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

Report for the Academic Year 2004-2005

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With Supporting Material from Department Faculty
(Edited by Joseph L. Thompson)
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Course Assessments, Modifications and Improvements

CHEM C101 and CHEM C121 *Elementary Chemistry and Laboratory*—Keith S. Anliker

Assessment methodology that was reported last year is still ongoing—both the "curricular innovations" and the analysis of their effectiveness. Please refer to last year's report for details.

The initiative, a small pilot project in the CHEM C121 lab, was assisted by a senior chemistry major fulfilling a Senior Capstone course. The initiative concerned the development of an online pre-lab component. Participation was unfortunately low and, thus, the survey information was inconclusive. Information gathered from this study included survey implementation and some preliminary information on how students perceive online pre-lab materials.

CHEMISTRY C105 ANNUAL STATISTICS REPORT

PERFORMANCE TRENDS IN PEER-LED TEAM LEARNING (PLTL) SECTIONS AND ADDITIONAL LEARNING INTERVENTIONS

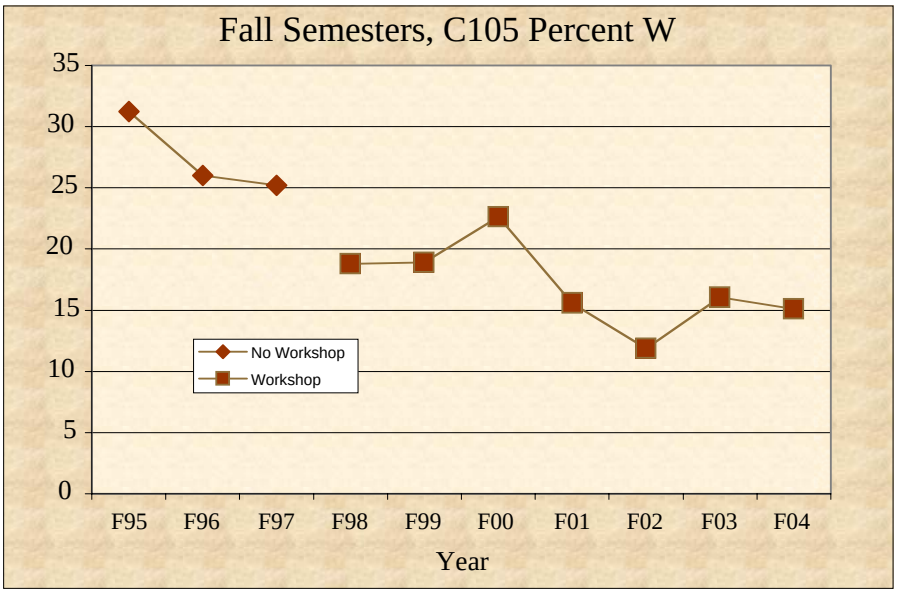
Data prepared by David J. Malik

Major continuing innovation: PLTL is a continuing program with sustained improvements in reducing DFW rates. The figure below shows the most recent results achieved in fall semester C105 sections:

t-Test W Rates: Two-Sample Assuming Unequal Variances
Fall only, through fall 2004

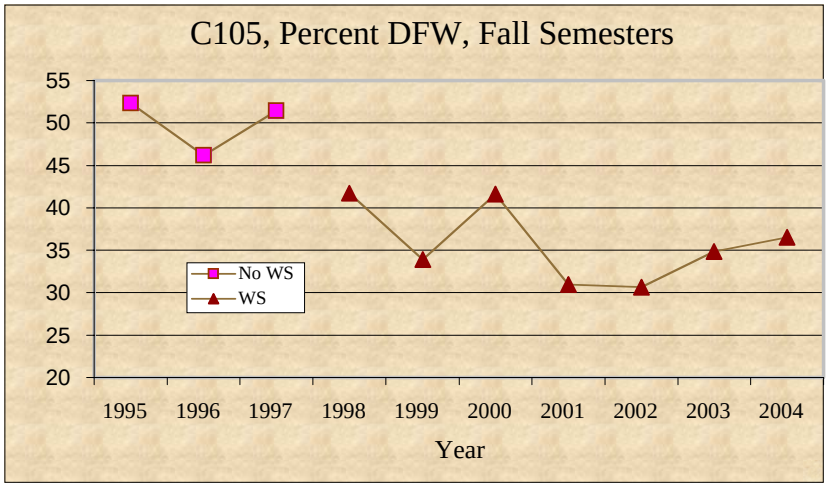
	No WS	*WS*
Mean	27.46	16.99
Variance	10.76	11.80
Observations	3	7
Hypothesized Mean Difference	0	

df	4
t Stat	4.5624
P(T<=t) one-tail	0.0052
t Critical one-tail	2.1318
P(T<=t) two-tail	0.0103
t Critical two-tail	2.7764



t-Test: Two-Sample Assuming Unequal Variances
Fall only through fall 2004

	No WS	*WS*
Mean	46.4916	35.7515
Variance	36.9093	20.7205
Observations	5	7
Hypothesized Mean Difference	0	
df	7	
t Stat	3.339710	
P(T<=t) one-tail	0.006212	
t Critical one-tail	1.894579	
P(T<=t) two-tail	0.012425	
t Critical two-tail	2.364624	

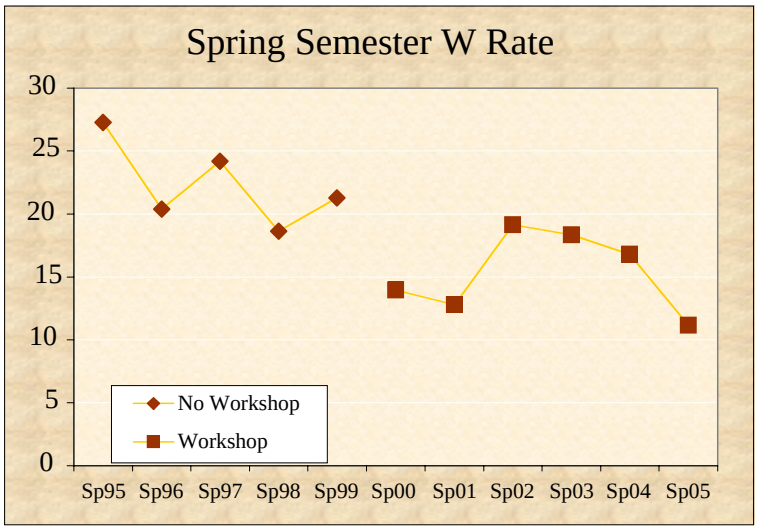


The current spring data significantly improve the student success rates compared to previous spring semesters. This is especially true for the W rate illustrated below where a decrease in the W rate from an average of 22% to 15% (about 30% improvement) with the addition of the PLTL Program. The confidence level has now risen to over 99% percent that the statistics are different. The student success levels are shown on the next page 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.

The spring semester data have always been more problematic than the fall semester's data where W and student success levels are about 17% and 64%. However, the spring semester has caught up with the fall W rate.

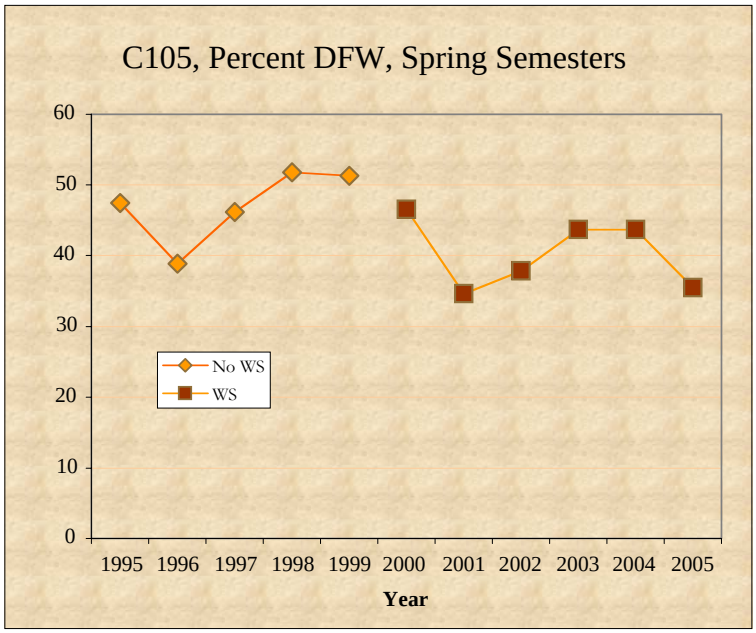
W t-Test: Two-Sample Assuming Unequal Variances
Spring only through spring 2005

	No WS	*WS*
Mean	22.3403	15.3602
Variance	11.6391	10.3029
Observations	5	6
Hypothesized Mean Difference	0	
df	8	
t Stat	3.4706	
P(T<=t) one-tail	0.0042	
t Critical one-tail	1.8595	
P(T<=t) two-tail	0.0084	
t Critical two-tail	2.3060	



DFW t-Test: Two-Sample Assuming Unequal Variances
Spring only thru Spring, 2005

	No WS	*WS*
Mean	47.0768	40.2800
Variance	26.8985	24.7073
Observations	5	6
Hypothesized Mean Difference	0	
df	8	
t Stat	2.2055	
P(T<=t) one-tail	0.0292	
t Critical one-tail	1.8595	
P(T<=t) two-tail	0.0585	
t Critical two-tail	2.3060	



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 receive immediate and targeted feedback as they work through the course material.

In-class response devices: A pilot was run for the spring semester where students could respond to class questions and their answer/selection would be recorded. Again, this provided immediate feedback to faculty on topical difficulties. This feedback improves student participation and attendance. The pilot will be introduced again in the fall 2005 semester due to the improved receiver/transmitter combination (now radio frequency, which will improve reliability and accuracy).

C105 ASSESSMENT OUTCOMES

The following outcomes are expected by the conclusion of the first semester of general chemistry. The final examination includes multiple evaluations in these areas. We expect not only a certain average performance standard, but we also determine the extent of performance at satisfactory and good levels. These results are provided below for the fall 2003 semester (consistent with the review materials provided).

- **Descriptive Chemistry and Nomenclature**: Understand nomenclature for an array of compounds including ionic, covalent, and coordination species
- **Stoichiometry**: Solve stoichiometric relationships of chemical reactions as gases, liquids, and solids
- **Thermochemistry**: Determine thermodynamic values and heats of chemical reactions and heat transfer
- **Structure**: Elucidate the structure of atoms, molecules and nuclear species, nuclear transformations, and molecular geometry (with consequential properties of matter)
- **Electronic Structure**: Specify electronic structures of a variety of atoms, ions, and molecules
- **Bonding**: Describe the bonding of a variety of molecular environments including theories of bonding and their application
- **Atmosphere and real gases**: Describe the chemical nature of major atmospheric pollutants and understand implications for real gases

The statistical description of what constitutes "Satisfactory" and "Good" performance is described in the table footnotes. The most problematic topic in the C105 curriculum is "electronic structure" where it is very difficult for students to master this content (reflected in a 29% good level).

	Average Class Performance*	**% Items Satisfactory+†**	**% Items Good+†**
Descript./Nomenclature	56%	80%	60%
Stoichiometry	61	89	58
Thermochemistry	55	67	67
Structure	57	88	77
Electronic Structure	48	71	29
Bonding	53	76	48
Atmosph./Real gases	52	100	33

* This is the average performance of the class as a whole on the number of students responding with the correct answer in each category.

† This is a fraction of the number of items within each category with a specified level of mastery. For example, 80% means 80% of the questions were answered with an average performance greater than the "satisfactory" level.

+ *Satisfactory* means no less than one sigma below the mean class overall performance. *Good* means greater than one sigma above the overall class performance.

RECENT PRESENTATIONS ON C105 INTERVENTIONS

1. *Understanding Student Success using PLTL,* David J. Malik, Department of Chemistry, Boston University, MA, February 23, 2004. Invited.
2. *Peer-Led Team Learning: An Urban University Success Story*, David J. Malik, Department of Chemistry, Providence College, Providence, RI, February 26, 2004. Invited.
3. *Maximizing Student Success via Peer-led Team Learning*, Moore Symposium, David J. Malik, Susan Holladay, Indiana University - Purdue University, Indianapolis, IN, March 5, 2004.
4. *Faculty Colloquium on Excellence in Teaching*, Moore Symposium, David J. Malik, Robert Orr, Indiana University - Purdue University, Indianapolis, IN, March 5, 2004.
5. *Creating a Culture for PLTL: Selling the Faculty and Administration*, in "Peer-led Team Learning - New Approaches, Different Results?", David J. Malik, American Chemical Society 227th National Meeting, Anaheim, CA, March, 2004.
6. *Maximizing Student Success using Peer-led Team Learning,* David J. Malik, DePauw University – Wabash College, Phi Lambda Upsilon Award Program, Crawfordsville, IN, April 2, 2004.
7. *Peer-led Team Learning in an Urban Public Institution: Demographic Challenges*, David J. Malik, 18th Biennial Conference on Chemical Education, Ames, IA, July, 2004. Invited.
8. *Maximizing Student Success through Peer-led Team Learning*, David J. Malik, International Union on Pure and Applied Chemistry Conference on Chemical Education, Istanbul, Turkey, August, 2004 (tentative).
9. *Peer-led Team Learning in an Urban Public Institution: Demographic Challenges,* David J. Malik, Cleveland State University, Cleveland, OH, September 10, 2004. Invited.
10. *PLTL as a De-Centralized Project,* David J. Malik, National Peer-led Team Learning Leadership Conference, Downer's Grove, IL, October 8 – 10, 2004. Invited.

Dr. Susan Holladay made additional presentations. However, she has since left the Department of Chemistry and her vita is unavailable.

SYMPOSIUM ORGANIZED

1. *Symposium on Peer Led Team Learning: New Approaches, Different Results?* David J. Malik, Organizer, 227th Spring National Meeting of the American Chemical Society, Full day symposium, Anaheim, March, 2004.

CHEM C106 *Principles of Chemistry II*—Marie L. Nguyen

There are four exams throughout the semester. These contain both multiple choice formatted questions and questions for which the students are required to show their work and support their answer. Thus, a determination of the understanding of specific topics can more easily be made. 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 the students, either individually or in groups, and then submitted during class. Typically, there are 12 different questions asked out of 30 class sessions and the question that is asked concerns material currently under discussion in the class session. These are 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 allowing students to check their own work. These problems serve two purposes: the students have to attend class to receive the points and they have to think during class.

The final that is given in C106 is the American Chemical Society (ACS) standardized final exam. This exam covers topics from the first full year of general chemistry. Students are thus responsible for the material they learned in the first semester of general chemistry, CHEM C105, along with the new material from CHEM C106. Thus long-term retention of the material presented in these two courses is one of the goals of the first year of general chemistry.

CHEM C106 *Principles of Chemistry II*—Jyanthi Jacob

This course focuses heavily on problem solving skills. Results of Exam I indicated that students were not ready for the extensive problem solving this course required from them. So, after Exam I, students were given take home quizzes that required them to work out problems at home after every class. These problems were then discussed at the beginning of subsequent class. Class results for subsequent exams improved significantly. Students quickly learned to read a problem correctly, assess given information, decide on the right formula to solve the problem, and work stepwise to arrive at a solution. However, after mentally adapting to problem solving questions, throwing in some simple conceptual questions caused distress in a significant number of students. Integration of problem solving and fundamental concepts and principles is important.

CHEM C110 *The Chemistry of Life* and
CHEM C341 *Organic Chemistry Lectures I*—Susan R. H. Holladay

In Fall 2004, I continued my quest to involve students during lecture. I grew more frustrated with the inability to hear students over the noise of the overhead projector. The document camera was an improvement. However, I was interested in exploring the use of the Tablet PC. I wanted to provide the students with lecture outlines that they could download from Oncourse and complete

during class. Now time in lecture could be spent problem solving instead of simply copying down problems.
The advantage of the Tablet PC is that it electronically stores handwritten notes and diagrams which could be posted on Oncourse or emailed to students. During the lecture I was able to write the students responses on the Tablet and it was projected on the screen. The lecture time became interactive. Students would actively participate in answering questions and filling out the outlines.
The Tablet PC gave me the ability to interact with my students during and after lecture in ways that could not have been accomplished with the document camera or power point slide. If a student had missed class for a justifiable reason, I could email him or her a copy of the lecture notes that resulted from the class discussion.

CHEM S126 *Experimental Chemistry I Honors*—Gavin Kirton

This course was co-taught with Franklin A. Schultz. One of the previous experiments was modified to make use of the newly acquired Pasco dataloggers to record titration curves electronically. Being the first class to use the Pasco equipment (which were aimed for use in CHEM C311 *Analytical Chemistry*), it was learned that students were, on the whole, very receptive to the use of the equipment. Students were able to observe the titration curve being generated live instead after the experiment. From verbal inquiry, the main problems that students identified were in learning the operations of the datalogger and in being unable to get reliable calibrations of the drop counter. However, many of the students found some novel methods for coping with the limitations of the drop counter. Including the new experiment with Pasco dataloggers, the suite of experiments in S126 was found to be suitable in meeting the objectives of student learning for an honors course.

CHEM C311 *Analytical Chemistry Laboratory*—Gavin Kirton

In summer 2005, the Pasco dataloggers (Xplorer GLX units) were introduced to the laboratory course. The first experiment was replaced with an introduction to the dataloggers using temperature probes. Most of the experiments were the same as in previous semesters, except 2 were combined into 1 because of the shorter time in summer semesters. The Pasco dataloggers were then used for the sixth experiment. Because of the time needed for students to get their first titration curve, the Pasco experiment was extended to 3 laboratory sessions, with the final experiment dropped. Their final notebooks and graphs showed that high quality titration curves could be obtained from the Pasco equipment.

In comments from notebooks and verbal inquiries, the students liked the ability to collect and process titrations electronically. They also discovered that they learned much about the chemistry behind the titration curves. However, students did feel overwhelmed with the quantity of work designed in the experiment, some saying that it was a semester in itself. They also found the calibration of drop counters frustrating and futile, so grading the unknown for which this equipment was used was abandoned.

With the theory portion of the course, the students seemed to appreciate the focus of the lectures on the theory behind the experiments. Also, the pre-lab assignments were found to be successful for preparing students for carrying out the lab and for writing quality reports (with fewer calculation/conceptual errors than previous semesters).

For the future semesters, a suggestion from the students will be considered. Specifically, students will be introduced to taking a titration curve earlier in the semester (in place of temperature probes). The Pasco equipment may also be used concurrently with conventional buret analysis. Thus, the Pasco experiment would be more qualitative in terms of dispensed volume. To reduce the load on pairs of student groups, a large set of titrations will be distributed amongst the class and the results will be pooled. Instead of accuracy, the grading of the unknown will be on the titration curve and qualitative identification of an acid/base.

CHEM C325 *Introductory Instrumental Analysis*—Gavin Kirton

This course was operated with very much the same syllabus as for spring 2004. However, some of the instruments were upgraded, and newly developed operating procedures were distributed. One of the main changes was the replacement of a capillary electrophoresis (CE), which ran into technical problems before students were able to carry out their experiments.

From the grading of quizzes and exams, the students were finding that the theory portion of the course to be more difficult than the laboratory portion. However, the quizzes have been beneficial to prompting the students to be more rigorous in their study of the material. From verbal inquiry, the requirements for pre-lab quizzes and summaries were not very clear to students. One suggestion is to have a more focused pre-lab assignment for experiments that should be part of the laboratory manual. Incorporating such pre-lab assignments into the next version of the manual is under consideration. Otherwise, continued improvements in laboratory reports as the semester progresses has been seen.

A few students chose to take part in an Analytical Open House hosted by Eli Lilly & Co. Those students found the visit to be very helpful in seeing the applications of course material to current industrial practices. Increasing the exposure of students to local employers will be considered. This will, it is believed, will help students focus their studies towards the goal of professional employment.

CHEM C362 *Physical Chemistry of Molecules*
and CHEM C361 *Physical Chemistry of Bulk Matter*—Clifford E. Dykstra

The physical chemistry lecture course sequence of C362 (fall) and C361 (spring) is a particularly challenging part of our program for majors. It is the primary place for giving the physical underpinnings of chemical science, and it provides students with concepts of value throughout a whole career in chemistry, from the basis for all of molecular spectroscopy to the thermodynamics of materials and bulk substances.

Assessment of student learning is consistently based on selected evaluation of problem sets and on certain exam questions where comparisons can be made from semester to semester.

There have been recent improvements and modifications.

In C362, a course portfolio has become a regular part of the course. On the first day of class, students are given a 3-ring notebook, pre-stocked with certain materials, and organized with dividers for them to maintain their own work. They are required (graded assignment) to prepare summaries of major sections and keep the summaries for reference in their portfolio. The assessment of this has been through comments from students on course evaluations, which have been very positive.

In C362 and C361, take-home worksheets have been introduced in the last three years, and these were substantially redone for 2004-2005. These are for students to spend 10-15 minutes the day of a lecture working on a small problem related to that lecture so as to instill greater immediate understanding. It is an optional assignment that is later discussed in class. Those that attempt these worksheets master certain skills more quickly, but of course, some of those most willing to do the worksheets are the ones who walk away from lectures with the best understanding already.

The most significant modification has been made in C361, which Dykstra refers to as "better late than never" testing. Instead of the traditional 3 mid-term exams, there are 6 shorter tests. After the first test, about 3/8 of the test questions cover prior material, all the way back to the beginning of the semester. The selection of the questions for previously tested material (the $3/8^{ths}$) is based on where students have had difficulty when material was first tested. Students know this, and they have a reason to go back and learn material if they didn't get it the first time. Student comments on this scheme have been extremely and uniformly positive. More important, on the final exam, better overall performance is seen on certain types of questions (the most basic ones, usually) than before this scheme was implemented. It means an important level of understanding has been achieved for a wider segment of the class.

CHEM C652 *Synthetic Organic Chemistry*—Martin J. O'Donnell

The graduate course in organic synthesis was improved this year by instituting a new testing procedure.

As in the past, four hourly exams were given throughout the semester. These covered the four major sections of the course: synthesis of aromatic compounds, amines, carbonyl derivatives, and alkenes and included mainly questions from the very recent literature. Special emphasis was given to mechanisms and issues of selectivity [chemoselectivity, regioselectivity, and stereoselectivity (enantioselectivity and diastereoselectivity)].

Each of the examinations was given and graded as usual during a class period. The students were then given back a second copy of the exam as a take-home exam plus the front sheet of the first copy, which listed their scores on the individual questions. They were not given their

answers to the questions the first time they took the exam. They were asked to redo any question for which they did not receive full credit by using the original literature citation and any source other than another person. This take-home was handed in a week later and then graded. The final grade received by the student for a particular exam was an average of the two scores.

It was noted that the students learned the course material by this second "look" at the various topics in the examination. Although it did make more work for both students and instructor, the students appreciated the chance to go over the exam material at their own pace without the time constraints of a limited examination period.

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

Report for the Academic Year 2004-2005

Prepared by Yuanshun Dai, Ph.D.
(Edited by Joseph L. Thompson)
June 2005

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1. Introduction

IUPUI strives to serve Indiana as the exemplary "urban university." The Department's mission, in support of this goal, is to build excellent academic programs coupled with strong research programs, industrial collaborations and community relationships. The Department plays a key role in advancing the information technology capabilities of the surrounding community and, indeed, society in general. The three pillars of this mission are its Graduate, Undergraduate and Service Course Programs. These programs of study emphasize research and practice in the basic principles of computing and information processing, which include the creation, representation, storage, transformation and transmission of information, and the mechanisms, both hardware and software, for accomplishing them. To achieve its vision and responsibilities to the community, the Department has adopted four strategic objectives:

i. Develop excellent academic programs that will have local and national recognition.
ii. Develop excellent research programs that are well focused and will bring local and national recognition.
iii. Develop strong business and industrial connections through research and academic programs.
iv. Provide leadership in delivering Information Science and Technology to the IUPUI community and Central Indiana.

The Department seeks to achieve these objectives by building strong undergraduate programs, developing rigorous graduate programs with emphasis on research, and maintaining a strong, market-driven, service course program in applied computing areas.

Students who complete an undergraduate degree have acquired a fundamental understanding of computing, information processing and information communication. They serve in a variety of programming, software engineering, database administration, systems analysis, computer-systems administration, management and research positions.

2. Student Learning Objectives of the Department

2.1. The Service Course Program

The objective of this program is to provide computing skills and knowledge of computer science concepts to a wide variety of students not in the Department's Bachelor of Science (B.S.) or Master of Science (M.S.) programs. Many students in other departments of the university, including those within the School of Science, take one or more of these at a level appropriate for their background and major program requirements. In doing this, the objective of the student is to broaden his or her general knowledge by achieving a general familiarity with computing as well as problem solving (analytical and critical) tools and skills.

The Certificate Program in Applied Computer Science is the heart of the Service Course Program. This greatly enhances the visibility and flexibility of the service course offerings for students because it responds to aspects of technology that traditional computer science programs do not address. Its mission is to introduce computer science principles, develop practical skills in market-driven software applications, and prepare students to be successful with emerging technologies. It is designed to supplement and enhance a primary degree, so it adds breadth to the students' knowledge as well as some depth in the area of computer science applications.

Students who earn the Certificate demonstrate that they have the core competencies necessary for entry-level positions in information technology. These skills include the ability to solve complex problems, design and implement algorithms, apply computer science theory to practical problems, adapt to technological change and program in at least two languages.

2.2. The M.S. in Computer Science

The Graduate Committee of the Department formalized general learning objectives as well as learning objectives that are specific to the goals the Department sets for graduate students.

<u>Outcomes Related to the Principles of General Knowledge</u>

Communication and Core Skills:

- Facility in writing and oral communication as practiced in science and business, with emphasis on the needs in Computer Science.
- Ability to collaborate productively in a group as well as provide group leadership in the area of expertise.
- Capability to comprehend written and auditory technical material.
- Ability to learn and integrate new knowledge, both general and in the area of expertise, and to discuss them intelligently.

Analytical and Critical Thinking:

- Ability to apply mathematical (such as algorithmic procedures and complexity analysis) and computing tools (such as languages and packages) to the formulation and solution of

problems.
- Capability to apply inductive and deductive reasoning, abstraction and decomposition to the solution of problems.
- Ability to formulate and evaluate competing models at various levels in the discipline and at general levels in other areas.
- Capability to apply scientific approaches to the solution of problems.

Breadth of Knowledge:

- Capability of intelligently discussing the inter-relationships between the area of expertise and other disciplines, as well as society in general.

Integration of Knowledge:

- Capability to integrate and apply knowledge and experience from various disciplines to form a broad view of the world and to deal successfully with unusual circumstances.
- Ability to successfully apply expertise in computer science to other disciplines and the issues important to society.
- Capability to facilitate technology transfer, and comprehension of the relationship between basic research and applications.
- A sound set of ethical guidelines for professional and social behavior.
- An understanding of aesthetics and the ability to apply it in the discipline of expertise.

Learning Outcomes Related to Computer Science

A thorough knowledge of the theoretical foundations and models of computer science:

- A firm understanding of the theoretical foundations of computer science. These foundations and models of computing include principles of data structures (organization of data so as to achieve the maximum performance), algorithms (precise techniques for solving problems), computer organization (functions of and relationships among the various components, such as processor, memory, secondary storage, operating system and their interrelations), mathematics of computers (mathematical tools used in the formal analysis of computing systems and their applications, such as switching theory, graph theory and associated algorithms), theory of language translation (finite automata), abstract computational models (Turing machines), and theory of programming languages (different execution models of higher-level languages).
- Ability to analyze different data structures and algorithms and to choose the most appropriate combinations for a given problem.
- Ability to formulate appropriately and devise optimal solutions to problems arising in practice or in research.
- Ability to analyze any problem domain, identify its requirements and characteristics (such as the complexity), model it accurately, select/create appropriate algorithms and object structures, and map the resulting problem solution onto a specific computing system architecture.
- Ability to define, plan, and execute a large-scale, software project following an efficient

software engineering process implemented with an appropriate programming language.

Recent computing trends:

Knowledge of advanced computing trends (in all different aspects) and an ability to extrapolate this knowledge in order to adapt quickly to future advances.

2.3. The B.S. in Computer & Information Science

In 1998, the Undergraduate Committee of the Department formalized eight learning objectives that are specific to the goals the Department sets for its majors. These complement the more general objectives 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. In 2005, the Department began to develop the Bachelor of Arts (B.A.) degree and proposed to provide the certification for specialized areas including Software Engineering, Distributed Systems, Bioinformatics and Information Assurance. They are summarized below for reference in the subsequent analysis.

Every student's performance is measured not only by a letter grade, but also by an evaluation against the major objectives that are set for each assignment and exam. These are based on the six Principles of Undergraduate Learning in which the number four, "Intellectual Depth, Breadth, and Adaptiveness," is refined to include the six tailored objectives mentioned above:

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).

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.

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.

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.

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.

These six objectives plus the five remaining Principles of Undergraduate Learning form the basis for the Department's eleven objectives with which it measures student progress in its courses. However, 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 objectives. This change resulted in a slight broadening of the objectives used previously. Section 4.3 describes these in detail under the new title, General Principles of Undergraduate Learning.

3. Assessment Activities

3.1. Types of Assessment

Because students in the School of Engineering and Technology, particularly those majoring in Computer Engineering, take several of the Department's courses, the Department decided to extend assessment activities to include such courses. Thus, for this academic year (2004-2005), the Department collected data for CSCI 230 *Computing I*, CSCI 240 *Computing II*, and CSCI 265 *Advanced Programming*.

The Teaching & Learning Committee of the School of Science decided in 2000 that the Capstone Course, which science students take during their final undergraduate year, should be assessed according to uniform guidelines. Prior to this time, the Departmental Capstone Course, CSCI

495, was taught in a one-on-one (faculty/student) basis, like a research course. The Department decided that this structure did not lend itself well to uniform assessment because of the great variation in the faculty/student relationships. This course is now taught as a group project under the direction of one faculty member. This structure enables assessment following closely the uniform guidelines that the Teaching & Learning Committee established. Section 4.3 discusses assessment data for this course. However, the format of the guidelines differs significantly from those that the Department has been following for assessing its other courses.

The university administration is rightly interested in the assessment of first year students in order to assure their well being and retention. Many of the Department's students in the B.S. Program, however, are either returning, part-time students, are transfer students from other institutions, or do not enter the program their first year because they find it necessary to shore up their mathematics background before they are prepared to undertake the first computer science course. For this reason, the Department is keenly interested in the retention rate of its students in the second year in the program, too. It is at this point that many have achieved economic viability as computer programmers and may encounter economic pressures to leave school. To be able to study the situation at this level, the Department is building a small customer relations management system and is collecting data for use in tracking its students.

3.2. Student Assessment in the M.S. Program

General Academic Standards

- Grades of A and B are expected; up to 6 credit hours of C may be included provided an overall grade average of 3.0 (B) is maintained. Other grades are unacceptable and the course work will not be counted toward fulfilling program requirements as listed on the student's plan of study.

Overall Student Performance

The objective of this type of assessment is to determine whether or not a given student is satisfactorily progressing towards, and finally achieves, the performance objectives that the Graduate Faculty in the Department has set for the Program.

- The instructor in each class will evaluate the progress of each student through the course and the final achievement by using the mechanisms and objectives stated in the course syllabus. These vary by course. The mechanisms are typically evaluations of exercises, written and oral examinations, and projects, collaboratively or individually executed. The general outcomes are that the student will understand the theoretical concepts and be proficient in applying them within the context of the course's subject.
- The student must accumulate individual and cumulative performance ratings for all courses taken that satisfy the minimum acceptable standards the Department establishes. The outcome here is that the graduate will have a uniformly high technical capability across a broad spectrum of subjects in computer science.
- Each student must demonstrate satisfactory accomplishment in a fundamental domain of knowledge, which the group of Core Courses provides. The outcome of this requirement is that the student will possess solid knowledge of the theoretical basis of computer science.

- Every student must achieve a sufficiently deep command of a specialization area to successfully complete a thesis or project. The evaluations from the specialization courses combined with the evaluation by the student's thesis or project supervisors measure this. The outcome of the student's preparation for this will be that she or he will possess expertise in a specific research or application area for future use in the profession.
- Finally, each student must make a written and public presentation of the thesis or project work, which the student's Examination Committee evaluates. This measures and sets a minimum standard on the student's capability to:

    - integrate appropriately new knowledge with the knowledge and skills presented in the courses taken in ways sufficient to engage in research or the solution of problems arising in practice,
    - communicate effectively, orally and in writing, with colleagues or teammates while solving problems and in presenting the solutions,
    - think analytically and critically and apply a variety of logical and computational tools as aids in this process,
    - articulate clearly the relationships between the area of expertise and other discipline areas and society in general.

Evaluation in the Semester Prior to Graduation

The student's Graduate Examination Committee examines the student's Project or Thesis and general proficiency in computer science at the satisfactory completion of her or his program of studies.

3.3. Program Assessment in the B.S. Program

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 objectives enunciated in the eleven General Principles of Undergraduate Learning 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. A high rank of this value means that the student has made significant achievement in progressing towards the objectives of the General Principles. For a low one, the individual components of the ranking indicate the areas that need addressing. As mentioned before, the Capstone course, CSCI 495, is evaluated according to the guidelines that the Teaching & Learning Committee of the School of Science established. These are explained at the end of Section 4.3.

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 General Principles of Undergraduate Learning.

To compare this approach to evaluating student performance with the traditional methods, in grading student performance the Department uses the correlations between the measure of learning outcomes mentioned above and the course grade determined according to traditional

criteria, which is computed for exams, homework and programming assignments. This allows the Department to determine whether or not there is a significant discrepancy between the objectives that the traditional methods measure and the General Principles of Undergraduate Learning.

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.

Enrollment Data: The Department monitors, documents, and analyzes DWF rates (Drop+Withdraw+Fail) 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.

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.

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.

4. Feedback and Response

4.1. The Service Course Program

The Department maintains an ongoing informal assessment of enrollment and student satisfaction and needs. This, in fact, led to the development of the placement procedure for the Certificate Program and the modification of courses in order to serve students in the School of Informatics.

4.2. The M.S. Program

As a result of information collected about advising, registration and course scheduling patterns, the Department decided to eliminate the requirement that students follow a specific disciplinary track in their Program of Study. Instead, in consultation with their advisors, students can select courses to develop depth in the area of their Project or Thesis.

4.3. The B.S. Program

This year, the Department conducted an analysis of historical DWF rates of courses within the B.S. curriculum. These data reveal that the most troublesome rates occur in the all levels of courses. It may be caused by the inflexibility in the course selection. Also, due to the reason that the Department allows students to select different specializations, the prerequisite requirements for some courses and courses needed for the degree have been changed:

a. Change calculus sequence requirements from: MATH 164, MATH 261, and MATH 351 or 511 to: MATH 221, MATH 222, and MATH 351 or 511.
b. Change additional mathematics requirements from: STAT 416 or 511, CSCI 470, CSCI 414 to: STAT 416 or 511 and one additional computational course (removing CSCI 470 and CSCI 414 as core requirements).
c. Remove the following computer science courses (CSCI 300, CSCI 355, CSCI 450) from the core curriculum requirements and offer the courses as electives.
d. New compiler course, CSCI 300, as a core requirement.
e. Reduce the current introductory course sequence (CSCI 230, CSCI 240, CSCI 265) from three courses to two (CSCI 230 and CSCI 265). Concurrently, move CSCI 340 into the first year.
f. Change requirements for physical science: The Department now requires **four** courses instead of the original five courses. One course must be PHYS 152. The remaining three courses are chosen from the areas of biology, chemistry, geology, and physics, or from certain courses in engineering. Each must have a lecture component and be at least 3 credit hours.

At the April 2005 Faculty Meeting, faculty voted to pursue a proposal for a Bachelor of Arts in Computer Science. A draft of the B.A. proposal was prepared with concentration areas in Database/Datamining, Game Programming, and Network Security/Biometrics. The draft proposal was presented to the Department's Advisory Committee. They supported the restructuring of the curriculum, but were convinced a B.S. was a stronger degree. School advisors also warned that Purdue University at West Lafayette would not likely approve a Bachelor of Arts degree. Thus, the Bachelor of Science degree requirements were restructured.

The eleven General Principles of Undergraduate Learning against which the students are now evaluated are summarized below for convenient reference in the following.

Definitions of the General Principles:		
1		The ability to write, read, speak and listen, perform quantitative analysis, and use information resources and technology, both individually and in teams.
2		The ability to analyze carefully and logically information and ideas from multiple perspectives.
3		The ability to use information and concepts from studies in multiple disciplines in their intellectual, professional, and community lives, and a commitment to update these continually.
4		The ability to examine and organize disciplinary ways of knowing and to apply them to specific issues and problems, both in teams and individually.
	4.1	Basic understanding of computing.
	4.2	Ability to analyze different data structures.
	4.3	Knowledge of a diverse array of computational algorithms.
	4.4	Basic understanding of computer architecture.
	4.5	Ability to develop and design small-scale software projects.
	4.6	Knowledge of advanced and recent computing trends.
5		The ability to recognize their own cultural traditions and to understand and appreciate the diversity of the human experience, both in the United States and internationally.
6		The ability to make judgments with respect to individual conduct, citizenship, and aesthetics. Ability to recognize ethical and professional responsibilities and evaluate current issues.

Specific Comments Concerning the Manner of Rating Student Achievement:

Retention rate and student satisfaction are analyzed here.

As mentioned in section 3, the retention rate is computed by the number of students majoring in computer science (or others who passed the three fundamental courses CSCI 230/CSCI 240/CSCI 265 and continue studying) over the total number of students who initially selected the first course 230. The following table summarizes all the data for the retention rate.

	Total	Computer Science Majors	Other Majors
1. Students CSCI 230	64	26	38
2. Failed in CSCI 230	13	4	9
3. Withdrew in CSCI 230	8	1	7
4. Pass CSCI 230/CSCI 240/CSCI 265	10	9	1
5. Rate for CSCI 230: (1-2-3)/1	67.2%	80.8%	57.9%
6. Retention Rate: 4/1	15.6%	34.6%	2.6%

The retention rate of CS Majors is 34.6%, which is similar to previous years and it is much higher than the other majors (2.6%). This shows that the interest of other majors will be reduced though they initially selected CSCI 230. To encourage other majors to enroll in all the fundamental courses in computer science, some methods to attract students to enroll in these courses may be developed.

Students' satisfaction is summarized in the following two tables: one for the fall 2004 semester and the other for the spring 2005 semester. The data indicate the average grade over those courses listed.

Fall 2004 evaluations

Course (CSCI)	230/240/265	300/340/362	402/450/470	443/452
Exams	4.157	3.813	3.443	3.425
Motivation	3.840	3.177	3.303	3.185
Rapport	4.357	3.937	3.817	3.635
Global	4.02	3.297	3.45	3.225
Avg. GPA	B	C	B	B+

Spring 2005 evaluations

Course (CSCI)	230/240/265	300/340/362	403/470	490
Exams	3.840	4.213	4.015	4.437
Motivation	3.420	3.820	3.495	4.417
Rapport	4.067	4.253	3.995	4.667
Global	3.663	3.933	3.670	4.560
Avg. GPA	B-	B+	B	B+

Capstone Course Assessment

CSCI 495, Spring 2005:

As indicated earlier, the format for evaluating the Capstone course is standard across all departments within the School of Science, but differs from the one the department uses to assess the other courses it has analyzed in the Annual Reports. The table on the below shows the assessment the instructor responsible of the class in CSCI 495 *EXPLORATIONS APPLIED COMPUTING* conducted this year. The total number of students is 17 and the Value=student count / the total number of Students.

	Needs Improvement	**Meets Minimum Standards**	**Good**	**Excellent**	**Not Applicable**
Shows ability to formulate problems, solve them, and interpret their solution	0.1	0.1	0.3	0.5	
Shows understanding of the scientific method	0.1	0.1	0.4	0.4	
Displays overall comprehension of own discipline	0	0.2	0.3	0.5	
Shows ability to communicate ideas of discipline					
orally	0	0.2	0.2	0.6	
in writing	0	0.2	0.2	0.6	
Gives experience in applying knowledge					X
from own discipline to other disciplines					X
from one area of own discipline to another area	0	0.3	0.2	0.5	
Makes efficient use of					
technological tools	0	0	0.3	0.7	
scientific resources (e.g., journals)	0	0.2	0.3	0.5	
Shows knowledge of contemporary and ethical issues in science and their relation to society	0	0.2	0.2	0.6	
Displays appreciation of the historical development of (an area of) the discipline					X

We found most students are excellent in these categories. Some students need improvement in "Formulating problems, solving them and interpret their solutions" and in "Understanding the Scientific Method." About average 20% of the students meet minimum standards, but are not so good overall and about average 30% of the students are good. According to this result, more effort should be put on the first two categories and help students in problem analysis and solutions as well as more explanation in Scientific Method.

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

Report for the Academic Year 2004-2005

Prepared by Chris Thomas, M.S., MTSC, Lecturer
(Edited by Joseph L. Thompson)
June 2005

This report describes how the Department of Geology 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).

Assessment at the Introductory Level

Most students who enroll in a 100-level geology course are non-science majors who do not intend to complete a major or minor in the sciences. Only one course, GEOL G110 *Physical Geology*, is a prerequisite for an upper-level course. Pending approval of the new Bachelor of Science in Environmental Science degree, GEOL G107 *Environmental Geology* is tentatively a prerequisite for this new degree. The Department of Geology 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 (PUL).

The Department of Geology 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:

- Over 150 students participated in a variety of field experiences, including locations in the Smoky Mountains, Indiana State Museum, Southside Landfill, North Indianapolis Quarry, Marengo Cave, Shades State Park, and Southwestway Park.
- Over 350 students (specific to geology courses) participated in service learning at a variety of sites around Marion County. 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 250 students completed a one-credit laboratory linked to a lecture course. GEOL G107 *Environmental Geology*, GEOL G110 *Physical Geology*, and GEOL G109 *Fundamentals of Earth History* include optional laboratories. These laboratories permit students to apply and integrate knowledge and practice critical thinking skills.

Principles of Undergraduate Learning	Service Learning	Research Project	Field Experiences	Laboratory 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	

Assessment at the Advanced Level

Courses above the 200-level are typically taken by geology 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 the 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 geology, GEOL G495 Senior Thesis. In 2005, the Department began an initiative to revise its advanced level (200-level and above) curriculum. The goals 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 courses in specific subdisciplines of their own choosing.
3. Assess students in the capstone course in activities designed around the Department learning outcomes.

This revision would match learning outcomes more closely to the required curriculum, permit more faculty to teach required courses, and eliminate required subdiscipline courses that did not fit into the Department learning outcomes.

Outside of these revisions, 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 Fieldwork.** 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 their critical thinking skills as well as their integration and application of knowledge.
- **Courses in Subdisicplines of Geology.** 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 fieldwork permit students additional opportunities to integrate and apply 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 2004-2005, the capstone course was not offered. All students chose to complete a senior thesis.

Principles of Undergraduate Learning	Reporting Skills in Geoscience	Advanced Laboratory and Fieldwork	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. Students who complete internships or senior theses are measured against their ability to critically think and integrate and apply knowledge specific to the subdiscipline each chose to research. Many of the students presented the results of their research in poster and oral presentations at the regional and national meeting of the Geological Society of America.

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.

Assessing Assessment

Except as noted in last year's report, the Department of Geology has not collected data specific to the assessment criteria above. Creating specific measuring tools connected to these criteria would enable us to measure on a year-to-year basis whether students meet the PULs and Department learning outcomes. After the Department has completed revising its advanced level curriculum, we can focus on developing these measuring tools.

The key anecdotal tool used to measure the success of the Department in preparing undergraduates is job placement or graduate school admission. Over the past two years a majority of our graduates have received awards to attend graduate school at IUPUI and at other institutions or received offers of employment related to their field of study.

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

Report for the Academic Year 2004-2005

Prepared by Robert D. Rigdon, Ph.D.
(Edited by Joseph L. Thompson)
June 2005

Course Assessment

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*. These courses include a developmental course (111), a service course (M118) that is taken by a wide cross-section of students, and an introductory major course (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, the following can be identified:

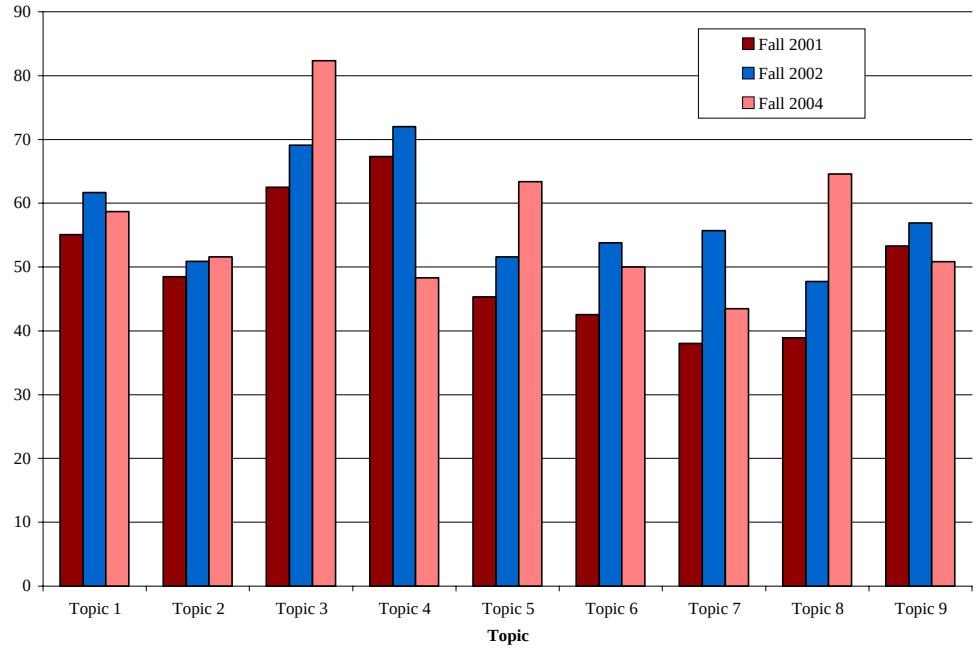
Topics that give students the most trouble
Topics that produce the greatest variation in performance from student to student
Topics that produce the greatest variation in performance from section to section

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.

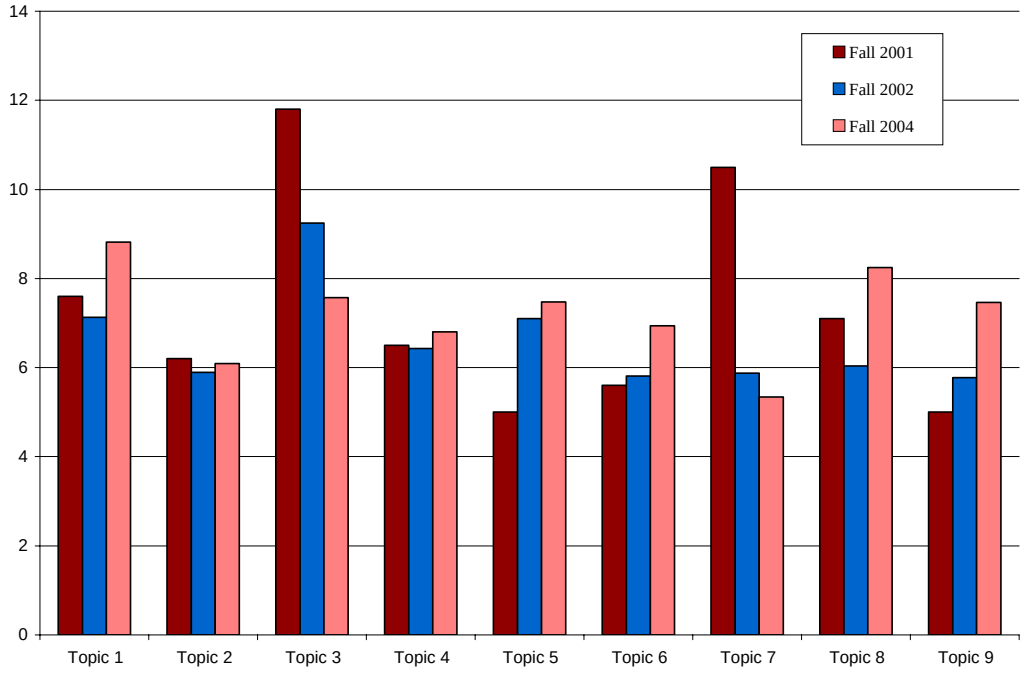
The chart on the next page illustrates the sort of comparison that analysis of the data makes possible. It compares the average scores on final exams in MATH 111 on each of nine topics for fall ’01, ’02, ’04.

In addition to overall averages, the Department has computed section averages on each topic, standard deviations on each topic for each section, and the standard deviation of the section averages on each topic. For example, in fall ’01, as the accompanying chart shows, the standard deviations of the section averages on topics 3 and 7 were significantly higher than on other topics, suggesting some lack of uniformity in the instruction on those topics. However, in fall ’04 those figures were in line with those for the other topics.

MATH 111 Final Exam
Mean Percent Correct by Topic



MATH 111 Final Exam
STD of Section Averages by Topic



A similar analysis applied to MATH M118 has shown that there is less variation from section to section and year to year on some course topics than was the case four to five years ago, and more on others. The same can be said for the variation from student to student. The Department will be looking at this.

Now that the Department has recently instituted a departmental final in MATH 163, performance of students across sections in that course can be more readily compared. Attempts are being made to understand the variation in student performance from section to section on the various topics of the course. The correlation between student scores on departmental finals and the students' course grades (as has been done in the past in MATH 111) will be examined. Since the departmental exams emphasized those skills that the Department had determined to be most important in that course, it is preferred that the correlation be high.

Upper Division Courses within the Major: MATH 351 and 492

MATH 351 is a course in which the student acquires several skills that are required for success in upper division courses within the major. The Department has developed an assessment form for this course in which a course instructor indicates the extent to which the math majors in his or her section have mastered these skills. 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 lower-level courses in preparing math majors for their upper division courses. Such reports on math majors enrolled in MATH 351 have recently suggested that in their early courses, some majors are not achieving all of the outcome objectives of these courses. The Department will attempt to determine the reasons for this.

All capstone mentors complete a Department capstone assessment form that is based on the template developed by the School of Science Teaching and Learning Committee. The questions asked on the capstone assessment form essentially assess attainment of the Principles of Undergraduate Learning (PUL) objectives while also assessing achievement of the discipline specific goals. The Department uses this form both to assess how well the capstone experience is serving its intended purpose (requiring that students show growth in all the PULs, and in discipline specific outcome goals) and as an assessment tool to assess how well Department programs are achieving their goals. The results continue to show that a high percentage of math majors:

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 their own discipline to another
e) show ability to apply knowledge from mathematics to other disciplines.

However, some weaknesses are also showing up (see the 2003-2004 report). The Department is attempting to address them.

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

Report for the Academic Year 2004-2005

Prepared by Brian A. Woodahl, Ph.D.
(Edited by Joseph L. Thompson)
June 2005

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 governmental agencies. Students in this program also can satisfy the Indiana certification requirements to teach physics in secondary school. 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 Physics Department faculty members also participate in the Medical Biophysics program, which offers the 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 IUPUI. 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. This course has undergone extensive innovation and assessment in recent years. PHYS 218 / PHYS 219 is an algebra-based sequence for engineering and technology students. PHYS P201 / PHYS P202 is an algebra-based sequence for pre-professional students. The Department also offers two conceptual physics courses, PHYS P100 (for allied health technologists) and PHYS P200 (for primary education majors), and a two-semester astronomy sequence suitable for all students.

Student Learning Objectives

Development of a unified core curriculum for the Schools of Science and Liberal Arts resulted in the delineation of a number of general education learning objectives. The general education objectives and the manner in which they are implemented in the Department of Physics are delineated in Table I.

Table I: Education Objectives and Methods

General Education Objective	Implementation in the Physics Department
A. Knowledge of, and proficiency in, communication and core skills.	1. Laboratory reports, capstone report. 2. Classroom and Capstone presentations. 3. Literature research, web-based learning. 4. Essay questions on homework and exams.
B. Proficiency in critical, analytical thinking and creative problem solving.	1. All physics courses require students to retrieve, evaluate, and interpret information from textbooks, lectures, journals, seminars, and/or internet sources. 2. Students must solve physical problems and draw mathematically-based conclusions through clear and logical reasoning from course assignments, laboratory exercises, and independent study.
C. Achievement in intellectual depth, breadth, and adaptability.	1. Extensive knowledge in physics and mathematics is required in all physics courses. 2. Many School and University requirements (e.g., social, biological, other physical sciences, and the humanities) also require students to demonstrate these traits.
D. Proficiency in the integration and application of knowledge.	1. Upper division courses and the capstone experience require students to integrate knowledge from numerous fields of mathematics and science to solve complex physical problems.
E. Understanding the individual's role within society.	1. 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 Evaluations

The Department initiated an internal review process in 1995. Late that year the Department was evaluated by an external visiting committee composed of members of five colleges and universities and one industrial corporation. A report was received by the Department in 1996. Several suggestions of the external committee have since been acted upon, including the creation of a new combined B.S./M.S. program in collaboration with the Department of Mechanical Engineering. The Physics Department will undergo its next external review in 2006.

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 (Gregor Novak). His effort was joined shortly thereafter by a new faculty member (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. Extensive assessment has been carried out since 1994 on our science and engineering physics sequence. This has been done based on retention data and nationally accepted standardized tests. The results of this program continue to be excellent.

Physics 218/219 and P201/P202 (algebra based): These two course sequences are currently undergoing a major revision. Dr. Gavrin recently 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 three primary components:

1. The two course sequences will be combined into one.
2. Credit will be awarded in six small "learning modules" rather than two semester-long courses.
3. Lectures will be replaced by a combination of multimedia resources and increased recitation and "workshop" style meetings. Drs. Gavrin, Vemuri, Woodahl, and Yurko are responsible for this effort.

It is expected this course transformation project to be the focus of most assessment activities in the Department over the next several years. Although the courses will not be offered in the revised form until the fall 2006 semester, the Department has already begun work on selecting or developing appropriate assessment instruments. A pilot study in two courses (PHYS 218 and PHYS P202) was carried out in the spring 2004 semester using a 60 item post course-survey. The survey was developed by Dr. Gavrin (in consultation with Dr. Howard Mzumara, Director of the IUPUI Testing Center) based on a survey used to assess a similar effort at the University of Wisconsin, Madison. The survey is intended to measure students' satisfaction with the course, and the ways in which they interact with the subject. It also measures their perceptions of the difficulty of the subject and their (self-reported) effort. A total of 80 students in the two classes responded to the survey. While detailed results are not yet available, it is clear that students felt the questions were clear and answerable in their current form. During the upcoming academic year, we will use this survey in all four classes to gain baseline data for the

transformation project. In addition to the above survey, we hope to develop or adopt other instruments that are suited to measuring students' success in learning the knowledge and skills central to the courses.

Assessment of Physics 490 (Capstone)

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 project 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 are summarized below.

	Needs Improvement	Meets Minimum Standards	Good	Excellent	Not Applicable
Shows ability to formulate problems, solve them, and interpret their solution			2	1	
Shows understanding of the scientific method				3	
Displays overall comprehension of own discipline			2	1	
Shows ability to communicate ideas of discipline					
orally			2	1	
in writing			1	2	
Gives experience in applying knowledge					
from own discipline to other disciplines			1	2	
from one area of own discipline to another area			1	2	
Makes efficient use of					
technological tools			2	1	
scientific resources (e.g., journals)		1	2		
Shows knowledge of contemporary and ethical issues in science and their relation to society		2	1		
Displays appreciation of the historical development of (an area of) the discipline		1	1	1	

Indiana University–Purdue University Indianapolis
Psychology Department
2005 Assessment Report

This report was written by the following members of the

Spring 2005 B454 Capstone Seminar in Psychology.

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Executive Summary

The students in Drew Appleby's B454 Capstone Seminar in Psychology evaluated the School of Science Senior Assessment Packets from 2003 and 2004 IUPUI psychology alumni. Each of the seven sections of this report is followed by figures illustrating its specific information. Section 1 reveals alumni student demographics. Sections 2 and 3 discuss alumni perceptions of how well students attained certain skills during their undergraduate education and their satisfaction with various undergraduate experiences. Section 4 illustrates how successfully each Principle of Undergraduate Learning was attained. Section 5 demonstrates how much career assistance was needed and received. Information presented in Section 6 is from the B454 Capstone students (not alumni) and evaluates students' perceptions of how well they attained the Psychology Department's Student Learning Outcomes. Section 7 includes alumni and current B454 student suggestions for improvement. The findings of this report (a) illustrate the strengths and concerns that graduating seniors have about the curriculum and other aspects of the IUPUI Department of Psychology and (b) serve as a foundation for suggestions to the department to improve the program to better prepare students for graduation and their post-baccalaureate aspirations.

Sources of Data

The data were compiled from two different sources. The first was the B454 Capstone Seminar in Psychology collaborative assessment project, which examined the School of Science senior surveys completed by psychology majors graduating from IUPUI in 2004. The suggestions were found in the senior reflections and on free responses at the end of the surveys alumni were asked to complete. The second source of data was the 13 seniors in the Spring 2005 B454 Capstone Seminar in Psychology. The students in this class were asked to assess their acquired abilities according to the Department of Psychology's Student Learning Outcomes (SLOs) and to provide suggestions to help the department improve the curriculum.

Analysis

Content analyses were performed on the graduating senior surveys provided by the Executive Director of Academic Services in the School of Science (Joe Thompson) and on the results of the self-assessment assignment from the B454 seminar. These analyses produced a list of suggestions that were sorted into subcategories, and suggestions were derived from these categories.

Interpretations

The data were analyzed into six subcategories: advising, research, communication, core curriculum, transition from B305 to B311, and graduation. One main concern that a majority of the alumni reported was advising. Many students indicated they wanted more advisor involvement throughout their academic career. A majority of students, both alumni and the seniors from this capstone, had many concerns about the lack of opportunities for involvement in research with faculty. A substantial number of alumni felt uncomfortable using data analysis programs, and the students in this capstone reported inconsistency in the way that data analysis was taught between B305 and B311. Some students were introduced to data analysis programs (e.g. SPSS) in B305, while others were never taught how to use the program. Many seniors were then expected to use such programs in B311 with no prior experience and felt unprepared for that course (see the final page of this handout for a report of these data). Another key problem proposed by the seniors in this capstone was the lack of information provided to graduating seniors about graduation requirements and procedures.

Suggestions

Advising. Although many weaknesses reported by alumni involved advising, it was not possible to determine if these weaknesses were due to actual problems in the advising system, alumni unawareness of the advising resources available to them, alumni underutilization of these resources, or a combination of these four variables. One way to make psychology students more aware of the advising services that IUPUI offers is to encourage psychology faculty to distribute a handout that contains basic information about advising in the department during the first day of their classes each semester (e.g., who the advisors

are, what hours they are available, and how to contact them). These forms could also include information about the Career Center and the services it provides and information about the Career Center's website (JagJobs). By distributing this information at the beginning of each semester, all psychology students will have the knowledge that these services exist and it will be up to them to utilize these services. A suggestion from B454 students is to have psychology advisors encourage their advisees to declare a specialization tract early in their academic career and to encourage them to think about the career they wish to pursue after graduation, rather than just giving them a list of requirements to be fulfilled. If both the student and the advisor know what the student's goals are, they can work together to plan a schedule of classes that will prepare students to meet their career goal rather than simply passing enough courses and accumulating enough hours to graduate.

Research. Another concern from both the alumni and the B454 students is a perceived lack of opportunities to do research with faculty. Both groups believe the department should make faculty research more accessible to psychology students. The department makes it clear that research is an important aspect of the undergraduate experience of psychology majors and that it wants its students to feel comfortable with research methods and data analysis. However, students perceive that they are given few chances to perform actual research.

Psychology Curriculum. One curricular issue that students identified was the lack of coherence among classes. Some classes require all papers be written in APA style, while others do not. One way to address this problem and guarantee that psychology students know how to write in APA style is t to have psychology classes require a written assignment (e.g. research paper or journal review), which must be written in APA style. Another issue that arose was the many B454 students felt as though they did not fully obtain all of the information regarding ethics in psychology. Alumni believed they were ethical people, but that they did not learn ethical standards at IUPUI. One solution to this problem would be to make ethics a larger part of the curriculum in the Introduction to Laboratory (B311) course. All students should be tested on their ethical knowledge (e.g., B454 students are required to take the University's on-

line ethics test at http://www.iupui.edu/~resgrad/Human%20Subjects/HumanSubjectsCourse.html to complete this assessment project). The department should require this test be passed by all psychology students to ensure that they know the ethics involved in psychological research.

Oral Communication. One area in which most students felt they did not excel is oral communication. Both alumni and B454 students felt they were not given enough opportunities to improve this skill by giving oral presentations. One way to alleviate this problem would be to require more oral presentations in psychology courses. Many students felt as though they had opportunities to talk in class, but were rarely asked to give professional presentations on psychological topics.

Transition from B305 to B311. Perhaps the most serious problem that was identified during this assessment project—and one that was discussed in great detail in B454—is the lack of continuity between Statistics (B305) and Introduction to Laboratory in Psychology (B311). Many students indicated that B305 did not prepare them for B311. They reported learning the mathematical basis of statistics in B305, but were then expected to be proficient in software programs such as SPSS and other data analysis programs when they entered B311. Therefore, many students fell behind in B311 because they did not develop a working knowledge of the software in B305. One way to alleviate this problem would be to incorporate the use of data analysis programs (e.g., SPSS and Excel) in B305 so that students know how to do statistics by hand and also how to use the programs to calculate those statistics as well. (Coincidently, a plan was proposed at a recent faculty meeting—and passed by the faculty—that would alleviate this problem. This plan is reproduced in Appendix E). Another suggestion offered by B454 students would be to have a computer science data analysis class specifically designed for psychology students. This class would teach students how to use Excel spreadsheets and also how to use SPSS to perform data analyses needed for research. Instead of learning the business aspect of data analysis that the recommended N207 course teaches, a psychology data analysis class using Excel and SPSS would be perceived as far more relevant.

Graduation Process. A problem discussed by the assessment team was the lack of information provided to graduating seniors about the actual graduation process. Many students were unaware of the requirement to register for CAND 991. One suggestion to the department is to have the School of Science contact seniors regarding graduation requirements and procedures. This could be obtained through a graduation fact sheet sent out to all students who have earned at least 90 credit hours. Alternately, this information could be sent out with the senior audit. This fact sheet could inform potential graduates that they must register for CAND 991, pertinent information about cap and gowns, the date/time/location of the ceremony, and any other requirements associated with graduation in order to make this process less confusing and frustrating to already stressed individuals.

Introduction

The Four Purposes of this Report

The first purpose of this report is to provide the IUPUI Psychology Department with easy access to the data collected from the IUPUI School of Science Senior Assessment Project from the graduating class of 2004. This report presents these data in an organized and summarized format.

The second purpose of this report is to provide the School of Science with suggestions to produce an even more effective survey instrument and procedure in the future. The third purpose of this report is to provide the Psychology Department with data-based suggestions that can be used to make programmatic improvements in psychology curricula designed to improve the education of future psychology students. The fourth purpose of this report is to provide the senior psychology majors enrolled in B454 Capstone Seminar in Psychology (see Appendix A for Syllabus) with the opportunity to engage in an authentic collaborative assessment project in which they are "hired" by the Psychology Department as an assessment consulting team. This task will require students to exhibit the underlined components of the following Student Learning Outcomes (SLOs) of the IUPUI Psychology Department.

- 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

The 13-Step Process Used to Create this Report

1. Joe Thompson provided the class with copies of the 185 surveys completed by the class of 2004 graduating psychology seniors. Of these 185 surveys, 49 were Senior Reflections, 72 were School of Science Graduating Student Surveys, and 64 were IUPUI School of Science Senior Surveys.
2. The class discussed their responsibilities for the semester and created a series of deadlines to complete the various stages of the report. The instructor outlined the various tasks required to complete the report, and class members volunteered to assume responsibility for tasks on the basis of their skills and interests.
3. The class discussed the ethical issues surrounding their task and concluded that an official statement of confidentiality signed by all class members (see Appendix B) should be required in the handling of confidential materials. Each class member was also required to pass the on-line version of the Indiana University Human Subjects Protection Test. Permission to analyze the data used in this study and to disseminate the results of this analysis had been previously granted to the School of Science by the IUPUI Institutional Review Board.
4. The instructor distributed an approximately equal number of reflection essays and senior surveys to each class member.
5. Each class member collated and summarized the personal and academic demographic information for their surveys, reported that data during the next class meeting, and prepared written and numerical summaries of their sections in pairs (one person was held responsible for numerical data while the other person was responsible for written interpretation of those data).

6. Each class member collated and summarized the skill and the satisfaction ratings from the surveys, reported that data during the next class meeting, and prepared written reports on both ratings. One class member volunteered to enter the data from these reports into Excel spreadsheets and to produce means and standard deviations for each rating. Tables of these data were then created for the final report.
7. Each class member collated and summarized the suggestions from the survey, reported data during the next class meeting, and prepared written reports based on the data.
8. Class members collated each of the previously mentioned reports into a set of reports that reflected a total data set for the Psychology Department.
9. The class then created a set of suggestions to improve the instruments included in the Senior Assessment Project and its administration.
10. Class members volunteered to collect and organize materials for each section of the report and to write explanatory sections of the report (e.g., how the Senior Assessment Project was administered and how the skills and satisfaction ratings were analyzed).
11. Appropriate amendments were made to an existing title page and introduction from previous B454 seminars assessment reports.
12. The instructor collected the materials for final editing. A final copy was given to Joe Thompson, posted to the Assessment section of the department's website, and presented during the annual IUPUI Psychology Department Capstone Poster Session on April 29, 2005.

The Nature, Purpose, and Administration of the IUPUI School of Science Senior Assessment Project

The SOS Senior Assessment Project is a package of four surveys that graduating SOS students are asked to complete and return. This package contains a written senior reflection on IUPUI's six principles of undergraduate education (PULs), a graduating student survey, a mentoring faculty survey, and an academic advisor survey.

This assessment package is administered each year to potential SOS graduates, who are informed of its existence through the Candidate course (CAND 991) for which they must register during the semester prior to their graduation. In order to receive this instrument, seniors must report to the SOS Office (LD 222) by October 1. The materials in this package are to be completed and returned to the Dean's Office by March 1 for May/August graduates and November 1 for December graduates.

Data from the mentoring and advisor surveys are used to give feedback to faculty who serve as mentors and advisors to SOS students. These data are reported directly to faculty and are not included in this report due to their confidential nature.

Data from the written senior reflections on the PULs and the graduating senior survey are collected to provide SOS and the Psychology Department with information that can be used to increase the effectiveness of their programs. Copies of these surveys appear in Appendix C, accompanied by the documents that introduce and supplement them in the Senior Assessment Project package.

Section One

Student Demographics

Source of Data

Students in the School of Science Psychology Department at Indiana University-Purdue University Indianapolis filled out the School of Science Graduating Student Survey regarding their experiences in the school of science as well as their post graduation plans.

Analysis

Of the 72 students who filled out the survey, 56 students were female while 16 were male ranging in age from 21-51 with a mean age of 26.29. Of the 72 students, 49 were Caucasian, six African American, and one West Indian, Irish American, American Indian, Asian, Hispanic, and Pacific Islander. Eight students did not provide a response for the question on ethnicity. All students who answered this survey were psychology majors. Eight students also had minors from other disciplines. Four students minored in sociology while at least one student minored in philosophy, political science, criminal justice, and French. Forty-one students earned a Bachelor of Science degree, 30 students received Bachelor of Arts, and one student did not report the degree he or she obtained. Fifteen students taking this survey graduated in December of 2003, 39 graduated in May 2004, 8 graduated in August 2004, and 10 students provided no graduation date.

Interpretation

The survey asked questions regarding the students' plans upon graduation. Of the 80 students who responded to this question, 36 mentioned graduate school, 8 mentioned professional school, 16 stated that they were continuing in their current employment, 19 were seeking new positions, and one student has already found a new position. Six of the 44 students who mentioned further education were accepted into their programs, 13 were not accepted, and 12 have not yet been accepted (assuming the student received no acceptance or rejection letter). Of the students who stated that they applied to a graduate program, nine applied to an Indiana University program. Students continuing in

current employment are doing so at: Clarian Health, SFS Services, Meijer, Damar Services, National City Bank, Indy Parks, IUPUI, City of Indianapolis, Party Lite Gifts, and Fisher Collision Repair. Several positions that students are seeking include human resources, caseworker, fighter pilot, ethics officer, director, mental health clinician, research counselor, pharmacy representative, and sales positions. When asked whether their job or advanced studies would relate to their majors, 44 responded yes, 17 responded no, and 11 students did not answer the question.

Suggestions

In reviewing the 36 students who are considering graduate school as their post graduation plans, more students were not accepted into their programs than those who were accepted. A suggestion to the School of Science would be to increase their involvement in making certain that more students are being accepted into graduate programs.

Summary

In summary, it appears that:

- most psychology majors are female
- students range in age from 21-51, with a mean age of 26.29
- the majority of majors are Caucasian
- more students are receiving a Bachelor of Science degree
- most students are seeking advanced degrees
- a smaller number of students are seeking employment
- students are seeking positions in various areas such as human resources, casework management, and sales

Frequency Table of Student Demographics

Frequency Table

Age

		Frequenc	Percen	Valid	Cumulativ Percen
Valid	21.00	3	4.2	4.2	4.2
	22.00	18	25.0	25.0	29.2
	23.00	13	18.1	18.1	47.2
	24.00	7	9.7	9.7	56.9
	25.00	6	8.3	8.3	65.3
	26.00	6	8.3	8.3	73.6
	27.00	1	1.4	1.4	75.0
	28.00	2	2.8	2.8	77.8
	29.00	1	1.4	1.4	79.2
	30.00	3	4.2	4.2	83.3
	33.00	4	5.6	5.6	88.9
	34.00	2	2.8	2.8	91.7
	37.00	1	1.4	1.4	93.1
	41.00	3	4.2	4.2	97.2
	48.00	1	1.4	1.4	98.6
	51.00	1	1.4	1.4	100.0
	Total	72	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	16	22.2	22.2	22.2
	Female	56	77.8	77.8	100.0
	Total	72	100.0	100.0	

Ethnicity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Caucasion	49	68.1	76.6	76.6
	West Indian	1	1.4	1.6	78.1
	Irish American	1	1.4	1.6	79.7
	African American	6	8.3	9.4	89.1
	American Indian	1	1.4	1.6	90.6
	Asian	4	5.6	6.3	96.9
	Hispanic	1	1.4	1.6	98.4
	Pacific Islander	1	1.4	1.6	100.0
	Total	64	88.9	100.0	
Missing	System	8	11.1		
Total		72	100.0		

Minor

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sociology	4	5.6	50.0	50.0
	Philosophy	1	1.4	12.5	62.5
	Political Science	1	1.4	12.5	75.0
	Criminal Justice	1	1.4	12.5	87.5
	French	1	1.4	12.5	100.0
	Total	8	11.1	100.0	
Missing	System	64	88.9		
Total		72	100.0		

Degree

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BA	30	41.7	42.3	42.3
	BS	41	56.9	57.7	100.0
	Total	71	98.6	100.0	
Missing	System	1	1.4		
Total		72	100.0		

Graduation Date

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	May 2004	39	54.2	62.9	62.9
	August 2004	8	11.1	12.9	75.8
	December 2003	15	20.8	24.2	100.0
	Total	62	86.1	100.0	
Missing	System	10	13.9		
Total		72	100.0		

Plans upon Graduation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Graduate School	36	50.0	81.8	81.8
	Professional School	8	11.1	18.2	100.0
	Total	44	61.1	100.0	
Missing	System	28	38.9		
Total		72	100.0		

Have you been Accepted

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	8.3	19.4	19.4
	No	13	18.1	41.9	61.3
	Not Yet	12	16.7	38.7	100.0
	Total	31	43.1	100.0	
Missing	System	41	56.9		
Total		72	100.0		

If so, at which Univesity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	IU-Law Indianapolis	1	1.4	7.1	7.1
	Unsure, still searching	2	2.8	14.3	21.4
	IU	2	2.8	14.3	35.7
	University of Indianapolis	1	1.4	7.1	42.9
	Undecided	1	1.4	7.1	50.0
	IUPUI	5	6.9	35.7	85.7
	IU-School of Music	1	1.4	7.1	92.9
	BGSU	1	1.4	7.1	100.0
	Total	14	19.4	100.0	
Missing	System	58	80.6		
Total		72	100.0		

Continue in current employment at

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clarian Health	2	2.8	12.5	12.5
	Administrative Assistant	1	1.4	6.3	18.8
	SFS Serves	1	1.4	6.3	25.0
	Meijer	1	1.4	6.3	31.3
	Damar Services	1	1.4	6.3	37.5
	National City Bank	1	1.4	6.3	43.8
	Indy Parks	1	1.4	6.3	50.0
	Rehabilitation Technician	1	1.4	6.3	56.3
	IUPUI	1	1.4	6.3	62.5
	City of Indianapolis	1	1.4	6.3	68.8
	Party Lite Gifts	1	1.4	6.3	75.0
	Unknown	1	1.4	6.3	81.3
	Mental Health Clinician	1	1.4	6.3	87.5
	Drug Counselor	1	1.4	6.3	93.8
	Fishers Collision Repair	1	1.4	6.3	100.0
	Total	16	22.2	100.0	
Missing	System	56	77.8		
Total		72	100.0		

Seeking a new position as

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Human Resource Consultant	1	1.4	5.3	5.3
	Unknown	3	4.2	15.8	21.1
	Caseworker	2	2.8	10.5	31.6
	Fighter Pilot	1	1.4	5.3	36.8
	Consultant	1	1.4	5.3	42.1
	Ethics Officer	1	1.4	5.3	47.4
	Director	1	1.4	5.3	52.6
	Mental Health Clinician	1	1.4	5.3	57.9
	Research Counselor	1	1.4	5.3	63.2
	Pharmacy Representative	1	1.4	5.3	68.4
	Sales	1	1.4	5.3	73.7
	Anything but Mental Health	1	1.4	5.3	78.9
	Mental Retardation Research Assistant	1	1.4	5.3	84.2
	Program Director at Youth Center	1	1.4	5.3	89.5
	Well Paid	1	1.4	5.3	94.7
	Human Resources	1	1.4	5.3	100.0
	Total	19	26.4	100.0	
Missing	System	53	73.6		
Total		72	100.0		

Have found new position as

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	University of Indianapolis as an Assistant	1	1.4	100.0	100.0
Missing	System	71	98.6		
Total		72	100.0		

Will your job or advanced studies relate to your major

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	44	61.1	72.1	72.1
	No	17	23.6	27.9	100.0
	Total	61	84.7	100.0	
Missing	System	11	15.3		
Total		72	100.0		

Section Two

Alumni Perceptions of Personal Skill Level

Source of Data

For this survey, 72 alumni were asked to rate their personal skill level for knowledge, abilities and skills acquired or refined while at IUPUI. The participants evaluated ten categories on a 5 point Likert scale. A score of one would indicate "poor ability level." A score of 5 indicated an "excellent ability level." Categories included reading and understanding of written material, critical thinking, new use of skills and knowledge, in-depth understanding of major, effective written and verbal communication, teamwork, problem-solving and the use of information technology.

Analysis

The overall response from alumni showed they perceived a high level of personal skill and subject knowledge after graduation. The respondents scored all ten categories of at above average levels. The reading and understanding books, articles and instruction materials category received the highest score, 4.47. The lowest scoring skills involved the use of technology and effective use of speech communication, both receiving a score of 4.11. The overall score for all categories was 4.30, placing the overall response from the participants in the above average category.

Interpretation

The results of the survey indicated that respondents felt they had successfully retained a high level of subject knowledge and skill after graduation. The implication is that the university is effectively building a solid foundation of practical skills and subject knowledge that students are able to build upon after graduation.

Though these results are positive in nature, there are aspects of the study that may have an effect on its accuracy. The sample size is relatively small compared to the total number of graduates. The survey which produced the results is taken voluntarily by the participants and may reflect the views of higher performing students.

Suggestions

To correct for this, the school should seek a larger pool of participants. Making the survey a mandatory requirement for graduation is one possible option. It could also be offered in specific senior-level classes in a similar fashion as class evaluations are at the end of the semester.

Alumni Perceptions of Personal Skill Level

For the following statements, please rate your current ability level in each area using the following scale.

1=poor ability level
2=below average ability level
3=average ability level
4=above average ability level
5=excellent ability level

Statement	**1**	**2**	**3**	**4**	**5**
Reading/Understanding books, articles, and instruction materials **(4.47)**	0	2	6	20	**44**
Thinking critically and analytically **(4.44)**	0	0	7	26	**39**
Finding new ways to use skills/knowledge **(4.42)**	0	0	4	33	**34**
Writing clearly/effectively **(4.42)**	0	2	6	24	**40**
Having an in-depth understanding of major **(4.37)**	1	0	5	31	**34**
Having a general understanding of subjects others than major **(4.24)**	0	1	10	**31**	29
Communicating clearly/ effectively **(4.20)**	0	1	10	**34**	26
Working as a team to solve problems **(4.18)**	0	3	11	28	**30**
Make efficient use of Information Technology **(4.11)**	0	1	13	**35**	23
Speaking clearly/effectively **(4.11)**	0	2	13	**32**	25
Overall **(4.30)**					

Mean = bold in parenthesis

Mode = bold

Section Three

Student Satisfaction with Learning Experience

Source of Data

In this portion of the survey, 70 participants were asked to rate their level of satisfaction with their learning experience in the School of Science. 17 areas of experience ranging from quality of teaching in major area to opportunities for research were measured on a five point Likert scale. A score of "1" indicated a "very dissatisfied" score, "2" was "dissatisfied", "3" was "neutral", "4" was "satisfied" and "5" was a score of "very satisfied".

Analysis

The highest scores were given to the quality of teaching in their major area (4.40), the overall quality of education at IUPUI (4.26) and the quality of the courses in their major areas (4.19). Opportunities for integrating personal experience (4.09) and increasing self-understanding (4.07) also scored in the satisfied range.

When asked to rate the performance of their major departments and the School of Science, scores dropped from "satisfied" to "neutral" in many key areas. Helpfulness of the major department (4.03) and quality of the School of Science equipment (4.01) were rated by participants in the "satisfied" range. However, graduates rated their experiences with the dean's office (3.87) and academic advising (3.64) in the less-than-satisfactory "neutral" range. Satisfaction with the personal attention from the major department was also rated as "neutral" with a score of 3.76.

Graduates gave the lowest scores when rating the quality of classes outside their major areas and their access to opportunities both in and out of the School of Science. The quality of required, non-major courses (3.47) and the quality of teaching by faculty outside of the School of Science (3.97) were both rated as "neutral". Participants were also less than satisfied with the number of opportunities for extra-curricular activities (3.40), for group work with other students (3.97) and for access to research resources

(3.74). The lowest score given by survey participants was the rating for opportunities to participate in faculty member's research projects (3.29).

Interpretation

Results from the survey showed that graduates were less that satisfied with their overall experiences while in the School of Science at IUPUI. Participants rated their personal learning experiences and the quality of teaching within the School of Science high on the survey. Results from this section of the survey indicate that students were generally satisfied with their personal learning experiences within their major coursework.

However, a perceived lack of support from their major department and the School of Science had a negative affect on the overall satisfaction score. This is also true of the less-than-satisfactory scores given for research opportunities, learning experiences outside the School of Science and the lack of extra-curricular activities. The cumulative experiences of the participants, both positive and negative, ultimately resulted in an overall satisfaction score of 3.86.

Suggestions

Responses provided by the survey participants indicated a disconnect between students and the support resources that are available to them. The overall feeling of the graduates was that there was a lack of personal attention and support from School of Science and departmental staff.

To correct this, the School of Science should encourage its staff to be more proactive in providing information to students. This would include, but not be limited to, information regarding extra-curricular activities, research opportunities and faculty advising resources.

Students also indicated a less-than-satisfactory rating for courses taken outside of their major. School of Science staff should also actively communicate with staff members of other IUPUI schools to ensure science students have positive learning experiences in courses outside their major areas.

Student Satisfaction with Learning Experience

For the following statements, please indicate your level of satisfaction with IUPUI in each area using the following scale.

1=poor ability level
2=below average ability level
3=average ability level
4=above average ability level
5=excellent ability level

Statement	1	2	3	4	5
Quality of teaching in major area **(4.40)**	0	0	3	**36**	31
Overall quality of education at IUPUI **(4.26)**	0	1	7	**35**	27
Courses in major **(4.19)**	1	2	5	**37**	25
Opportunities to integrate what is learned with personal experiences **(4.09)**	1	2	14	**34**	19
Opportunities to increase self-understanding **(4.07)**	0	3	15	26	**26**
Helpfulness of department in major **(4.03)**	2	4	8	**32**	24
Quality of Scientific Equipment in SOS **(4.01)**	0	2	12	**39**	17
Quality of teaching by other faculty at IUPUI **(3.97)**	0	4	13	**34**	19
Opportunities to work with other students in groups/teams **(3.97)**	1	2	14	**34**	19
Helpfulness of Dean's Office in SOS **(3.87)**	3	5	12	**28**	22
Personal attention from major department **(3.76)**	3	6	17	**23**	21
Accessibility of research resources **(3.74)**	0	4	25	**26**	15
Academic advising in major department **(3.64)**	2	10	16	**25**	17
Opportunities to engage in community services **(3.53)**	1	9	22	**28**	10
Required courses outside of major area **(3.47)**	3	5	26	**28**	8
Opportunities to engage in extra-curricular activities **(3.40)**	3	6	**28**	20	11
Opportunities to participate in faculty member's research **(3.29)**	4	9	**30**	17	10
Overall **(3.86)**					

Mean = bold in parenthesis

Mode = bold

Section Four

Principles of Undergraduate Learning

Source of Data

Graduating seniors were asked to write reflections expressing how successfully they felt they obtained IUPUI's Principles of Undergraduate Learning (PULs). These principles are: core communication and quantitative skills; critical thinking; integration and application of knowledge; intellectual depth, breadth, and adaptiveness; understanding society and culture; and values and ethics. A total of 49 reflections were analyzed and scored on a scale of 1 to 3, 1 meaning not attained, 2 meaning progressing toward attainment, and 3 meaning successfully attained. Each PUL was then broken down into specific skills; these skills were tallied based on whether the student addressed them in their reflection.

Analysis

Core communication and quantitative skills was addressed in 47 out of 49 of the reflections. Sixty-six percent of the students reported that they had successfully attained communication and quantitative skills during the course of their education, 32% stated that they had attained some of these skills, and only 2% reported unsuccessful attainment. The mean score was 2.5. Core communication and quantitative skills were broken down into five sub-skills: writing, reading, speech, math, and technical skills. Thirty-five students discussed their writing skills, 24 mentioned being able to understand the material they read, 38 discussed their speaking skills, 15 discussed the mathematical skills attained, and 29 wrote of their technological proficiency skills.

Critical thinking was addressed in 46 out of the 49 reflections. The majority, 59%, of the students felt that they had successfully attained critical thinking and 41% reported attaining some skills, but not successfully. No students claimed to be unsuccessful in attaining critical thinking skills. The mean score was 2.6. Critical thinking was broken down into five sub-skills. Twenty students discussed their abilities to retain and understand information, 24 believe they can apply their knowledge in order to solve

problems, 31 mentioned their abilities to analyze issues, 23 discussed being able to synthesize information, and 26 students discussed their abilities to evaluate information and data.

Integration and application of knowledge was addressed in 46 of the reflections. Fifty-four percent of the graduates reported that they had successfully attained this PUL, while 41% stated that they had attained some skills, and only 4% reported being unsuccessful at integrating and applying their knowledge. The mean score was 2.5. In addition, 35 students discussed their abilities to apply knowledge to better their personal lives, 27 discussed applying this principle to their professional lives, and 17 reported using their knowledge to further the goals of society.

Intellectual depth, breadth, and adaptiveness were discussed in 43 of the 49 reflections. The majority of students, 63%, had successfully attained this principle, 33% stated they were progressing toward attainment, and 4% were unsuccessful. The mean score was 2.5. This principle was broken down into three sub-skills. Thirty-four students discussed their depth of knowledge in their major, 27 discussed their intellectual breadth in different courses and disciplines, and 23 mentioned their ability to adapt to different situations.

Understanding society and culture was addressed in 46 of the senior reflections. Seventy percent of the students were successful in attaining this principle during the course of their education, 26% had attained some skills, while 4% believed they were unsuccessful at understanding society and culture. The mean score was 2.6. Thirty-five students discussed their abilities to understand human similarities and differences. Twenty-eight were able to recognize cultural interconnectedness. Twenty-one students discussed how this principle has led them to act in a civil manner.

Values and ethics were discussed in 44 of the 49 total reflections. Sixty-four percent of the graduates felt that they had successfully attained this principle. Thirty-two percent stated they were progressing toward attainment, and 5% claimed to be unsuccessful. The mean score was 2.5. Thirty-four students discussed their abilities to make choices with integrity, wisdom, and maturity. Ten students discussed their abilities to recognize the importance of art in their lives and to society.

Interpretation

The majority of students reported successfully attaining all six of the PULs. While the mean scores for each of the principles are very similar, there are definite strengths and weaknesses. Students did not discuss attainment of mathematical and reading skills in their reflection on the principle of core communication and quantitative skills as often as the other previously discussed sub-skills. Within critical thinking, students mentioned the ability to analyze material effectively more often than any other of the sub-skills. There was a clear deficit in the number of students who discussed their abilities to further the goals of society with the application and integration of knowledge.

While the principle of understanding society and culture received the highest number of students reporting successful attainment, few of them mentioned applying these skills to act in a civil manner. Values and ethics is another principle that received a high proportion of students reporting successful attainment. Many of them discussed their beliefs in their abilities to make choices with integrity, wisdom, and maturity. In contrast, very few students mentioned their abilities to recognize the importance of art in our society, which was listed as a sub-skill to the values and ethics principle.

Suggestions

Giving students the opportunity to discuss their attainment of each of the six PULs allows them to point out weaknesses in the material and life skills that they are subjected to during the course of their education. In addition, it allows them to reflect on and identify the courses and experiences that led to successful attainment. The shortfalls in the identification of the sub-skills could have resulted from the lack of specification that each one should be addressed in the reflection. This problem could be addressed by more clearly stating which skills should be discussed when reflecting on the larger and more general PUL. Perhaps, it would be beneficial to have students fill out a survey about the principles of undergraduate learning instead of writing reflections. A survey would give students the opportunity to address all components of the PULs while still allowing space for comments and suggestions. A survey could also show the strengths and weaknesses of each component of the PULs, allowing for a clearer

understanding of what students need in the future.

Principles of Undergraduate Learning

For the following statements, a rate of one, two, or three was given to assess whether or not the student believes he/she obtained the designated PUL. The sub-unit reflects if that attribute was considered in making that decision.

1=not attained
2=progressing toward attainment
3=attained

PULs with Sub-units	Totals	*Mean*
Core Communication & Quantitative Skills	**124**	*2.5*
Writing	35	
Reading	24	
Speech	38	
Math Skills	15	
Technical Skills	29	
Critical Thinking	**112**	*2.6*
Retain & Understand	20	
Solve/Apply	21	
Analyze	28	
Synthesize	20	
Evaluate	24	
Integration and Application of Knowledge	**115**	*2.5*
Personal Life	35	
Professional Life	27	
Further Goals of Society	17	
Intellectual Depth, Breadth, and Adaptiveness	**111**	*2.5*
Major	34	
General Ed/Electives Courses	27	
Adaptiveness	23	
Understanding Society and Culture	**122**	*2.6*
Human Similarities and Differences	35	
Cultural Interconnectedness	28	
Act in a Civil Manner	21	
Values and Ethics	**114**	*2.5*
Makes Choices with Integrity, Wisdom & Maturity	34	
Recognize the Importance of Art	10	

Section Five

Career Assistance

Source of Data

A survey titled “IUPUI School of Science Senior Survey” was included in an assessment packet given to graduating seniors. A total of 64 surveys were reviewed and analyzed. These surveys asked students to identify areas related to career and graduate school assistance in terms of how much assistance they received, who provided the assistance, and the amount of assistance students would have liked to receive.

Analysis

Assistance received. A total of 64 (94%) students identified the amount of assistance they received in job search tips, 4 (6%) did not respond. Twenty-two (34%) reported that they needed assistance, fourteen (22%) reported they wanted assistance, but did not receive any, and nineteen (30%) reported that they received some assistance. Five (8%) reported that they received adequate assistance, and no one reported receiving a lot of assistance. A total of 57 (89%) students identified the amount of assistance they received in developing their resumé, 7 (11%) did not respond. Seventeen (27%) reported they did not need any assistance, thirteen (20%) reported they wanted assistance, but did not receive any, and 23 students (36%) reported that they received some assistance. Four (6%) reported that they received adequate assistance and no one reported receiving a lot of assistance. A total of 57 (89%) students identified the amount of assistance they received in career options and exploration, 7 (11%) did not respond. Eleven (17%) reported that they needed no assistance. Twelve (19%) reported that they wanted assistance but received none, and 26 students (40%) reported they received some assistance. Seven (11%) reported they received adequate assistance, and one (2%) reported receiving a lot of assistance with career options and exploration. A total of 60 students identified the amount of assistance they received with applications to graduate school. Twenty-three (36%) reported that they needed no assistance. Thirteen (20%) reported that they wanted assistance, but did not receive any. Fourteen (22%) reported that they

received some assistance, nine (14%) reported they received adequate assistance, and one student (2%) received a lot of assistance. A total of 49 (77%) students identified the amount of assistance they received with internships. Fifteen (23%) reported that they needed no assistance. Sixteen (25%) reported they wanted assistance, but did not receive any. Ten (16%) reported that they received some assistance, and six (9%) reported that they received adequate assistance. Two students (3%) reported that they received a lot of assistance.

Who assisted. A total of 34 (53%) students identified who assisted them in the area of job search tips. Thirteen (20%) reported that faculty assisted them and one (2%) reported staff assistance. Six (9%) reported that advisors assisted them. Eleven (17%) reported that the Career Center assisted them and three (5%) reported that peers and other students assisted them with job search tips. A total of 28 students identified who assisted them in developing their resumé. Fifteen (23%) reported that faculty assisted them and four (6%) reported that staff assisted them. Five (8%) reported that an advisor assisted them, four (6%) reported that the Career Center assisted them, and no one reported assistance from other students or peers. A total of 52 students identified who assisted them with career options and exploration. Eighteen (28%) reported that faculty assisted them and six (9%) reported that staff assisted them. Twelve (19%) reported that advisors assisted them. Eleven (17%) reported that the Career Center assisted them, and five students (8%) reported that peers and other students assisted them. A total of 20 students identified who assisted them with their graduate school applications. Ten (16%) reported that faculty assisted them and two (3%) reported that staff assisted them. Six (9%) reported that advisors assisted them and no one reported that the Career Center assisted them. Two students (3%) reported that peers and other students assisted them. A total of 14 (22%) students identified who assisted them with internships. Eight (13%) reported that faculty assisted them. One student (2%) reported staff assistance and two (3%) reported that the Career Center assisted them. Additionally, one student (2%) reported assistance from peers and other students.

Assistance needed. A total of 51 (80%) students identified the amount of job search assistance they would have liked to receive. Thirteen (20%) reported they needed no assistance. Fourteen (22%) reported they needed some assistance and 11 students (17%) reported they needed adequate assistance. Thirteen (20%) reported that they needed a lot of assistance. A total of 43 (67%) students identified the amount of assistance they would have liked to receive in developing their resumé. Fifteen (23%) needed no assistance, twelve (19%) needed some assistance, and seven students (11%) needed adequate assistance. Nine (14%) needed a lot of assistance. A total of 52 students identified the amount of assistance they would have liked to receive in career options and exploration. Ten (16%) needed no assistance, eleven (17%) needed some assistance and eighteen (28%) needed adequate assistance. Thirteen students (20%) needed a lot of assistance. A total of 53 (83%) students identified the amount of assistance they would have liked to receive with graduate school applications. Twenty-two (34%) needed no assistance, twelve (19%) needed some assistance, and eleven (17%) reported needing adequate assistance. Eight students (13%) needed a lot of assistance. A total of 52 (81%) students identified the amount of assistance they would have liked to receive with internships. Nineteen (30%) needed no assistance, thirteen students (20%) needed some assistance, and eleven (17%) needed adequate assistance. Nine students (14%) needed a lot of assistance.

Questions. A total of 51 students answered the question; “What other career related information helped you during your academic career? What other information could be helpful?” Twenty-four (47%) did not respond to this question. Two (4%) reported graduate school information. Six students (12%) reported B103, and one (2%) reported the question was not applicable. Three students (6%) reported no to the question. Nine (18%) reported the psychology department, and four (8%) reported earlier preparation and major information. A total of 51 students answered the question; “Did you complete an internship/practicum/work experience during your studies at IUPUI? If so, where?” Nineteen (37%) reported yes, nineteen (37%) reported no, and 13 students (25%) did not report.

Interpretation

The strongest areas in the “amount of assistance received” section were from students claiming that they needed no assistance. The weak areas in this section came from individuals who claimed that they wanted assistance, but received none. Another weak area was receiving adequate assistance; only a few students reported receiving adequate assistance. The strongest areas in “who assisted” students were faculty, advisors, and the Career Center when it came to assistance with job search tips, and career options and exploration. The weak areas were in staff assistance, peer/student assistance, and Career Center assistance when it came to resumé development, graduate school applications, and internships. The strongest area in regards to the “amount of assistance students would have liked to receive,” is that most students claimed they needed no assistance. The weak area was that many students claimed that they would have liked some assistance, adequate assistance, or a lot of assistance.

Suggestions

Based on the data from the “amount of assistance received,” suggestions include: having flyers or advertisements from the career and employment center so that students know where they can get help with resumé development, career options and exploration, graduate school applications, and internships. The career and employment center could make sure they give effective, appropriate, and adequate information to students by having this information in the center, on file, or on hand, to make sure staff is giving adequate information. The career and employment center can hire more staff and employees in order to provide a greater number of students with assistance.

Based on the section identifying “who assisted” students, suggestions are: to train, educate, and better inform staff members that work in departments in the areas of job search tips, resumé development, internships, graduate school applications, and career options and exploration so that they can better assist students. Educating students about job searches, resumé development, graduated school applications, career options and exploration, and internships can allow them to better assist their fellow peers and students. Also having student mentors in these areas may be helpful.

Based on the data where students acknowledged how much assistance they "would have liked to receive," overall, the Career Center needs to improve on providing students with adequate information. The Career Center can educate staff and employees by creating a training session or a short course in how to better assist students in these areas. Additionally, the Career Center could hire some individuals that already know about some of these areas, and know how to assist students in these areas.

Summary

Concerns

- Students reporting that they wanted assistance, but received none
- Students reporting that they did not receive adequate assistance
- Few students reported receiving a lot of assistance
- Not enough staff assistance
- Not enough career assistance in the areas of internships, applications to graduate school, and resumé development

Suggestions

- The Career Center could make flyers, advertising the types of assistance provided
- Career Center can make sure they give adequate information by having information on file, in the office, and available for students to look at, or obtain a copy
- Career Center can hire more staff to assist a greater number of students
- Career Center can hire student mentors to help other students with job searches, resumé development, graduate school applications, and internships
- Career Center could create a training course for staff members instructing them on how to better assist students

Career Assistance Data

School of Science Senior Survey

Area	None needed	wanted but none	received some	adequate	lots	
job search tips	22	14	19	5	0	
resume development	17	13	23	4	0	
career options and exploration	11	12	26	7	1	
applicationto grad school	23	13	14	9	1	
internship	15	16	10	6	2	
Area	faculty	staff	advisor	career center	peers/students	other
job search tips	13	1	6	11	3	1
resume development	15	4	5	4	0	4
career options and exploration	18	6	12	11	5	2
applicationto grad school	10	2	6	0	2	3
internship	8	1	2	2	1	4
Area	None needed	needed some	needed adequa	needed lots		
job search tips	13	14	11	13		
resume development	15	12	7	9		
career options and exploration	10	11	18	13		
applicationto grad school	22	12	11	8		
internship	19	13	11	9		

School of Science Senior Survey/64
PERCENTAGES

Area	None needed	wanted but none	received some	adequate	lots	
job search tips	34.38	21.88	29.69	7.81	0	
resume development	26.56	20.31	35.94	6.25	0	
career options and exploration	17.19	18.75	40.63	10.94	1.56	
applicationto grad school	35.94	20.31	21.88	14.06	1.56	
internship	23.44	25	15.63	9.38	3.13	
Area	faculty	staff	advisor	career center	peers/students	other
job search tips	20.31	1.56	9.38	17.19	4.69	1.56
resume development	23.44	6.25	7.81	6.25	0	6.25
career options and exploration	28.13	9.38	18.75	17.19	7.81	3.13
applicationto grad school	15.63	3.13	9.38	0	3.13	4.69
internship	12.5	1.56	3.13	3.13	1.56	6.25
Area	None needed	needed some	needed adequa	needed lots		
job search tips	20.31	21.88	17.19	20.31		
resume development	23.44	18.75	10.94	14.06		
career options and exploration	15.63	17.19	28.13	20.31		
applicationto grad school	34.34	18.75	17.19	12.5		
internship	29.69	20.31	17.19	14.06		

#1 totals out of 51 (percentage)

No response 24 (47)	grad school inf 2 (39)	B103 6 (12)	n/a 1 (2)
No 3 (6)	career info/jobs 9 (17)	psych dept 2 (2)	earlier prep/majors info 4 (8)

#2 Totals (percetage)

yes 19 (37)	no 19 (37)	no response 13 (25)

Section Six

Student Learning Outcomes

Source of Data

Of the 13 students in the B454 Capstone Seminar, research was compiled on the students' responses to how well they obtained the seven Student Learning Outcomes (SLOs). Two of the seven SLOs were broken down into more specific areas. SLO number five was broken down into: Personal Development, Relationship Building, and Career Planning. SLO number six was broken down into: Writing skills, Speaking skills, Information competence, and Technological proficiency. Overall, research was compiled on 12 SLOs instead of seven.

Analysis

A five-point Likert scale was used to evaluate each SLO. Five meaning that the student felt they had successfully obtained the skills of that SLO; a one meant that the student had not obtained any skills of that SLO. The results indicated that the majority of the thirteen students in this class felt they had successfully obtained skills in the areas of ethics and personal development. Both areas had a mean of 4.62. The area where students felt they had obtained the least proficiency was in research with a mean of 3.69. The areas of speaking, technological proficiency, and critical/creative thinking and writing ranked higher than research, but still with a low enough score to require some improvement. All three areas ranked with a mean of 4.15. All other areas ranked with a mean between 4.15 and 4.62, with students feeling that they had somewhat obtained the skills.

Interpretation

These results show that the University should take a close look at how the students are/are not obtaining research skills. Research is a very important area of a psychology graduate that needs to be improved. Other areas for investigation would be that of speaking, technological proficiency, and critical/creative thinking and writing. These areas also show room for improvement.

Suggestions

A few students reported that they were unaware of the SLOs. The B454 class suggests that the school should take a different approach in making the students aware of SLOs. We also suggest that the curriculum needs to be modified in order to receive a more positive rating.

Student Learning Outcomes

SLO Areas	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	Mean
Content	5	3	3	4	4	4	4	5	5	4	5	4	5	4.230769
Research	4	2	3	3	3	3	3	5	5	4	4	5	4	3.692308
Application	4	5	5	4	5	3	4	4	5	4	5	5	4	4.384615
Ethics	5	4	5	4	5	5	5	5	4	4	5	5	4	4.615385
Personal Development	5	5	5	4	5	5	5	5	3	4	5	4	5	4.615385
Relationship Building	3	4	5	3	4	5	5	4	5	4	5	5	5	4.384615
Career Planning	5	3	5	4	4	4	4	4	4	4	5	5	4	4.230769
Writing Skills	4	5	5	4	5	5	5	3	4	3	5	5	5	4.461538
Speaking Skills	3	2	5	3	5	4	5	4	5	4	5	5	4	4.153846
Information Competence	4	4	4	4	5	3	5	5	4	4	4	5	5	4.307692
Technological Proficiency	4	4	4	4	5	3	5	5	4	4	3	4	5	4.153846
Critical/Creative Thinking and Problem Solving	4	4	5	4	4	4	4	5	4	3	4	5	4	4.153846

s1 = student #1

Section Seven

Suggestions

The findings of this report illustrate the strengths and concerns that graduating seniors have about the curriculum and other aspects of the Department of Psychology. The authors of this report would now like to present some suggestions to the department to improve different aspects of the program to better prepare students for graduation and their futures.

Source of Data

The data was compiled from two different areas. The first place we collected data for suggestions to the Department of Psychology was the collaborative assessment project. This project looked at the senior surveys completed by psychology majors for the Class of 2004. The suggestions were found in the senior reflections and on free responses at the end of the different surveys that the alumni were asked to fill out. The second place we collected this data was from the thirteen seniors in Drew Appleby's Spring 2005 Capstone Seminar (B454). The students in this class were asked to assess their acquired abilities according to the Department of Psychology's Student Learning Outcomes (SLOs) and to provide suggestions to help the department improve the curriculum.

Analysis

We performed a content analysis of the surveys provided to us by Joe Thompson and by reviewing the assessment papers from this capstone. This analysis produced a large list of suggestions that were then analyzed and placed into different subcategories (e.g. research, curriculum, graduation, etc.). The categories were then evaluated and a suggestion or multiple suggestions were offered based on the compilation of suggestions given by the alumni and also the seniors in this capstone.

Interpretations

The data was analyzed into six subcategories: advising, research, communication, core curriculum, B305 to B311, and graduation. One main concern that a majority of the alumni reported was advising. Many students indicated they wanted more advisor involvement throughout their academic career. A

majority of students, both alumni and the seniors from this capstone, had many concerns about research and the lack of opportunities for involvement in research with faculty. A large number of alumni felt they were not comfortable using data analysis programs, and the students in this capstone reported inconsistency in the way that data analysis was taught between B305 and B311. Some students were introduced to data analysis programs (e.g. SPSS) in B305, while others were never taught how to use the program. Many seniors were then expected to use such programs in B311 with no prior experience and felt unprepared for that course (see Appendix D for a report of these data). Another key problem proposed by the seniors in this capstone was the lack of information provided to graduating seniors about the requirements for graduation.

Suggestions

Advising. Many weaknesses reported by alumni involved advising. However, we were unable to determine if these weaknesses were due to actual problems in the advising system or because the alumni were unaware of the resources available to them or if they simply did not utilize those resources. One way to make psychology students more aware of the services that IUPUI offers them is to require all professors to hand out a form or forms that contain basic information about advising (e.g., who the advisors are and how to use the Advising Office to make appointments with them). These forms could also include information about the Career Center and the services it provides and information about the Career Center's website (JagJobs). By distributing this information at the beginning of each semester, psychology students will have the knowledge that these services exist and it will be their responsibility to utilize the many advising resources offered to them. A suggestion from our class is to have psychology advisors encourage a specialization tract early on and encourage students to think about their future careers, rather than just giving students a list of requirements to be fulfilled. If both the student and the advisor know what the student's career goals are, they can work together to plan a schedule of classes that will prepare that students to meet their goals.

Research. Another concern from both the alumni and the seniors in our class is the perceived lack of research experience and opportunities to do research with faculty. Both groups believe the department should make faculty research more accessible to psychology students. The department wants their students to feel comfortable with research methods and data analysis, but students perceive that they are given very few chances to perform real research projects.

Core Curriculum. There were many areas in core curriculum that could use improvement. Many issues that students discussed were the lack of uniformity between classes. Some classes require that all papers be written in APA style, while others do not. One easy way to fix this problem and guarantee that psychology students know how to write in APA format, is to simply enforce that all psychology classes require some kind of report (e.g. research paper or journal review) and that this report be written in APA style.

Many students felt as though they did not fully obtain all of the information regarding ethics in psychology. The alumni felt as though they were ethical people, but that they did not learn ethical standards at IUPUI. One solution to this problem would be to make ethics a larger part of the curriculum in the Introduction to Laboratory (B311) course. All students should be tested on their ethical knowledge (e.g., within this capstone, we were required to take the University's on-line ethics test at http://www.iupui.edu/~resgrad/Human%20Subjects/HumanSubjectsCourse.html in order to complete this assessment project). The department should require this test be passed by all psychology students to ensure that they know the ethics involved in psychological research.

Oral Communication. One area in which most students felt they did not excel is oral communication. Many students (both alumni and our class) felt they were not given enough opportunities to give oral presentations and improve this skill. One way to alleviate this problem would be to require more presentations to be given in psychology courses. Many students felt as though they had opportunities to talk in class, but were rarely asked to give professional presentations on psychological issues.

B305 to B311. One serious problem that emerged during this assessment project—and one that was discussed in great detail by our class—is the lack of continuity between Statistics (B305) and Introduction to Laboratory (B311). Many students stated that B305 did not prepare them for B311. They reported learning the mathematical basics of statistics in B305, but then they were expected to be proficient in software programs such as SPSS and Excel when they entered the B311 course. Therefore, many students fell behind in B311 because they did not develop a working knowledge of the software in B305. One way to alleviate this problem would be to incorporate the use of data analysis programs (e.g., SPSS and Excel) in B305 so that students know how to do statistics by hand and also how to use the programs to calculate those statistics as well. Another suggestion offered by our class would be to have a data analysis class specifically designed for psychology students. This class would teach students how to use Excel spreadsheets and also how to use SPSS to perform their data analysis functions associated with research. Instead of learning the business aspect of data analysis that the recommended N207 course teaches, a psychology data analysis class using Excel and SPSS would be more relevant to their major.

Graduation Process. One key problem discussed by the assessment team was the lack of information provided to graduating seniors about the actual graduation process. Many students were unaware of the requirement to register for CAND 991. One suggestion to the department is to have the School of Science contact seniors regarding graduation requirements and procedures. This could be obtained through a graduation fact sheet sent out to all students who have earned at least 90 credit hours. Alternately, this information could be sent out with the senior audit. This fact sheet could inform potential graduates that they must register for CAND 991, pertinent information about cap and gowns, the date/time/location of the ceremony, and any other requirements associated with graduation in order to make this process less confusing and frustrating to already stressed individuals.

Appendix A

B454 Capstone Seminar in Psychology Syllabus

Indiana University - Purdue University Indianapolis

B454 CAPSTONE SEMINAR IN PSYCHOLOGY

Class Number 25009

Spring 2005

Instructor: Dr. Drew Appleby, Director of Undergraduate Studies in Psychology
Office: LD 120C (Office hours: 8:00 to 9:00 Monday, Tuesday, and Wednesday)
E-mail: dappleby@iupui.edu (Do not E-mail me through Oncourse.)

Class Number → Time → Days → Room: 25009 → 9:30 to 10:45 → Tuesdays and Thursdays → LD 004

Credit: Three semester hours

Texts

American Psychological Association. (2001). *Publication manual of the American Psychological Association.* Washington, DC: Author. (required)

Appleby, D. C. (2003). *The savvy psychology major*. Dubuque, IA: Kendall/Hunt. (recommended)

Course Rationale (What is a capstone class, and why am I required to take one?)

In an architectural context, a capstone is the top-most stone that completes a building. In an academic context, a capstone is the final class that completes a student's curriculum. Capstone classes 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 when they graduate from the program (e.g., think critically, perform research, and write in APA style). This process serves a dual purpose. First, it allows psychology majors with a final opportunity to practice and demonstrate the skills they will need to succeed after graduation on the job or in graduate school. Second, it provides the Psychology Department with a final opportunity to assess whether or not it has been successful in its mission to produce competent psychology majors.

Course Description

This seminar requires senior psychology majors to investigate three crucial topics.

- They will investigate the past, present, and future of an area of psychology in which they have an occupational interest.
- They will also investigate themselves by identifying, clarifying, investigating, and preparing to actualize their post-baccalaureate aspirations.
- They will also investigate how last year's class of graduating psychology majors perceived the quality of their undergraduate education

These investigations will occur as they (1) write an APA-style review paper about an area of psychology in which they have an occupational interest, (2) create a professional planning portfolio, and (3) engage in a collaborative assessment project.

Course Purposes

This capstone seminar serves the following three audiences.

- **Psychology Majors →** As a capstone, it is the highest point of the undergraduate education of IUPUI psychology majors. As such, it challenges students to demonstrate that they have accomplished the seven student learning outcomes (SLOs) of the IUPUI Psychology Department (which have been approved by the department's Undergraduate Committee for assessment purposes) listed on the final page of this syllabus. These SLOs constitute the academic repertoire that will enable psychology majors to attain their educational and/or career goals (i.e., graduate school or employment). For those who have not accomplished these SLOs, this seminar will provide them with one more chance to do so.
- **The Psychology Department →** This course serves a vital assessment function by enabling the department to answer the following question: How do we know that our students know what we want them to know? This syllabus lists the department's SLOs and describes the assignments in this seminar that have been designed to determine if these SLOs have been accomplished. The purpose of this type of assessment is to collect information that can be used to make data-informed evaluations of the effectiveness of the department's curriculum so that subsequent improvements to the curriculum can be made based on these evaluations.

- **The School of Science and the University** → All seven of the SLOs of the Psychology Department are based on the fundamental skills and abilities underlying the Principles of Undergraduate Learning that all IUPUI undergraduates strive to achieve, and all seven of these SLOs will be assessed in this class. The results of this assessment will be communicated to the appropriate administrative committees and offices (e.g., the Psychology Undergraduate Committee and the School of Science Teaching and Learning Committee) where they will be used to make programmatic improvements.

Assignments

You will complete three major assignments in this seminar. Each assignment is designed to provide opportunities to demonstrate mastery of several of the department's SLOs.

- You will **write an APA-style review paper** whose topic is the particular area of psychology in which you have an occupational interest (e.g., I/O psychology, cognitive neuroscience, or pastoral counseling). The body of this paper—not including the title page, abstract, and reference section—will be at least ten pages long, and it will be organized into the following five sections:
  a. The history of this area including its relationship to other areas of psychology and academic disciplines
  b. This area's principle theories and the research methods this area employs to test the validity of these theories
  c. How the empirical findings in this area can be applied to promote human welfare
  d. A specific occupation in this area, an accurate description of the responsibilities of a person in that occupation, and a list of the specific knowledge, skills, and characteristics a person would need to be successful in that occupation
  e. A reference section containing at least ten references from the scholarly literature
  f. The SLOs required by this assignment are #1, #5, #6, and #7.
- You will **engage in a collaborative assessment project.**
  a. You and your classmates will act as a team of consultants to the Psychology Department who will "hire" your team as assessment consultants to analyze and interpret the data collected with the instruments included in the School of Science's Senior Assessment package that is completed by psychology majors during the semester they graduate.
  b. Your team will produce a formal assessment report for the Psychology Department that will be presented at the annual Capstone Poster Session and to the Psychology Department's Undergraduate Committee.
  c. The SLOs required by this assignment are #2, #3, #4, #5, #6, and #7.
- You will **create a professional planning portfolio** that contains a Core section—completed by all students—and either an Employment section or a Graduate School section, depending upon your post-baccalaureate plans.
  a. The Core section will contain the following documents:
     - A statement describing your immediate and long-term career and life goals, including an explanation of why these goals are appropriate in terms of your knowledge, skills, characteristics, values, and experiences
     - An official senior audit and a semester-by-semester plan to complete a BA (not a BS) degree in psychology
     - An evaluation of how successfully you have acquired the seven SLOs of the psychology department, including: (1) a description of your strengths and weaknesses in each of these areas, (2) an explanation of why you are strong and weak in these areas, and (3) suggestions for the department to enable it to help future psychology majors develop these strengths and strengthen these weaknesses
     - A current, accurate, and professional-appearing resumé that has been written with the help of a one of the career counselors in the Career Center or Melissa Pohlman in the School of Science Office.
     - An address where you can be reached after graduation
  b. The Employment section will contain the following documents:
     - The results of a computerized job search strategy from the Career Center
     - A professional-appearing cover letter that can be modified for specific job applications
     - Completed letter of recommendation request forms from at least three appropriate people who have agreed to write strong letters of recommendation for you for a job
     - Evidence of a genuine attempt to develop or strengthen interviewing skills
     - Complete applications for at least three jobs
  c. The Graduate School section will contain the following documents:
     - Results of a search for appropriate graduate programs
     - A personal statement that can be modified for specific graduate programs
     - Evidence of preparation for the entrance exam your graduate/professional program requires (e.g., GRE or MCAT)
     - Completed letter-of-recommendation request-forms from at least three appropriate people who have agreed to write strong letters of recommendation for you for graduate school
     - Completed applications for at least three graduate programs
     - The SLOs required by this assignment are #5 and #6.

Course Procedures

The majority of the work in this seminar will be performed outside of class. Class time will be used to

- Present information that can be used to complete assignments,
- Discuss and peer-review the assignments prepared outside of class, and
- Create strategies to complete the assignments (e.g., choose work teams, assign tasks, and determine deadlines).

Evaluation

The three assignments in this seminar (i.e., the paper, the report, and the portfolio) will be worth 100 points each. These points will be assigned on the basis of the following criteria:

- 50 points for quality of content (i.e., accuracy and coverage)
- 20 points for precision (i.e., letter-perfect APA style and impeccable grammar, spelling, punctuation, and capitalization)
- 20 points for presentation (i.e., appearance of written documents and demeanor during oral presentations)
- 10 points for timeliness (i.e., meeting deadlines)
- An additional 100 points—for a grand total of 400 points—will be assigned on the basis of the quality and quantity of teamwork exhibited by each student during the collaborative assessment project. These "teamwork points" will be determined by the set of criteria given on page 4 of this syllabus. They will be used at the end of the semester to assign a 0 to 100 point total for each student's level of "teamwork" based on both peer (see page 5) and instructor ratings.

Final Grades

The scale for determining final grades will be as follows.

A+	=	93.3% of the total points (373 → 400)	C+	=	73.3% of the total points (293 → 305)
A	=	90% of the total points (360 → 372)	C	=	70% of the total points (280 → 292)
A-	=	86.6% of the total points (346 → 359)	C-	=	66.6% of the total points (266 → 279)
B+	=	83.3% of the total points (333 → 345)	D+	=	63.3% of the total points (253 → 265)
B	=	80% of the total points (320 → 332)	D	=	60% of the total points (240 → 252)
B-	=	76.6% of the total points (306 → 319)	F	=	less than 60% of the total points (0 → 239)

Important Note: Psychology majors must earn at least a C- in this class for it to fulfill the Psychology Department's capstone requirement.

References

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

Teamwork Rating Sheet for B454

Ratee's Name: _____

Your Name: _____

How often did the Ratee .....

Attend team meetings
Always 5 4 3 2 1 Never

Meet deadlines
Always 5 4 3 2 1 Never

Produce high quality work
Always 5 4 3 2 1 Never

Take a leadership role
Always 5 4 3 2 1 Never

Do her/his fair share of the work
Always 5 4 3 2 1 Never

Do more than her/his fair share of work
Always 5 4 3 2 1 Never

Volunteer to help another team member
Always 5 4 3 2 1 Never

Improve the morale of the team
Always 5 4 3 2 1 Never

Cause the morale of the team to decrease
Never 5 4 3 2 1 Always

Help to resolve conflict in the team
Always 5 4 3 2 1 Never

Produce conflict in the team
Never 5 4 3 2 1 Always

Cause other team members to work harder than they should
Never 5 4 3 2 1 Never

Cheerfully volunteer for non-preferred tasks
Always 5 4 3 2 1 Never

B454 "Merit Pay" Distribution Sheet

A significant portion of the work in B454 is done as a team (e.g., the collaborative research project, planning and peer reviewing the term papers, and sharing progress on the portfolios). As your instructor, it is my responsibility to evaluate the quality and quantity of each member's contribution to the team as part of the grading process. To do this as fairly and accurately as possible, I need the input of each team member regarding the quality and the quantity of all her/his teammates' work. The following method will allow me to gain this input.

Imagine you are the supervisor of this team and that I—as your supervisor—have given you a $1200 budget line to reward the members of your team for their work on these projects. This money will be added to their regular salary as a special merit pay bonus in their paychecks. It is your responsibility to distribute this $1200 among your teammates in a fashion that is equal to the quality and quantity of their work. If you believe all your teammates worked equally hard and produced work of equal quality, then you should give each of them a $100 merit pay bonus. If you believe that some of them worked harder and produced work of higher quality than others, then you should give them more than a $100 in merit pay. If you do this, you must then give some of your other teammates—whom you believe did not work as hard, who produced lower quality work, or who decreased the morale of the team—less than $100 in merit pay.

There are many factors to take into account when you assign merit pay to your teammates. I urge you to refer to the Team Work Rating Sheets you filled out for each of your teammates as you make your merit pay distribution. I also urge you to make punctual and faithful class attendance especially important. In the world of work, those who do not show up for work or who are consistently late are often considered to be liabilities to workplace morale because they force their teammates to work harder than they should and/or force them to waste time before they can begin a task. Also consider that employees who cheerfully volunteer to accept tasks are more often rewarded with merit pay bonuses than those who refuse to do more than what they consider to be their "fair share."

The following list contains the names of all the member of your class. Give each of them a merit pay bonus that can range from $0 to $1200. Do not assign a bonus to yourself—leave your salary line blank. The only restriction on your merit pay distribution is that the total must add up to exactly $1200 because $1200 is all you have to distribute.

This exercise serves two purposes. The first is to provide me with a valuable piece of information about each member of the class I can use when I determine her/his final grade. The second is to provide you with an opportunity to perform a task you will be required to do if you plan to eventually assume a position of leadership in a company or organization. According to the Department of Labor's SCANS Report (1991), the successfully employed American in the 21st century will need to be able to (1) exercise leadership, (2) manage staff, (3) budget funds, and (4) evaluate the performance of others. This task will allow you to practice these important skills.

Kareema Bailey	$ _____
Lisa Butterbaugh	$ _____
Stephanie Coffman	$ _____
Anne Delaney	$ _____
Tiffany Gibbs	$ _____
Trisha Hefner	$ _____
Lindsay Lindsey	$ _____
Elizabeth McOuat	$ _____
Monica Richardson	$ _____
Joseph Romero	$ _____
Nicole Rush	$ _____
Jacob Stuckey	$ _____
Terri Troyer	$ _____
Total	$ _____ (This line must be $1200.)

Reference

United States Department of Labor: The Secretary's Commission on Achieving Necessary Skills. (1991). *What work requires of schools: A SCANS report for America 2000.* Washington, DC: Author.

The IUPUI Psychology Department's 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

Statement of Confidentiality

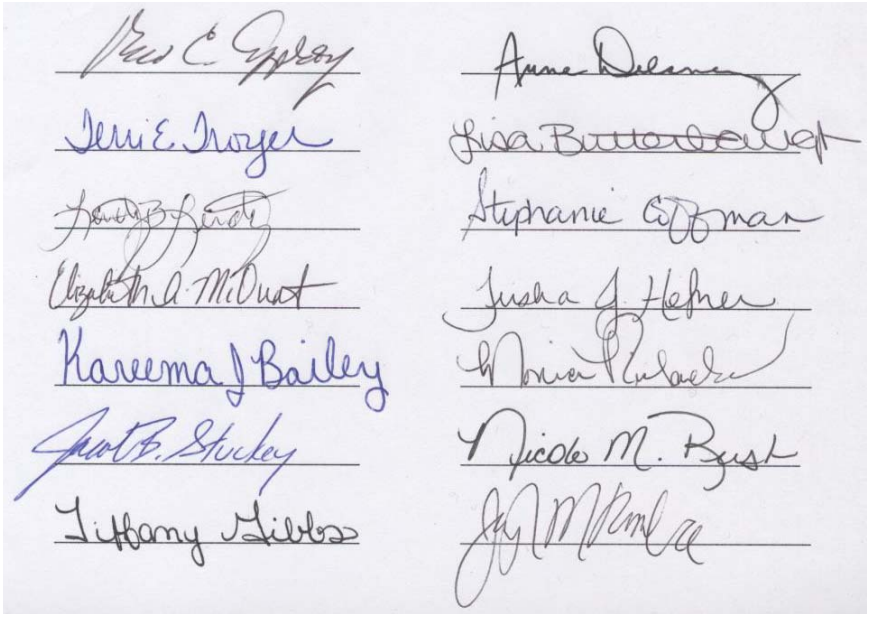
Statement of Confidentiality

We (the instructor and students of the spring 2005 IUPUI Capstone Seminar in Psychology) are conducting a research project to collate and analyze the data collected from the School of Science's Senior Graduating Student Surveys and Senior Reflections completed by psychology majors. This project has two objectives.

1. To provide the Psychology Department with an assessment report based on the results of the Graduating Student Surveys and Senior Reflections completed by the members of the department's graduating class of 2004. (It is our assumption that the information provided in our final report will enable the Psychology Department to make data-informed decisions to improve its curricula for future generations of IUPUI psychology majors.)

2. To provide our student members with the opportunity to participate in a collaborative research project and to demonstrate the skills that such a project requires.

These surveys and reflections were provided to us by Joe Thompson (Assistant to the Associate Dean for Academic Programs and Student Development of the School of Science) with all student and faculty names omitted. By signing below, we pledge to maintain the anonymity of the surveys and reflections we will be analyzing, as well as the anonymity of any party mentioned in the reflections. The specific content of individual surveys a reflections will not be discussed outside the context of the classroom nor will we attempt to identify the names of any participants. Our signatures below indicate that we fully understand and agree to abide by all the aspects of this statement of confidentiality.



Appendix C

Surveys

School of Science
Graduating Student Survey

Please complete the questionnaire. The questionnaire provides for your anonymity.

1. Age: _____ Gender: _____ Ethnicity: _____

2. Major: _____ Degree: Cert. _____ Grad. Date: _____
   _____ A.S. _____
   Minor: _____ B.A. _____
   B.S. _____
   M.S. _____
   Ph.D. _____

3. Plans upon graduation:
   a. Graduate School _____ Professional School _____ Have you been accepted? _____

      If so, at which University? _____

   b. Continue in current employment at _____as _____.

   c. Seeking a new position as _____.

   d. Have found a new position at _____as_____.

4. Will your job or advanced studies relate to your major? Yes _____ No _____

5. For the following statements, please rate your current ability level in each area using the following scale:

   1 = poor ability level
   2 = below average ability level
   3 = average ability level
   4 = above average ability level
   5 = excellent ability level

_____ Reading and understanding books, articles, and instruction materials

_____ Make efficient use of information technology

_____ Writing clearly and effectively

_____ Speaking clearly and effectively

_____ Working as part of a team to solve problems

_____ Thinking critically and analytically

_____ Finding new ways to use my skills and knowledge as I encounter new situations or problems

_____ Having a general understanding of subjects other than the one in which I majored

_____ Having an in-depth understanding of my major field of study

_____ Communicating effectively with people who see things differently than I do

6. For the following statements, please indicate your level of satisfaction with IUPUI in each area using the following scale:

   1 = very dissatisfied
   2 = dissatisfied
   3 = neutral
   4 = satisfied
   5 = very satisfied

_____ Overall quality of the education you received at IUPUI

_____ Quality of teaching by faculty in your major area

_____ Quality of teaching by other faculty at IUPUI

_____ Quality of scientific equipment in the School of Science

_____ Academic advising in your major department

_____ Courses in your major area

_____ Required courses outside your major area

_____ Personal attention from those in your major department

_____ Opportunities to increase your self-understanding

_____ Opportunities to work with other students in groups or teams

_____ Opportunities to integrate what you have learned with personal experiences

_____ Opportunities to engage in community services

_____ Opportunities to engage in extra-curricular activities

_____ Opportunities to participate in faculty members' research

_____ Accessibility of research resources (special labs, research services, equipment)

_____ The helpfulness of department staff in your major area

_____ The helpfulness of Dean's Office staff in the School of Science

7. Suggestions to better serve School of Science majors:

_____

_____

_____

_____

_____

_____

Thank you for your time in completing this survey. *jlt: 08/04*

IUPUI School of Science Survey

Name: _____ Graduation Date: _____

Major: _____

Address (after graduation if known) _____

_____

Phone Number (after graduation if known) _____

Email (after graduation if known) _____

Check the box that describes the amount of assistance you RECEIVED in the following areas

Area	No Assistance Needed	Wanted but Received No Assistance	Received Some Assistance	Received Adequate Assistance	Received Lots of Assistance
Job Search Tips					
Resume Development					
Career options And exploration					
Application to Graduate School					
Internship Opportunities					

If you did receive assistance in any of the areas, check the box according to WHO HELPED YOU in each area.

Area	Faculty	Staff	Advisor	Career Center	Peers/other Students	Other
Job Search Tips						
Resume Development						
Career options And exploration						
Application to Graduate School						
Internship Opportunities						

Please check the box that describes the amount of assistance you WOULD HAVE LIKED TO RECEIVE in the following areas.

Area	No assistance Needed	Need(ed) Some Assistance	Need(ed) Adequate Assistance	Need(ed) Lots of Assistance
Job Search Tips				
Resume Development				
Career options And exploration				
Application to Graduate School				
Internship Opportunities				

What other career-related information helped you during your academic career? What additional information would have been beneficial?

Did you complete an internship / practicum / work experience during your studies at IUPUI? If so, where?

What are your plans after graduation? (work, graduate school, etc.)? (For career / job search information, feel free to contact Tenille Bullock at tbullock@iupui.edu).

If work, where are you working and what will you be doing?

If graduate school, where and what will you be studying?

Additional comments

Congratulations on completing your degree!!!!!

Revised 12/5/2003

Appendix D

Perceptions of B305 to B311 Transitions

B305 and B311 Experiences

of the Students in B454 Capstone Seminar in Psychology

Summary:
Overall, regardless of the professor for B305, students who took the class at IUPUI primarily learned statistics with pencil, paper, and calculators. There were some positive, as well as negative comments regarding individual experiences in this class. However, *all* students who responded were required to use SPSS in B311 at IUPUI, but felt they were not adequately prepared to use this program having not learned it previously, or in the actual class. If the goal of the Psychology Department is to have coherence between the two classes, with B305 ultimately preparing students for B311, the curriculum may need to be reevaluated.

The following comments are from students who have completed or are taking B305/B311 at the IUPUI campus.

B305 Statistics

Professor B:

- All work was done with calculator, student felt adequately prepared before entering this course
- Work was done strictly with paper, pencil, and calculator
- Student's second attempt with B305; relieved that no computers were used, class taught exclusively with pencil, paper, and calculators; professor also walked through each step of data collection, organization, and analysis which gave student better understanding of whole research process

Professor C:

- Course taken in summer and student felt class was great, calculations done primarily by hand, but with visits to the computer lab twice a week
- Student felt everything was extremely thorough with step-by-step explanations and the professor was always available to help with questions

Professor E:

- Paper and pencil only, student felt class was difficult and stressful

Professor F:

- Student's first attempt at B305; course taught exclusively with Excel and SPSS for collection and analysis of data; instructor provided website resources for explanation of Excel and SPSS, but gave no instruction in class – student dropped course

B311 Intro Lab in Psychology

Professor A:

- All work was done on computer with SPSS, student felt very lost and ill-prepared having gone from all calculator in B305 (with Professor B) to all SPSS in B311
- Student felt this class was a waste of time, everything was done on computer in SPSS but nothing was explained as to why or how it was used…this student gained SPSS knowledge by doing research outside of class
- Class work was done exclusively on SPSS without explanation of how, student felt extremely unprepared having no prior SPSS experience in B305 (with Professor B)
- Student indicated everything was done in SPSS and a "cookbook" of instructions was provided, student also felt this professor was available for questions or help

Professor D:

- Student is currently taking this class and does not feel that her experience in B305 (with Professor E) prepared her for this course
- Student's first attempt with B311; SPSS was used exclusively and basic information packets were given, but not explained. Professor or TA would enter data into SPSS on overhead projector, but student felt he did not know what was going on most of the time. Student did not complete the course.

Appendix E

Draft of Proposed Changes to B305 Statistics

Draft of Proposed Changes to B305 Statistics

Proposed Change: Create a core SPSS curriculum that would be added to all B305 courses. Course time would be redistributed to 2/3 lecture, 1/3 lab. (We checked with MaryAnn black concerning how we distribute time and we can make this change). Students would attend two shorter lecture periods during the week and one lab section. Each section of B305 would have 2 lab times (LD 137 doesn't accommodate more than 30 people). These lab courses would be taught by a graduate student TA.

Objectives:

1) Uniformly introduce SPSS to our students in B305.
2) Create a core SPSS curriculum to ensure the knowledge/skills they possess before entering B311 and Capstone courses.
3) Reduce work load on B305 faculty to develop and implement the lab.
4) Reduce the amount of time that B311 and Capstone Instructors take to teach/refresh students SPSS skills.

Strategies:

1) Modify how B305 is currently offered. Is currently offered as roughly two- 2 hour time periods. We could change it to two 1 hr. 15 minute lecture periods (e.g., m/w or t/th) and one 1 hour 15 minute lab period.
2) The lecture portions of the class would get taught in regular classrooms and the lab would get scheduled in LD 131. In this scenario, we may be able to have larger lecture sections and thus possibly offer a smaller number of sections each semester.
3) A graduate student would be assigned to 1 or 2 sections of B305, so would be responsible for up to 4 lab sections.
4) A set of SPSS modules would be created that cover content such as: data entry, simple descriptive analyses, create tables/figures, running and reading output for analyses such as t-test, correlation, regression, and analysis of variance. The modules would be individualized so that faculty could order them to fit their particular lecture schedule.
5) The set of modules would be consistent across all sections of B305 and would include an SPSS textbook that could be used as a resource in both B311 and Capstone.
6) A portion of the overall B305 grade would be determined by the lab grade. This percentage would/could be under the control of the individual instructor.