand, and respect socio-cultural complexity and international diversity.

Specialization Courses

The purpose of specialization courses is to provide you with an opportunity to focus your studies in a particular area of psychology by choosing and completing two 300-level or above psychology classes. Continuing our school psychologist plan from the preceding section, you could build on the knowledge you gained in B310 by taking B360 Child and Adolescent Psychology and become even more knowledgeable about the effects of drugs after completing B320 by taking B394 Drugs and Behavior. The addition of these courses to your already impressive set of core courses would help to successfully set you apart from other graduate school applicants. This is becoming increasingly important because of the huge number of psychology majors who graduate each year in the United States with a bachelor's degree (approximately 74,000). A unique feature of IUPUI's psychology curriculum is the option to earn a certificate of completion in one of the following four areas of concentration: clinical rehabilitation psychology, behavioral neuroscience, industrial/organizational psychology, or the psychobiology of addictions. You must complete a set of core, specialization, and capstone courses described in the table on page 524 of the *2002-2004 IUPUI Campus Bulletin* to earn one of these certificates. Courses you could take to satisfy this requirement include B322 Introduction to Clinical Rehabilitation Psychology, B365 Stress and Health, B366 Concepts and Applications in Organizational Psychology, B367 Concepts and Applications in Personnel Psychology, B376 The Psychology of Women, B382 Practicum in Community Psychology, B386 Introduction to Counseling, B396 Alcohol, Alcoholism, and Drug Abuse, B420 Humanistic Psychology, and B422 Professional Practice.

Capstone Courses

In architecture, a capstone is the top-most stone that completes a building. In an academic context, a capstone is the final class that completes a psychology major's curriculum. The purpose of capstone classes is to provide students with an opportunity "to demonstrate comprehensive learning in their major through some type of product or performance" (Palomba & Banta, 1999, p. 124). In other words, a capstone is a class in which senior psychology majors are required to pull together what they have learned in their previous classes and use this integrating experience to demonstrate they are capable of doing what they should be able to do as they graduate from the program (i.e., the department's SLOs). This process serves a dual purpose. It will provide you with a final

opportunity to practice and demonstrate the skills you will need to succeed after graduation on the job or in graduate school. It also provides the Psychology Department with a final opportunity to assess whether or not we have been successful in our mission to produce competent psychology majors and to use the results of this assessment to improve our curriculum for future psychology majors.

Most psychology departments offer only one capstone class, and many offer no capstone at all. The IUPUI Psychology Department offers you three types of capstone courses. If you are pursuing a BA degree, then you may complete a capstone laboratory research project, a capstone practicum, or a capstone seminar. If you are pursuing a BS degree, you must complete a capstone laboratory.

- A capstone laboratory offers you the opportunity to design, perform, analyze, and report an empirical research project on a topic of your choosing and can be conducted (a) in a laboratory class dedicated to the study of a particular sub-discipline of psychology (e.g., social, developmental, or personality psychology), (b) in an individual research class, or (c) in an honors research class. The classes that will satisfy this requirement are B423 Capstone Laboratory in Physiological Psychology, B425 Capstone Laboratory in Personality, B431 Capstone Laboratory in Sensation and Perception, B445 Capstone Laboratory in Learning, B457 Capstone Laboratory in Motivation, B461 Capstone Laboratory in Developmental Psychology, B471 Capstone Laboratory in Social Psychology, B497 Capstone Individual Research, and B499 Capstone Honors Research.
- A capstone practicum allows you to apply what you have learned about a particular sub-disciple of psychology (e.g., industrial/organizational or clinical rehabilitation psychology) in a workplace or clinical setting. The classes that will satisfy this requirement are B462 Capstone Practicum in Industrial Psychology and B482 Capstone Practicum in Clinical Rehabilitation Psychology.
- A capstone seminar provides you with opportunities to (a) perform an in-depth examination of a sub-discipline of psychology in which you have an occupational interest, (b) engage in a collaborative research project, and (c) create a professional planning portfolio designed to facilitate your transition to life after college (i.e., employment or graduate school). The class that will satisfy this requirement is B454 Capstone Seminar in Psychology.

The purpose of this paper has been to provide you with a clear understanding of the rationale behind the IUPUI Psychology Department's undergraduate curriculum. You can approach your undergraduate education as a psychology major in a more active and purposeful manner once you understand why the department created its curriculum, how you can accomplish its SLOs, and who you can become as a result of the accomplishment of these SLOs. Successful undergraduate educations take place when well-qualified faculty lead well-informed students through a well-planned curriculum. The IUPUI Psychology Department possesses a well-qualified faculty and a well-planned curriculum. I hope this paper has transformed you into a well-informed student.

References

Brewer, C. L. (1993). Curriculum. In T. V. McGovern (Ed.), *Handbook for enhancing undergraduate education in psychology* (pp. 161-182). Washington, DC: American Psychological Association.

Costello, R. B. (Ed.). (1993). *The American heritage college dictionary*. Boston: Houghton Mifflin.

Langer, E. J. (1989). *Mindfulness.* Reading, MA: Addison-Wesley.

Palomba, C. A., & Banta, T. W. (1999). *Assessment essentials: Planning, implementing, and improving assessment in higher education.* San Francisco: Jossey-Bass Publishers.

Rodin, J., & Langer, E. J. (1977). Long-term effects of a control-relevant intervention with the institutionalized aged. *Journal of Personality and Social Psychology, 35,* 897-902.

Appendix UG-2

Full Curriculum for the Undergraduate Program in Psychology

(Psychology Courses and General Education Courses)

2002-2004 Graduation Requirements for a Bachelor of Arts (BA) or a Bachelor of Science (BS) in Psychology

1. **Requirements are similar for the BA and BS degrees in each of the following areas unless specified otherwise.**
2. **Although this guide sheet was written very carefully, academic regulations change and students should consult an academic advisor to be sure they are following the most up-to-date requirements for graduation.**

Area I: English Composition and Speech Communication (a grade of C or higher is required in all three courses)

___ ENG W131 English Composition
___ a second 3-credit composition course for which ENG 131 is a prerequisite
___ COMM R110 Fundamentals of Speech Communication

Area II: Foreign Language

For a BS degree, no foreign language is required.

For a BA degree, this requirement may be fulfilled in three different ways:

1. complete two or three first-year courses (totaling 8-10 hours) of a foreign language, including American Sign Language
   ___ first semester foreign language
   ___ second semester foreign language
   ___ third semester foreign language (if necessary to reach a total of 10 credit hours)
2. complete a second- or third-year foreign language course with a grade of C or better
   ___ second- or third-year course
3. take a placement test and place into a 200-level foreign language course or higher
   ___ placement into a 200-level foreign language course or higher

Area IIIA: Humanities, Social Sciences, and Comparative World Cultures

Four courses totaling twelve hours are required. One will be HIST H114, and one each will come from Lists H, S, and C. Some courses appear on more than one list, but they may not be used to fulfill the requirements of more than one list.

___ HIST H114 History of Western Civilization II

___ **List H: Humanities**

AFRO A150 Survey of the Culture of Black Americans
AMST A103 Topics in American Studies
HER H100 Art Appreciation
HER H101 History of Art I
HER H102 History of Art II
CLAS C205 Classical Mythology
COMM T130 Introduction to Theatre
ENG L105 Appreciation of Literature
ENG L115 Literature for Today
CMLT C190 Introduction to Film
FOLK F101 Introduction to Folklore
FLAC F200 World Cultures through Literature
MUS M174 Music for the Listener
HIST H105 American History I
HIST H106 American History II
HIST H108 Perspectives on the World to 1800
HIST H113 History of World Civilization I
HIST H217 The Nature of History
PHIL P110 Introduction to Philosophy
PHIL P120 Personal and Social Ethics
REL R133 Introduction to Religion
REL R173 American Religion
REL R180 Introduction to Christianity
REL R212 Comparative Religions
WOST W105 Introduction to Women's Studies

___ **List S: Social Sciences**

AFRO A150 Survey of the Culture of Black Americans
ANTH A104 Culture and Society
GEOG G130 World Geography
COMM C180 Introduction to Interpersonal Communication
ECON E101 Survey of Current Economic Issues & Problems
ECON E201 Introduction to Microeconomics
ECON E202 Introduction to Macroeconomics
ENG G104 Language Awareness
FOLK F101 Introduction to Folklore
GEOG G110 Introduction to Human Geography
SPEA V170 Introduction to Public Affairs
POLS Y213 Introduction to Public Policy
POLS Y101 Principle of Political Science
POLS Y103 Introduction to American Politics
POLS Y219 Introduction to International Relations
SOC R100 Introduction to Sociology
SOC R121 Social Problems
WOST W105 Introduction to Women's Studies

___ **List C: Comparative World Cultures**

ANTH A104 Culture and Society
CLAS C205 Classical Mythology
FLAC F200 World Cultures through Literature
GEOG G110 Introduction to Human Geography
HIST H108 Perspectives on the World to 1800
POLS Y217 Introduction to Comparative Politics
REL R133 Introduction to Religion
REL R212 Comparative Religions

Area IIIB: Junior/Senior Integrator

___ One three-credit course from a list of to-be-announced Junior/Senior Integrator courses

Area IIIC: Physical and Biological Sciences (four courses totaling twelve credit hours including one lab course)

For a BA degree: four astronomy, biology, chemistry, geology, or physics courses*

____ astronomy, biology, chemistry, geology, or physics course with a lab
____ astronomy, biology, chemistry, geology, or physics course
____ astronomy, biology, chemistry, geology, or physics course
____ astronomy, biology, chemistry, geology, or physics course

For a BS degree: four biology, chemistry, geology, or physics courses, two of which must be biology and/or chemistry*

____ biology, chemistry, geology, or physics course with a lab
____ biology, chemistry, geology, or physics course
____ biology or chemistry course
____ biology or chemistry course

The following courses do not fulfill this requirement: AST A130, BIOL N100, BIOL N120, BIOL N200, CHEM C100, and GEOL G130, PHYS 140, and all agricultural courses.

Please read item 14 on page 477 of the *2002-2004 Bulletin* to avoid losing credits for taking "overlapping" science courses.

Area IIID: Mathematics and Computer Science

For a BA degree

___ one three-credit math course above MATH M111 (MATH M118 is recommended)*
___ one computer science course (CSCN N207 is recommended)

For a BS degree

___ MATH M118 (recommended)
and
___ MATH M119 (recommended)
___ one computer science course (CSCN N207 is recommended)**

or

___ one course above MATH 153/154
and
___ a second course above MATH 153/154

* It is possible to test out of M118 and M119; please contact the Math Department for details.

Please read item 14 on page 477 of the *2002-2004 Bulletin* to avoid losing credits for taking "overlapping" math courses.

** Neither CSCN N100 nor CSCI N241 will fulfill this requirement.

A student may have a grade of D or D+ in only one course that satisfies this requirement; all other grades must be C- or higher.

Area IIID: Major Courses for Psychology Majors (40 credit hours required)

Introductory Courses (all three of the following courses are required)

___ B103 Orientation to a Major in Psychology
___ B104 Psychology as a Social Science
___ B105 Psychology as a Biological Science

Methods Courses (both of the following courses are required)

___ B305 Statistics
___ B311 Introductory Laboratory in Psychology

Core Courses (six from the following twelve courses are required)

___ B307 Tests and Measurement
___ B310 Life Span Development
___ B320 Behavioral Neuroscience
___ B358 Industrial/Organizational Psychology
___ B370 Social Psychology
___ B380 Abnormal Psychology
___ B424 Theories of Personality
___ B398 Brain Mechanisms of Behavior
___ B334 Perception
___ B340 Cognition
___ B344 Learning
___ B356 Motivation

Specialization Courses (any two different-numbered 300-level or above psychology courses that total at least six credit hours)

___ First 300-level or above specialization course
___ Second 300-level or above specialization course

Students may earn a **concentration** in an area of specialization in psychology (i.e., Behavioral Neuroscience, Clinical Rehabilitation Psychology, Industrial/Organizational Psychology, or the Psychobiology of Addictions) by completing a specific set of core, specialization, and capstone courses identified in the electronic version of the 2002-2004 Bulletin. The printed version of the Bulletin contains errors. Do not rely on it.

Capstone Course (one of the following courses is required)

____ **For the BA degree (any of the following courses)**

B454 Capstone Seminar in Psychology*
B462 Capstone Practicum in Industrial/Organizational Psychology*
B482 Capstone Practicum in Clinical Rehabilitation Psychology*
B471 Capstone Lab in Social Psychology
B423 Capstone Lab in Physiological Psychology
B461 Capstone Lab in Developmental Psychology
B481 Capstone Lab in Clinical Rehabilitation Psychology
B445 Capstone Lab in Learning
B457 Capstone Lab in Motivation
B431 Capstone Lab in Sensation/ Perception
B425 Capstone Lab in Personality
B497 Capstone Individual Research
B499 Capstone Honors Research

____ **For the BS degree (any of the above courses except those marked with an *)**

Area V: Electives

Students may choose the remainder of their 124 required credit hours from any Science and Liberal Arts courses (see exception to this rule described in item 12 on page 477 of the Bulletin). They must also earn at least 32 credit hours at IUPUI at the 300-level or above and be in residence at IUPUI for a minimum of two semesters.

Appendix UG-3

Curriculum for the Minor in Psychology

Curriculum for the Minor in Psychology

Introductory Sequence (six credits): B104 and B105.

Core Courses (3 courses, 9 credits chosen from a list of 12 courses): Tests and Measurement (B307), Life Span Development (B310), Behavioral Neuroscience (B320), Perception (B334), Cognition (B340), Learning (B344), Motivation (B356), Introduction to Industrial/Organizational Psychology (B358), Social Psychology (B370), Abnormal Psychology (B380), Brain Mechanisms of Behavior (B398), and Theories of Personality (B424).

Psychology Elective (1 course, 3 credits): any upper level (300 or above) psychology course.

There have been no changes in implementing the minor since the last external review. The minor began in 1989, and its popularity grew slowly. Starting in 1996, more than 50 minors were awarded each year. Starting in 2001 and continuing to the present, more than 70 minors are awarded each year.

Appendix UG-4

Developments in B104 Introductory Psychology as a Social Science

Developments in B104 Introductory Psychology as a Social Science

Application of Course Concepts. The emphasis of the course is on applying psychological principles and concepts to life. This is the emphasis of the textbook, the focus of the recitation exercises, and the purpose of one of the computer exercises, Psych Whiz. Besides being a worthwhile goal in itself, an additional purpose of the applied emphasis is to enhance student motivation.

Changes in the Exams. Evaluation of students with the use of exams has gone through many phases. In addition, to the writing emphasis, the exams reflect the applied goal of the course. Many questions provide students with novel situations and ask them to identify the chapter concepts. At least one question per test is an audio-visual question asking students to watch the scene and identify relevant concepts. The difficulty of the test items has been increased three times during the review period, indicating that the students are working harder and learning more course concepts.

Management of Testing. Tests in 4 courses for over 2000 students per semester are given in a small, 250 sq. ft. room. A few years ago, students were confronted with long lines, a noisy environment, and some fellow students who cheated on the tests. A host of management procedures have been implemented and these include: Staggered test closing dates, testing reservation system, more computers, carpeting, security cameras, identification checks. These efforts have dramatically reduced the testing problems. The only recent complaint about testing has been that the keyboards are noisy when the room is full. To offset this problem, silent keyboards have been installed.

Feedback to Students. Students are given immediate, actually instantaneous, feedback on all class activities and the results are recorded directly into the internet grade book. The only current exceptions to this rule are that the exam essays are graded later, usually within 48 hours, and the record of research participation is posted once a week. Immediate feedback is provided for all computer exercises, multiple-choice component of the exams, and class attendance. When students attend class or student learning assistance sessions, they swipe their JagTag and class points are immediately entered into the grade book.

Peer-tutoring Programs: Student Learning Assistance (SLA) and Psych Tools. Most sections of the course have an SLA section that meets once a week led by one or two peer mentors. Currently, University College hires and trains all student mentors. Starting in the Spring 05 semester, a psychology faculty member will be helping in hiring and doing much of the training. Psych Tools is a separate tutoring program. Students may walk-in or reserve a session. In addition, faculty may send students to work one-on-one with a peer mentor in lieu of a class session. The office is adjacent or close to most class sessions.

Appendix UG-5

B104 Student Satisfaction and Perception Data

Table 1. Student Satisfaction Responses for Spring, 04.

Other Psychology Courses		B104
4.42*	Instructor displays enthusiasm about this class	4.70
4.40	Instructor deals fairly & impartially w/students	4.62
4.30	Instructor helpful w/students have problems	4.55
4.42	Instructor maintains rapport with students	4.49
4.12	Enjoy taking another course from instructor	4.45
4.59	Overall, course is among the best	3.85
3.84	Overall, instructor is among the best teachers	4.22
4.11	Difficulty of material is appropriate for level of course	
3.53	In this course I am developing my writing skills	3.15
4.08	Course is improving my ability to think critically	4.14
1185	Number of students	577

*(5 = Strongly agree, 4 = Agree, 3 = Neither agree nor disagree)

Table 2. Number of Student Responses to 3 Open-ended Questions: Considering the Course Structure & Syllabus: (1) What is your first, immediate impression of the course. (2) What should we keep, (3) What should we change (N = 110).

Impression	
1	Class left no room for slacking off
1	The homework really prepared me for the tests
1	I actually learned psychology
1	Toughest intro class I have taken
1	Amazed how I can apply all the things I learned to my life
1	Psych has been fun, but tough learning experience
1	Prepare to study a lot: Devote time to homework & come to class
1	Lot of homework but helped me learn
1	Like the way you can build personal, 1 on 1 communication with teacher 7 students
1	I love the computer exercises & homework online
1	Course is very organized & creative
1	The harder you work the better you do
1	The course gets you in touch with related things in your life
1	The course made me analyze situations & not only view the exterior
1	The tests were challenging but I learned a lot
1	I'd recommend the course to anyone wanting to be challenged academically
1	I learned a lot & I think it was due to how the course was structured
1	The course structure is fantastic
1	One of the best classes in terms of amount of material learned
1	Interesting but very challenging
1	Course is fun, it is just a lot of work
1	Course is challenging
1	High level of organization & professionalism
4	Course is easy or easy if you study
1	Everyone wanted me to succeed, but they didn't do the work for me
Keep	
13	Everything
50	Online Homework
30	Group exercises & Active learning approach
26	Testing Procedures/Take a test twice
22	Class structure & point system
18	SLA
5	Book and Study guide
Change	
12	Nothing
21	Change class away from active learning: More lecture, more basic
12	One chapter per test
6	Change essays: Easier, easier scoring
5	No or less homework

Appendix UG-6

Graduating Seniors' Evaluations of Advising

Graduating Seniors' Evaluations of Advising:
Upward Trends in Ratings, 1995-2001

by D. W. Rajecki

Participants and Procedure

From December 1995 to May 2001, the department approved the graduation applications of 518 IUPUI senior psychology majors. We sent a first class mailing to the address on each student's transcript. Packets contained a personalized cover letter, a two-page exit survey questionnaire, and a stamped return envelope. Excluding dead letters, a follow-up mailing was sent after a month with no a response. Eventually, 333 usable instruments arrived, a return rate of 64.3%. We set aside the questionnaires of 19 students that failed to graduate within a calendar year of their initial application, leaving a working sample of 314 cases.

The 76 men in the final sample ranged in age from 21.6 to 53.1 years (M = 28.96, SD = 7.75); their psychology GPAs (including all courses with grades of A through F) ranged from 2.00 to 4.00 (M = 3.28, SD = 0.51). The 238 women ranged in age from 21.6 to 55.5 years (M = 27.45, SD = 6.21); their psychology GPAs ranged from 1.86 to 4.00 (M = 3.23, SD = 0.54). Transcripts did not provide ethnicity information.

Questionnaire Items

The first two items from the questionnaire are reported. One read, "Concerning registration and the matter of which courses to take and when to take them, how would you rate the advising job done by faculty and staff?" and was accompanied by a seven-interval, bipolar scale with endpoints of *poor* (1) versus *excellent* (7).

The other item read, "Concerning options for careers or continuing (postgraduate) education, how would you rate the advising job done by faculty and staff?" and was accompanied by a seven-interval bipolar scale with endpoints of *inadequate* (1) versus *adequate* (7).

Results

Sex was ignored as a variable in the following analyses. Occasional missing data in questionnaires are reflected in sample sizes and degrees of freedom.

Course advising. Seniors' ratings of course advising were entered in 1 X 7 ANOVA, with year (1995-2001) as the seven-level, between-subjects factor. Table 1 shows a clear trend of increasingly positive average ratings of course advising over the years, $F(6, 305) = 8.86$, $p < .01$. The lowest average rating (2.73) occurred in 1995. The 95% confidence interval for that mean was 1-88-3.58, well below the scale mathematical midpoint of 4.00. However, the 4.00 "barrier" was broken in 1999, and course-advising ratings continued to increase thereafter.

Career advising. Seniors' ratings of career advising were entered in a 1 X 7 ANOVA, with year as the seven-level, between factor. Table 1 shows a fairly clear trend of increasingly positive

average ratings of career advising over the years, $F(6, 304) = 2.37$, $p < .05$. The lowest average rating (2.93) occurred in 1995, with a 95% confidence interval of 2.11-3.76, which is below the scale midpoint of 4.00. However, the career-advising mean in 2001 exceeded this midpoint.

Strength of association. Individuals' course advising ratings were moderately correlated with their career advising ratings, $r(311) = .53$, $p < .01$. But respondent age predicted neither course advising scores ($r = -.09$) nor career advising scores ($r = -.09$). Similarly, respondent GPA predicted neither course advising scores ($r = .01$) nor career advising scores ($r = .04$).

Table 1

IUPUI Psychology Majors' Exit Survey Ratings of Course and Career Advising by Year

	Course Advising			Career Advising		
Year	*n*	*M*	(*SD*)	*n*	*M*	(*SD*)
1995	15	2.73	(1.53)	15	2.93	(1.49)
1996	51	3.47	(1.63)	51	3.02	(1.54)
1997	54	3.87	(1.69)	53	3.60	(1.81)
1998	61	3.92	(1.70)	61	3.72	(1.68)
1999	52	4.12	(1.53)	52	3.87	(1.57)
2000	52	4.38	(1.56)	52	3.79	(1.75)
2001	27	4.48	(1.48)	27	4.22	(1.89)

Note. Scale range was 1-7 with a mathematical midpoint of 4.

Appendix UG-7

Jobs Entered by Psychology Alumni from 1999 to 2004

Jobs Held by IUPUI Psychology Majors

Who Entered the Workforce with a BA or BS Degree

The majority of our alumni enter the workforce immediately after they graduate. The following lists of jobs, which are organized according to the three clusters of skills required for each category of job, are examples of the occupations they have entered (left column) from 1999 to 2004 and the companies, agencies, and organizations that employ them (right column).

Jobs Requiring Clinical Skills	Employers
Substance Abuse Counselor	Mid-Town Mental Health
Provider Relations Representative	Community Health Alliance
Instructor, Community Support Services	Noble of Indiana
Case Manager	St. Vincent Stress Center
Clinical Director	New Directions, Inc.
Neuropsychology Technician	Wishard Health Services
Mental Retardation Service Coordinator	Helen Forabee Regional MHMR
Family Care Manager	Child Protection Services
Crisis Intervention RN	St. Francis Hospital
Case Manager	Gallahue Mental Health Center
Crisis Clinician	Mid-Town Mental Health
Vocational Rehabilitation Counselor	Florida Keys Employment and Training Council
Instructor and Case Manager	Noble of Indiana
Behavioral Clinician	Indianapolis Juvenile Correctional Facility
Specialist III	Child Protection Services
Child Advocate	Alternatives, Inc.
Employment Consultant	Mid-Town Mental Health
Independent Case Manager	Indiana Case Management Services

Jobs Requiring Quantitative, Research, or Computer Skills	*Employers*
Clinical Research Associate	Eli Lilly
Information Specialist	National Institute for the Deaf
Research Assistant	IU School of Medicine
Associate Toxicologist	Eli Lilly
Process Scientist	Roche Diagnostics
Engineer	Little Blue Productions
Data Analyst	Covance Laboratory Services
Supplier Quality Assurance Associate	Subaru Automotive
Data Management Associate	Eli Lilly
Newspaper Columnist	Orlando Sentinel
Free Lance Writer	Self-Employed
Data Manager	IUPUI Office of Institutional Research

Jobs Requiring Business/Managerial/Leadership Skills	*Employers*
Conference Manager	University Place Conference Center
Textbook Adoption Coordinator	Pearson Education
Direct Placement Recruiter	Kelly Services
Human Resources Generalist	Reebok International
Program Manager	Indiana Department of Commerce
Event Coordinator	Marsh Supermarkets
Human Resources Administrator	Roche Diagnostics
Project Manager	IU Law School and Roudebush VA Hospital
Training Coordinator	IUPUI Student Technology Consulting Department
Operations Branch Manager	GE Capital
Academic Advisor	IUPUI University College
Employment Specialist	Independent Residential Living
Physician Contact Consultant	Anthem Blue Cross and Blue Shield
Director of Personnel	Indianapolis Newspapers, Inc.
Project Manager	Indiana Consortium for Mental Health Research
Assistant Vice President of Personnel	American Underwriters Group, Inc.
Program Director	Central Indiana Community Foundation
Program Coordinator	Indiana Commission for Higher Education
Project Coordinator	IUPUI Cognitive Development Laboratory
Manager	Gleaners Food Bank
AmeriCorps Promise Fellow	AmeriCorps National Service
Director of Fresh Express Delivery	Marsh Supermarkets
President	Hashman Training and Development Company
Senior Account Agent	Allstate Insurance
Claims Supervisor	American Surety, Inc.
Recruiter	Indecon, Inc.
Recruiter	U.S. Army
Processing Trainer	Regenstrief Institute
Director	La Petite Academy
Residence Hall Director	Marian College
Application Engineer	Altec Industries
Manufacturing Quality Auditor	QMT
Director of the National Training Center	Veterans Association
Account Manager	Aperture Technologies
Purchasing Agent	Spectrum Products
Human Resources Information Systems Analyst	Clarion Health Partners
Owner and Director	Roberts & Associates Human Resources Consultants
Accountant and Corporate Officer	Young's Printing Company
New Homes Sales Consultant	Trinity Homes
Pharmaceutical Sales Representative	Boehringer Ingelheim Pharmaceuticals, Inc.
Charge Auditor	Riley Outpatient Center for Pediatric Opthamology

Appendix UG-8

Graduate Schools and Programs of Graduating Psychology Majors from 1999-2004

IUPUI Psychology Majors Have Been Accepted into the Following Graduate Schools and Programs

Graduate Schools	Graduate Programs
Indiana University	Clinical Psychology
Purdue University	Social Psychology
University of Michigan	Psychobiology
University of Utah	Medicine
University of Connecticut	Marriage and Family Therapy
University of Chicago	Neuroscience
Villanova University	School Psychology
Xavier University	Industrial/Organizational Psychology
North Carolina State University	Forensic Psychology
Ohio State University	Child and Family Studies
Michigan State University	Law
University of Illinois	Counseling Psychology
University of Colorado-Denver	Criminal Justice
University of North Carolina	Gerontology
San Diego State University	Occupational Therapy
San Francisco State University	School Counseling
University of Tennessee	Optometry
Colorado State University	Special Education
University of Pennsylvania	Addictions Studies
University of Pittsburgh	Nursing
University of Colorado-Boulder	Communication and Information Science
Rutgers University	Business Administration
University of South Florida	Physician's Assistant
University of Akron	Clinical Rehabilitation Psychology
University of Toronto	Biology
University of Cincinnati	Human-Computer Interaction
Arizona State University	Library Science
University of Alabama	Dentistry
Georgia Tech University	Social Work
Christian Theological Seminary	Psychometry
Pepperdine University	Sociology
Governors State University	Student Affairs
University of Northern Colorado	History
Indiana State University	Student Personnel
Northern Illinois University	Mental Health Counseling
Ball State University	Osteopathic Medicine
Butler University	Public Health
Pacific School of Psychology	Higher Education
East Carolina University	Physical Therapy
Rush University	Cognitive Psychology
Indiana Wesleyan University	Pediatric Neuroscience

Appendix C

The Department's Response to the Undergraduate Program's External Review Report

Response to the 2005 Review Team Report of the IUPUI Psychology Department's Undergraduate Program

Drew C. Appleby, Ph.D.
Director of Undergraduate Studies in Psychology
September 14, 2005

The IUPUI Psychology Department underwent a program review in 2005 by writing a comprehensive self-study report and inviting a seven-member team of external reviewers to read the report, spend three days on campus to gather data about the department, and write a report based on the self-study and these data. This response to their report is divided into two sections.

- a summary of the review team's (RT) report on the undergraduate program (UP) containing the initial responses to the report by the Director of Undergraduate Studies
- a section that warns the UP that the positive tone of the RT's report should not produce a false and dangerous sense of complacency that could cause the UP to reduce its efforts to gain the financial, spatial, and human resources necessary to continue programmatic improvement

It is important to understand that this is not a final response to the report, but rather the Director of Undergraduate Study's attempt to produce a document whose contents will serve as stimuli for discussions among the members of the Executive Committee, the Undergraduate Committee, the faculty, and the staff about the RT's report and our department's ability to utilize the information in their report to improve our UP. (*Italicized* passages in this report have been quoted verbatim from the RT's report.)

A Summary of the RT's Report of the UP

In its overall review of the whole department, the review team (RT) noted that two of the department's major strengths are a *clear and effective focus on undergraduate education* and *Kremer's textbook and the Foundation*. The RT identified *assessment of undergraduate learning* as one of the department's major weaknesses. The RT recommended that the department's strategic plan contain provisions to:

- *maintain the quality of the undergraduate program,*
- *continue to integrate the graduate programs and the undergraduate program, and*
- *identify existing internal faculty candidate(s) to take over Kremer's book, rather than use a new hire or an endowed chair.*

In its specific review of the undergraduate program (UP), the RT stated that its *overall evaluation of the undergraduate program is very positive. The department is clearly committed to providing a quality program for psychology majors and other undergraduate students*. It then reinforced this evaluation by stating that *the department's undergraduate program is excellent and that appropriate personnel and policies are in place to keep it so*. The RT supported these conclusions with the following statements.

- *The curriculum of the department meets professional standards.*
- *The number of psychology majors and enrollment in psychology classes is strong.*
- *The department and individual faculty members have developed a number of innovative programs and courses.*
- *Most or all members of the faculty appear to be involved in undergraduate education.*
- *There are opportunities for undergraduate involvement in research and a community of undergraduate students who take advantage of these opportunities.*

Although the RT gave the UP an overall positive evaluation, its report addressed several aspects of the UP

that it targeted for specific recognition or recommendations. These areas were (1) curriculum and courses; (2) assessment of student learning; (3) advising; (4) student involvement in the discipline, research, and academic community; and (5) personnel, leadership, and systems. The following sections address these aspects.

Curriculum and Courses

The RT singled out B103 Orientation to a Major in Psychology, B104 Psychology as a Social Science, and the track concentrations as particularly effective curricular components.

The RT was concerned that psychology majors have complete freedom to choose classes to fulfill the Core and Specialization components of the curriculum. Specifically, the RT indicated that *it was not clear that IUPUI psychology majors are necessarily exposed to advanced courses in a sufficiently wide range of psychological disciplines under the existing Core Course requirements of 6 courses selected from a menu of 12 possibilities and was concerned that distributional requirement(s) may be needed to ensure students are exposed to a sufficient range of content and methodological approaches*. It is possible for current psychology majors to fulfill their six-course Core requirement by taking only those courses that the department designates as "social" (i.e., that are taught in B104) or only those courses that are "biological" (i.e., taught in B105 Psychology as a Biological Science). The validity of this contention could be determined with an audit of the transcripts of graduating seniors for the past two years. If such a problem does exist, one way to ensure that psychology majors are exposed to both sides of psychology in their Core courses would be to divide the Core into a set of "social" courses (i.e., B310 Life Span Development, B380 Abnormal Psychology, B358 Industrial/Organizational Psychology, B370 Social Psychology, and B307 Testing) and a set of "biological" courses (i.e., B344 Learning, B356 Motivation, B344 Cognition, B320 Behavioral Neuroscience, B398 Brain Mechanisms of Behavior, and B334 Perception) and requiring students to take three from each of these sets or perhaps at least two from one set and four from the other.

The RT also stated that *elements of the psychology curriculum could be better integrated with elements of the college and university curriculum. The committee heard it argued, for example, that B103 (Introduction to the Major) could be integrated with the college's freshman seminar program and that better use could be made of pedagogical resources provided by the library and student services units (e.g., library services expressed interest in providing support for research methods and capstone courses)*. The first of these concerns is puzzling because it has been addressed. One section of B103 was offered as a freshman learning community in fall 2005 as one of University College's special "bridge" classes that began two weeks prior to fall semester to provide a concentrated orientation to incoming psychology majors. The Director of Student Development worked diligently to create this special class since fall 2004. The second of these concerns will be addressed this fall with a series of meetings that will take place with Sally Neal (the School of Science librarian) and faculty who teach B103, B311 (Introductory Laboratory in Psychology), and the capstone classes. The purpose of these meetings will be to create (a) a strategy in which library instruction can be built into these classes in a developmental manner and (b) assessment techniques to determine the effectiveness of this strategy.

Assessment of Student Learning

The undergraduate section of the Self Study contained a clear request for assistance in the area of assessment from the RT, and the RT responded to this request in a supportive and helpful manner. According to the RT, *there is a clear sense in the self-study and in our interviews that the department has a healthy concern for identifying and implementing goals for student learning. The involvement of the Director of Undergraduate Studies in these issues at the national level and his commitment to the development and assessment of such goals are extremely positive and valuable assets. The department has done a good job of identifying student*

learning objectives and operationalizing some of them in the context of some courses. The committee now encourages the department to seek means of expanding this process. The RT's suggestion for the first step in the expansion of this process is to determine the extent to which existing courses contain assignments designed to enable students to accomplish the department's learning objectives. *For example, beyond the writing requirement in introductory course exams, it is not clear how much writing is required of IUPUI psychology majors. An inventory of courses that currently include writing requirements and the nature of these requirements would be a critical first step in assessing the department's Student Learning Outcome #6. Once the loci in the curriculum relevant to each goal are identified or developed, in cases where they are lacking, then assessment of their success is feasible*.

The RT has set the stage for the second step in the assessment process as described as follows in the self study. "The first step in assessment for any academic program is to determine its student learning outcomes (i.e., what it wants its students to know and to be able to do as a result of successfully completing its program). The second step is to link these outcomes to specific components of the curriculum. The third step is to operationalize these outcomes so their degree of achievement can be measured. The fourth step is to collect data within the context of these components that can be used to determine if these outcomes are being achieved. The fifth step is to use the information collected during the fourth step to make data-informed changes to the curriculum when these changes are deemed necessary." An assessment matrix—in which one side represents the department's learning objectives and the other side consists of the courses in the undergraduate curriculum—could serve as an organizing strategy to perform the curricular audit the RT is suggesting. Analyzing syllabi and asking faculty which specific learning objectives they target in their classes and the means that they used to assess how well their students accomplish these objectives, would serve as a valid means to identify *the loci in the curriculum relevant to each goal.*

Academic Advising

The RT was very positive about the progress the department had made in its academic advising system by indicating that *weaknesses in the undergraduate student advising program were identified in the 1997 departmental review process. The department has clearly responded to those concerns. The committee was impressed by the peer advising system and the procedures overseen by the Director of Undergraduate Studies and Director of Student Development. The system appears to be working quite well and the department should be proud of its attention to student advising.* The RTs only concern was the inevitable challenge for faculty to find time in their busy schedules for advising, especially at an institution such as IUPUI because of its large part-time and evening student population. The RT had no suggestions for improvement in this area.

Student Involvement in the Discipline, Research, and Academic Community

- The RT *was impressed by the extent to which undergraduate students are involved in the academic life of the department*. It sited the following as contributing factors to this successful sense of academic community among psychology majors:
- the encouragement and information provided to students in B103,
- the B104 peer tutoring program,
- the undergraduate concentration tracks,
- the strong capstone program,
- the department's numerous opportunities and generous support for undergraduate research including ample faculty support for undergraduate research in their research programs.

All of these factors, plus testimony from students, led the RT to conclude that there is *a critical mass of students heavily involved in such activities*.

Personnel, Leadership, and Systems

According to the RT, *the department is clearly committed to quality undergraduate education*. The following factors appear to contribute to this commitment:

- *the creation of the Director of Undergraduate Studies and the Director of Students Development positions and the support for undergraduate activities provided by those who hold these positions,*
- *the commitment of department resources to creating software systems to support course management, and*
- the fact that *all faculty members are involved in undergraduate education*.

However, the RT was concerned that the self-identification of a small subset of the faculty as "the undergraduate faculty" (i.e., those not affiliated with one of the three graduate programs) might produce *lowered expectations for involvement in undergraduate education among those with graduate program affiliation*. It encouraged *the department to maintain involvement in undergraduate education by all faculty members as well as find ways to have as many of the current and future faculty members as possible involved in graduate education.*

One of the overall recommendations for the whole department was to *identify existing internal faculty candidate(s) to take over Kremer's book, rather than use a new hire or an endowed chair.* It is difficult to accept this recommendation because it was not accompanied by a rationale; it was just given. The individual who assumes John Kremer's B104 responsibilities will need to have his pedagogical, technological, and business savvy. Plus, in order to continue improving B104 and to disseminate the proof of its improvement, this individual will also need to be a skilled researcher with the ability and willingness to publish in professional journals and make presentations at regional and national conferences. Many existing faculty possess one or more of these abilities, but none have exhibited them all. Limiting the search for such an individual to our current faculty seems to be unwise.

Cautionary Note

The RT clearly stated that *business as usual is not an option for our department*. The RT gave the UP clear indication that it is carrying out its business successfully (e.g., *the department's undergraduate program is excellent and the appropriate personnel and policies are in place to keep it so*), and one of its overall recommendations is to *maintain the quality of the undergraduate program*. However, the words "in place" and "maintain" in these statements are potentially problematic if they are interpreted to mean all the UP must to do to continue its excellence is to preserve its status quo, rather than to continually strive to improve. The fact that the RT recommended that the department should *use replacement hires to build existing graduate programs* (with no mention of strengthening the UP) and that *each hiring decision should be viewed as an opportunity to enhance the research strength of the department and the number of potentially successful grant writers* (with no mention of enhancing its teaching and service strength) could substantially diminish the negotiating power of the UP in future resource-allocation and hiring decisions.

Appendix D

Undergraduate Curriculum Audit

Collaborative Student Assessment Project

Fall 2005 B454 Capstone Seminar in Psychology

Drew Appleby, Instructor

Impetus for the Project

The Psychology Department recently wrote a self study and underwent a program review. The following section of the Review Team's report provides an explanation for the project described in this document.

There is a clear sense in the department's Self Study and in our interviews that the department has a healthy concern for identifying and implementing goals for student learning. The department has done a good job of identifying student learning objectives and operationalizing some of them in the context of some courses. The committee encourages the department to seek means of expanding this process. The first step in the expansion of this process is to determine the extent to which existing courses contain assignments designed to enable students to accomplish the department's learning objectives. For example, beyond the writing requirement in introductory course exams, it is not clear how much writing is required of IUPUI psychology majors. An inventory of courses that currently include writing requirements and the nature of these requirements would be a critical first step in assessing the department's Student Learning Outcome #6. Once the loci in the curriculum relevant to each goal are identified or developed—in cases where they are lacking—then assessment of their success is feasible.

I perceived this suggestion from the Review Team as a challenge for my B454 Capstone Seminar students who are required to perform a collaborative research project. This seminar has performed two collaborative assessment projects in the past, both of which enabled my students to become active participants in the assessment process, rather than simply being assessed.

The remainder of this document describes the steps in two projects completed by my B454 students.
1. The first was the project to address the specific suggestion of the Review Team.
2. The second was a project that was created as a natural consequence of the first project.

Steps in Project #1: The Curriculum Matrix / Syllabus Audit Project

There are nine pages of documents referred to in the descriptions of the following two projects, and they are included in the appendices in parenthesis at the end of the sections that refer to them.

1. We gathered syllabi for all of the courses offered by the Psychology Department that fulfill the department's graduation requirements.

2. We "de-bundled" the department's 7 Student Learning Outcomes (SLOs) into 15 component outcomes so these specific outcomes could be identified within syllabi. For example, SLO #6 is Communication Skills, Information Competence, and Technological Proficiency, which is defined as the ability to write and speak effectively, demonstrate information competence, and utilize technology for many purposes. We de-bundled this SLO into (a) writing skills, (b) speaking skills, (c) information competence skills, and (d) technological skills (Appendix D1).

3. We went one step further than what the Review Team had suggested by creating three developmental levels—Beginning, Developing, and Advanced—at which each of these outcomes are learned in

psychology classes. We used a modified version of Bloom's taxonomy to define these levels by the cognitive activities students are required to engage in at each stage. The Beginning Level requires students to retain and/or comprehend information, the Developing Level requires students to apply and/or analyze information, and the Advanced Level requires students to evaluate and/or create information. We did this to determine if the curriculum was set up in a "developmentally coherent" manner that provides psychology majors with a sound foundation in psychology in lower level introductory classes and then challenges them to build upon this foundation with more complex cognitive tasks in intermediate and capstone classes (Appendix D2).

4. We spent time learning to identify the different cognitive levels in course assignments by practicing on the B454 syllabus.

5. We developed a syllabus audit worksheet to record the data that would be collected from each syllabus (Appendix D3).

6. We created a matrix consisting of all the psychology courses that satisfy graduation requirements on the vertical axis and the department's de-bundled learning outcomes on the horizontal axis (Appendix D4).

7. We created and submitted an IRB proposal, which was subsequently approved.

8. We divided the syllabi we had collected among the class members, and each class member "audited" her/his group of syllabi to (1) identify assignments requiring one or more of the 15 component outcomes and (2) determine the cognitive level required for the successful completion of these assignments.

9. We were asked by two faculty members to identify classes in which students were (1) required to read original empirical research articles and (2) write in APA style.

10. After auditing each syllabus and determining its targeted component outcomes and developmental levels, each student contacted the author of the syllabus to verify the validity of the outcomes and levels that had been identified. If the author's interpretation differed from the student's interpretation, the author's interpretation was accepted. (Please note that although students tried very hard to contact the faculty whose syllabi they audited for their feedback, not all faculty responded to their requests. Classes in which no faculty feedback was received are marked with an asterisk (*) in the matrix.)

11. Students reported their syllabus findings to one student who maintained the matrix. Each box in the matrix was filled with a dash (-) if the component outcome was not targeted with an assignment in the syllabus or filled with a B, D, or A to signify the cognitive level at which students were required to engage in an assignment (Appendix D5).

The Steps in Project #2: The "Grade Yourself" Project

1. We decided to augment the data we collected with the syllabus audit by surveying the members of the fall 2005 psychology capstone classes to determine how well they believe they have accomplished each our department's SLOs.

2. We constructed a survey that required our participants to "grade" themselves—with the standard A to F grading scale—in terms of their perceptions of how well they attained the department's 15 SLOs (Appendix 6).

3. We were able to collect these data from the 41 students in four of the five capstone classes.

4. These data were arranged in a table that also included the mean GPA for each SLO, the number of classes in which each SLO was targeted and at which cognitive level students were required to demonstrate their mastery of each SLO (Appendix D7).

5. The data in this table can be used to help our department answer three important questions about our curriculum.

    a. How many opportunities do we provide our majors to accomplish our SLOs?
    b. At what cognitive level do we require our students to engage in our SLOs?
    c. How well do our students believe they have accomplished our SLOs?

6. An extension of this study for next year's B454 class could be to gather data from capstone instructors about their perceptions of the ability of their students to accomplish our SLOs. It would be interesting to have instructors "grade" each of their students on each of the SLOs targeted in their classes and then compare these data with the grades that students give themselves.

Appendix D1

The De-Bundled 15 Student Learning Outcomes

The De-Bundled 15 Student Learning Outcomes

SLO	Description
Content	Understand the major concepts, theoretical perspectives, empirical findings and historical trends in psychology.
Research	Understand and use basic research methods in psychology, including design, data analysis, and interpretation.
Application	Understand and generate applications of psychology to individual, social, and organizational issues.
Ethics	Understand and abide by the ethics of psychology.
Diversity	Recognize, understand, and respect the complexity of socio-cultural and international diversity.
Self-Awareness	Develop self-awareness by identifying your own personal strengths, weaknesses, values, goals, etc.
Understanding Others	Understand the behavior and mental processes of others.
Collaboration Skills	Work effectively as a member of a group to accomplish a task.
Career Exploration	Identify and prepare for a career in psychology or a related field.
Writing Skills	Demonstrate effective writing skills.
Speaking Skills	Demonstrate effective speaking skills.
Information Competence	Demonstrate information competence by identifying, locating, and retrieving written and electronic information sources.
Technological Competence	Utilize technology for many purposes.
Creative Thinking	Demonstrate creative thinking skills.
Problem Solving	Demonstrate problem-solving skills.

Appendix D2

Modified Version of Bloom's Taxonomy

Modified Version of Bloom's Taxonomy

A. Beginning Level

1. Remembering
   a. Students demonstrate this skill when they recognize or recall knowledge in an accurate manner.
      1) Key words in questions, assignments, or projects (QAPs) used to assess the accomplishment of this skill are list, identify, name, recognize, retrieve, and describe.

2. Understanding
   a. Students demonstrate this skill when they understand the knowledge they remember.
      1) Key words in questions, assignments, or projects used to assess the accomplishment of this skill are explain, summarize, interpret, paraphrase, exemplify, and infer.

B. Developing Level

1. Applying
   a. Student demonstrate this skill when they can put what they to use in a new situation.
   b. Sample key words in QAPs that measure this skill are use, implement, and carry out

2. Analyzing
   a. Can the student differentiate between constituent parts?
   b. Sample key words in questions, assignments, or projects that measure this skills are compare, organize, deconstruct, and attribute.

C. Advanced Level

1. Evaluating
   a. Can the student justify a decision or course of action?
   b. Sample key words in QAPs that measure this skill are critique, judge, and evaluate.

2. Creating
   a. Can the student generate new products ideas or ways of viewing things?
   b. Sample key words in questions, assignment, or projects that measure this skill are design, construct, plan, and produce.

Appendix D3

Curriculum Audit Worksheet

B454 Curriculum Audit Worksheet

Course Number and Title:_____

Instructor: _____ **Last Semester Taught:** _____

Use the following table to describe the type of assignments used in the course whose successful completion indicates that its students have accomplished the following SLO components.

SLO Component	Level*	Description of Assignment
Content		
Research		
Application		
Ethics		
Diversity		
Self Awareness		
Understanding Others		
Collaboration Skills		
Career Exploration		
Writing Skills		
Speaking Skills		
Information Competence		
Technological Competence		
Creative Thinking		
Problem Solving		
Analytical Thinking		

*Beginning (B), Developing (D), Advanced (a)

Please put the page number of the syllabus where the information is found at the end of your description

Appendix D4

IUPUI Psychology Department Curriculum Audit Matrix

IUPUI Psychology Department Curriculum Audit Matrix

	Content	Research	Apply	Ethics	Diverse	Self-Aware	Understand Others	Collaboration	Career Explore	Write Skills	Speak Skills	Info Comp	Techno Comp	Creative Thinking	Problem Solving
B103															
B103															
B104															
B105															
B252a															
B252b															
B252c															
B292															
B305															
B307															
B310															
B311															
B320															
B322															
B334															
B340															
B334															
B354															
B356															
B358															
B360															
B362															
B365															
B366															
B368															
B370															
B374															
B375															
B376															
B380															
B382															
B386															
B394															
B396															
B398															
B420															
B422a															
B422b															
B423															
B424															
B425															
B431															
B445															
B454															
B457															

	Content	Research	Apply	Ethics	Diverse	Self-Aware	Understand Others	Collaboration	Career Explore	Write Skills	Speak Skills	Info Comp	Techno Comp	Creative Thinking	Problem Solving
B460															
B461															
B462															
B471															
B472															
B481															
B482															
B492															
B497															
B499															
Total															

Appendix D5

Completed Curriculum Matrix

IUPUI Psychology Department Curriculum Audit Matrix

Introductory Courses

	Content	Research	Application	Ethics	Diversity	Self-Aware	Understand Others	Collab Skills	Career Explore	Write Skills	Speak Skills	Info Comp	Tech Comp	Creative Thinking	Problem Solving	APA style	Read Orig. Research
B103a	-	-	D	D	B	A	B	A	A	A	B	A	D	A	A	Yes	No
*B103b	-	-	-	-	-	D	-	D	A	A	B	D	D	D	D	Yes	No
B104	D	-	D	-	-	-	-	B	-	B	-	-	B	B	B	No	No
B105a	B	B	D	B	-	-	-	-	-	B	-	D	B	B	-	No	No
*B105b	B	-	B	-	-	-	-	-	-	-	-	-	-	-	-	No	No
B105c	D	B	D	B	B	B	B	-	B	B	-	-	B	B	-	No	No

Methods Courses

	Content	Research	Application	Ethics	Diversity	Self-Aware	Understand Others	Collaborate Skills	Career Explore	Write Skills	Speak Skills	Info Comp.	Tech Comp	Creative Thinking	Problem Solving	APA style	Read Orig. Research
B305a	A	A	A	D	-	-	-	D	-	D	-	D	D	-	A	No	No
*B305b	D	D	D	-	-	-	-	-	-	-	-	-	D	-	D	No	No
B311a	B	A	A	D	-	-	-	-	-	A	-	B	D	A	A	Yes	Yes
B311b	A	A	A	D	-	-	-	B	-	A	-	A	A	A	A	Yes	No

Core Courses

	Content	Research	Application	Ethics	Diversity	Self-Aware	Understand Others	Collaborate Skills	Career Explore	Write Skills	Speak Skills	Info Comp	Tech Comp	Creative Thinking	Problem Solving	APA style	Read Orig. Research
*B307	A	D	A	D	B	-	-	A	-	-	-	A	-	-	A	No	No
B310a	D	B	B	B	B	D	D	D	-	D	B	B	B	A	B	No	Yes
B310b	A	D	D	D	D	-	D	D	-	D	-	D	D	-	D	Yes	No
B320	A	B	B	B	B	B	B	-	-	D	-	D	-	-	-	No	No
B340	D	B	A	D	-	-	A	D	-	D	D	-	D	-	-	No	No
B344a	B	D	D	B	-	D	-	-	-	D	-	-	D	D	D	No	No
*B344b	B	-	D	B	-	-	-	-	-	B	-	B	D	-	-	No	Yes
*B356	B	-	D	-	-	-	-	-	-	D	-	-	-	-	-	Yes	Yes

B358a	B	B	D	B	B	D	-	D	A	D	D	B	D	B	D	No	No
B358b	D	B	D	B	-	D	-	B	B	A	D	-	-	-	B	No	No
B370a	D	D	D	B	B	B	D	-	-	D	-	B	D	D	-	No	Yes
B370b	A	D	A	D	D	D	D	D	B	A	-	A	D	D	D	No	No
*B380a	D	-	D	B	-	A	B	-	-	D	-	D	D	D	A	Yes	No
B380b	D	-	B	-	-	-	B	-	-	-	-	-	D	-	-	No	Yes
B380c	B	-	D	-	-	-	B	-	-	-	-	-	-	-	-	No	No
B424	A	D	A	D	-	A	A	A	-	A	D	D	A	D	A	No	No

Specialization Courses

	Content	Research	Application	Ethics	Diversity	Self-Aware	Understand Others	Collaborate Skills	Career Explore	Write Skills	Speak Skills	Info Comp	Tech Comp	Creative Thinking	Problem Solving	APA style	Read Orig. Research
*B322	D	D	D	B	B	B	B	-	D	D	D	D	D	D	D	Yes	Yes
*B360a	B	B	A	B	-	A	-	B	-	B	B	D	B	D	D	Yes	No
B360b	B	B	B	B	A	B	B	B	-	B	-	B	B	B	-	Yes	No
*B365	D	B	A	B	-	A	B	-	-	D	-	B	B	A	A	Yes	Yes
B366	D	-	D	-	-	A	B	-	B	D	-	D	-	-	-	?	?
B368	B	B	D	B	D	D	D	D	B	D	D	D	D	D	D	Yes	No
B375	A	B	D	B	-	B	-	-	B	A	B	B	B	-	B	P	Yes
B376	D	-	D	B	A	A	D	A	-	D	D	A	D	A	D	No	No
B386	D	-	A	A	-	A	A	D	B	D	D	-	B	A	D	No	No
B394	A	D	D	-	B	D	D	D	-	D	-	D	D	-	D	?	?
B396	B	-	-	-	-	-	-	-	-	D	-	D	-	D	-	No	Yes
B420	D	B	D	-	D	D	D	D	-	A	B	D	B	A	D	No	No
*B422	B	A	D	A	D	D	D	A	-	A	D	D	D	A	A	Yes	Yes
B472	D	-	A	-	D	D	D	D	-	A	D	B	B	A	D	No	No

Capstone Courses

	Content	Research	Application	Ethics	Diversity	Self-Aware	Understand Others	Collaborate Skills	Career Explore	Write Skills	Speaki Skills	Info Comp	Tech Comp	Creative Thinking	Problem Solving	APA style	Read Orig. Research
B454	A	A	A	D	-	A	A	A	A	A	D	A	A	A	A	Yes	Yes
B461	A	A	A	D	-	-	D	B	-	A	D	A	D	A	A	No	No
*B462	-	-	D	-	D	D	D	D	D	B	D	B	-	D	D	Yes	Yes
*B481	A	A	B	B	-	A	B	B	-	B	B	D	D	D	D	Yes	Yes
B482	-	A	A	D	D	A	A	D	A	A	A	-	D	A	A	No	Yes
*B499	A	A	A	A	-	-	-	A	-	A	A	A	A	A	A	-	-

Topics Courses

	Content	Research	Application	Ethics	Diversity	Self-Aware	Understand Others	Collaborate Skills	Career Explore	Write Skills	Speak Skills	Info Comp	Tech Comp	Creative Thinking	Problem Solving	APA style	Read Orig. Research
B252 (a)	B	-	D	B	B	A	B	-	-	D	-	D	D	D	A	Yes	No
B252 (b)	D	-	D	B	-	A	D	-	B	D	-	D	D	D	A	Yes	No
B252 (c)	B	-	B	B	-	A	B	-	-	D	-	B	D	D	A	Yes	No

Appendix D6

Survey That Required Psychology Capstone Students to Grade Themselves on Their Perceived Achievement of the 15 De-Bundled Student Learning Outcomes

Dear Fellow Capstone Students:

Our B454 Capstone Seminar class is assessing the Psychology Department's curriculum, and we ask for your assistance. We have performed an analysis of each class syllabus to identify which of the student learning outcomes (SLOs) of the department are taught in each class and at what level they are being taught (i.e., introductory, intermediate, or advanced). We then shared our results with the instructors of the classes to insure the accuracy of our analyses.

Another aspect of the Psychology Department we are measuring is the skills psychology majors believe they have acquired from their education at IUPUI. Therefore, we are asking each of you to "grade" your achievement of the skills outlined by the department's SLO's. In this situation, we would like you to consider only the psychology and general education courses you have taken at IUPUI, not those you took at any other schools you have attended. We want to provide the department with data that will allow it to determine the correspondence between what it believes it is teaching its students and what its students believe they are being taught. This will assist in identifying the areas of the curriculum, which are strong, and those, which need improvement.

The data you provide us will be kept confidential and only reported in aggregate form (i.e., as means of group scores, not individual scores). Thank you for your time and participation.

Sincerely,

B454 Students

Which Capstone Course are you currently taking?_____

Please indicate if you are a BA or a BS:_____

Please grade yourself on your attainment of each of the following 15 student learning outcomes of the IUPUI Psychology Department. Use the grading scale of A-F as described below.

A = Outstanding
B = Above Average
C = Average
D = Below Average
F = Unacceptable

Please perform this task as honestly as possible. The grade you give yourself in this situation should reflect both the department's ability to provide opportunities for you to develop these sets of knowledge and skills and your willingness to take advantage of these opportunities.

Essential Skills	**Grade (A-F)**
Understand the major concepts, theoretical perspectives, empirical findings and historical trends in psychology.	
Understand and use basic research methods in psychology, including design, data analysis, and interpretation.	
Understand and generate applications of psychology to individual, social, and organizational issues.	
Understand and abide by the ethics of psychology.	
Recognize, understand, and respect the complexity of socio-cultural and international diversity.	
Develop self-awareness by identifying your own personal strengths, weaknesses, values, goals, etc.	
Understand the behavior and mental processes of others.	
Work effectively as a member of a group to accomplish a task.	
Identify and prepare for a career in psychology or a related field.	
Demonstrate effective writing skills.	
Demonstrate effective speaking skills.	
Demonstrate information competence by identifying, locating, and retrieving written and electronic information sources.	
Utilize technology for many purposes.	
Demonstrate creative thinking skills.	
Demonstrate problem-solving skills.	

Appendix D7

Summary Table of Curriculum Audit and Self-Reported GPA

Summary Table of Curriculum Audit and Self-Reported GPA

Learning Outcome	Number of Assignments	Beginning Level	Developing Level	Advanced Level	Mean GPA
Application	47	7	25	15	3.41
Career Exploration	15	8	2	5	3.32
Collaboration Skills	28	7	14	7	3.37
Content	45	15	17	13	3.10
Creative Thinking	34	5	15	14	3.20
Diversity	20	10	8	2	3.10
Ethics	36	21	12	3	3.54
Information Competence	37	11	18	8	3.41
Problem Solving	36	4	16	16	3.24
Research	31	13	9	9	2.98
Self-Awareness	32	6	12	14	3.56
Speaking skills	22	7	13	2	3.07
Technological Competence	40	11	25	4	3.20
Understand Others	31	13	13	5	3.39
Writing Skills	44	8	21	15	3.34