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BIOS: a one-week pre-freshman biology "boot camp" as a tool to increase student success and retention in the biological sciences major

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BIOS: A ONE-WEEK PRE-FRESHMAN BIOLOGY “BOOT CAMP”
AS A TOOL TO INCREASE STUDENT SUCCESS AND RETENTION
IN THE BIOLOGICAL SCIENCES MAJOR

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The School of Human Resource Education
and Workforce Development

by
Sheri M. Wischusen
B.S., University of North Alabama, 1978
M.S., University of Alabama, 1982
May 2009
DEDICATION

This work is dedicated to my loving husband Bill and our wonderful sons Peter and Alex. Your patience with too many fast-food dinners and Mom spending too much time at the dining room table working on assignments gave me the will to continue. Bill, your dedication to and enthusiasm in teaching have been my inspiration. Pete and Alex, I love you and am very proud of the young men you have become.

This work is also dedicated to my parents, Nolton and Dot Maples, and my brother Ken. Even though my Dad was not able to be here for my graduation, before his death he instilled in me a sense of independence and strength. Mom, you have continued that support and have become my example of a strong woman. Ken, all those long phone calls kept me grounded as you offered advice and a shoulder to cry on for the years of this work.

There are so many other people who have impacted my life as I have undertaken this process, I cannot mention them all. My in-laws, Henry and Margaret Wischusen, I love that you are excited to introduce Bill and me as “Dr. and Dr.” My “other family,” my best friends Missy and Jim Epperson and sons, Kyle and Daniel, you offered so many sanity-saving distractions along the way. I couldn’t have made the journey without you. To my pastor and friend Jay Hogewood, you kept reminding me that I would get through the process, as you did only a few years ago. Thanks for the prayers and support.
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My boss for many years in the LSU Howard Hughes Medical Institute Program, Harold Silverman, current Vice Provost of the State University of New York System, and the current program director, Dean Kevin Carman, offered continuing support and patience as I pursued this crazy dream. Thanks Kevin and Harold for the opportunity to work with the HHMI Program for all these years. I am also indebted to Drs. Frank Cartledge and Pam Monroe for their encouragement.

The BIOS Program was the brainchild of many faculty, staff and students. It could not have been the success it has been without their consuming dedication. Along with my husband Bill, Biological Sciences faculty Drs. Steve Pomarico and Joe Siebenaller have bought into BIOS completely, and their encouragement has been endless. There are not enough words to express my
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whining about homework. Thanks also to the dozens of Biological Sciences graduate students and
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of scientists you have been to the students in the program. I appreciate you all.

I am indebted to Bernie Braun, data analyst in the LSU Office of Budget and Planning, for
providing student records for my research for the last four years. Bernie, your patience is admirable
and your data-mining skills are priceless. Thank you so much for all your help. Geaux Tigers!

I also have to thank my HRE graduate school colleagues, those fellow students with whom I
learned statistics, prepared group projects and studied for exams. Glynn Cavin, Gabe Trahan, Kara
Hill, Jo Monroe and Marti Ratcliff, to mention but a few, you guys are the best! Thanks for putting
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ABSTRACT

The Biology Intensive Orientation for Students (BIOS) Program was designed to assess the impact of a five-day intensive pre-freshman program on success and retention of biological science majors at a large research university. The program combined content lectures and examinations for the Introductory Biology course for Science Majors, as well as learning styles assessments and informational sessions to provide the students with a preview of the requirements of biology, and the pace of college. Students were tracked following their BIOS participation. In the pilot year of the program the BIOS participants performed significantly better on the first and second exams, had a higher course average, and had a higher final grade than the control group. These students also had higher success rates (grade of A, B or C) during both the Fall and Spring semesters and remained on track through the first semester of their sophomore year to graduate in four years at a significantly higher rate than the control group. As the students progress through their college careers BIOS participants show increased retention in the biology major and remain on track to graduate in four years than students who did not participate in BIOS.

The BIOS program has been shown to be a very effective orientation for incoming freshman science majors at a large research university. This one-week “boot camp” was originally designed to ease the transition from high school to college, but has proven to have a positive effect on the long term success and retention of students in the biological science majors. While summer-long bridge programs are difficult to fund and staff with large numbers of students, and first semester programs offer help too late for many students, a one-week “boot camp” can be feasible at large universities and provide help for students before they make their first semester mistakes. BIOS organizers have compiled useful information for college departments that wish to replicate a pre-freshman boot camp.
CHAPTER 1.
INTRODUCTION

Rationale

A college education is increasingly important in today’s job market. Even if students do not plan to attend four years of standard “college,” modern high-tech jobs have increased the educational need of the general labor force (Somerville & Yi, 2002). “In 1950, 80 percent of jobs were classified as ‘unskilled.’ Today, an estimated 85 percent of jobs are classified as ‘skilled,’ requiring education beyond high school. At the same time, 60 percent of future jobs will require training that only 20 percent of today’s workers possess” (Broad & Rush, 2003, p. 7). Another study also estimates that within the next decade as many as 85% of high school graduates will have to have some sort of postsecondary education to be able to hold a job in the increasingly complex world (Upcraft & Schuh, 2002).

More people than ever are enrolling in college, and today’s college student is very different from his/her counterparts in the past. Nationwide, 75% of high school graduates enroll in college within two years of high school graduation (Somerville & Yi, 2002). With an overall increase in enrollment comes an increase in the diversity of the student body, including first-generation college students and students from underrepresented minority groups. These groups have been shown to have more difficulty in college than traditional students (Pascarella et al., 2004).

Students enter college with unrealistic ideas of how much work will be expected of them by college instructors as well as optimistic ideas of their study habits, how much they will have to study and how effective their studying will be. They have been successful in high school with minimal effort and see no reason to change their study habits, or lack thereof, for university coursework (Upcraft, et al. 2005). Nationally, 50% of incoming students must take remedial courses to learn the basic skills of reading, writing and/or math (Somerville & Yi, 2002). There is a perception gap between high school teachers and college/university faculty in how prepared students are for college work (Sanoff, 2006).
44% of polled college faculty thought students were not well prepared for college work, while only 10% of the high school teachers questioned indicated they thought students were not well prepared.

Student course failure is costly to the student. When a student fails or drops a required course he/she must enroll in that class again. Students who have to take more remedial courses or re-enroll in courses will take longer to graduate (Levine & Cureton, 1998). For example, at one Southeastern University the Introductory Biology course for science majors has over the past few years had a high overall DFW (grade of “D”, “F” or Withdrawal) rate (approximately 40%) and among students who enter the university self-identifying as biology majors the DFW rate was 27.4% in the years 2001-04 ("University & College Trend Data", 2006). One of the factors involved seems to be time required for new students to learn and implement the skills required to meet the expectations of college courses. Because of this lack of understanding of expectations and the skills they need, many capable students perform poorly on the first, and sometimes second, exam. As a result, these students either drop the course or finish the semester with a low grade ("University & College Trend Data", 2007). Students in general are taking longer to graduate. In 1998, a report stated that fewer than 2 of 5 are able to graduate in 4 years (Levine & Cureton, 1998).

Student course failure is costly to the university. Nationwide, college remediation is estimated to cost as much as one billion dollars a year (Somerville & Yi, 2002). Retaking coursework because of failure or withdrawal accounts for approximately 20-30% of the enrollment in introductory biology each semester (Louisiana State University Office of Budget and Planning). Because this and other general science courses have high un-met demand, that is -many more students wish to enroll than there is space to accommodate, LSU and other large universities waste resources when students drop courses and re-enroll in subsequent semesters.

Administrations of many universities across the US have recognized the need for some sort of intervention to bolster student success and retention rates in specific majors. They employ a variety of different approaches, including short (less than two-week) orientation sessions; multiple-week summer
programs; freshman year seminars and/or specific course sequences; or complete undergraduate academic intervention (Chevalier et al., 2001; Fletcher et al., 2001b; Gordon & Bridglall, 2004; Malave & Watson, 1998; Reyes et al., 1998).

Freshman programs have been shown to be effective in preparing students for college. Participation in a first-year seminar has been shown to have a statistically significant positive impact on student success (House & Kuchynka, 1997; Minchella et al., 2002). Longer-term bridge and orientation programs are common and effective in specific fields and/or for targeted groups, such as engineering majors (Soulsby, 1999), minority students in engineering (Reyes, et al., 1998), women in engineering (Fletcher, et al., 2001a), and first-generation college attendees (Pascarella et al., 2004). Examples of freshman enhancement programs with well-assessed endeavors include the following:

1. The three-day SUCCESS Week at Southern Illinois University Carbondale offers a one-week timeframe with a mixture of social and academic activities (Chevalier et al., 2001). This program starts the week before classes begin in the fall semester and the main focus is to provide “a solid footing in the academic and social activities within the College of Engineering and among their peers” (Chevalier et al., 2001, p. 1). Hands-on engineering projects during the week offer students group interaction as well as academic support. Program administrators have tracked students to degree and results have shown a trend toward higher retention rates among participants. The fourth year retention rate for the 1996 cohort was 36% versus 24% for non-participants.

2. Women in Applied Science and Engineering (WISE) at Arizona State University sponsors a Summer Bridge Program for incoming female engineering majors (Fletcher et al., 2001a). This program is held the week before the freshman fall semester, and offers reviews in science courses as well as computer sessions and student services. This bridge program serves as the first step in continuing support for participating students in the program. WISE program administrators credit these efforts for both an increase in the enrollment of women in the engineering program (up from 17% in 1992 to 21% in 2000) and an increase in retention rates (up from 52% in 1992-95 to 64% in 1996-99).
3. The NSF Foundation Coalition, made up of engineering groups from Arizona State University, Maricopa Community College District, Rose-Hulman Institute of Technology, Texas A&M University and the University of Alabama, was established to produce innovative models of education in their engineering majors. This group created a bridge program for incoming majors, as well as provided an overall strategic plan to revamp the entire undergraduate engineering curriculum (Frair et al., 1997).

4. The Freshman Integrated Curriculum at Texas A & M University (Malave & Watson, 1998) provides a common curricula for all engineering students, beginning with the freshman year. Tracking of upperclassmen that had been in the program from the beginning of their college careers showed 10-15% higher freshman GPAs and grades through their first two years than non-participants.

5. A first year course-specific one-credit seminar at Purdue University (Minchella et al., 2002) combines academic and orientation aspects for freshman biology majors. Program participants did significantly better on exams in Introductory Biology and on final grades for that course. Retention rates in the major after three semesters were 48% for the participants and 36% for non-participants.

6. A freshman bridge program and seminar course at Arizona State University from the Office of Minority Engineering Programs (Reyes et al., 1998) was created to increase enrollment and retention of minority engineering students. Their retention rates in the first year were 66% for program participants and 54% for non-participants.

7. At the University of Connecticut an optional first year course for freshman engineering majors has contributed to a 10% increase in retention of students in the engineering major after their freshman year (Soulsby, 1999).

There are several ways that “Student Success” is defined in higher education research. The two major definitions are simply graduating from college, or, more specifically, graduating from college in the originally selected major. Success indicators include: academic preparation (as measured by SAT scores); academic ability (as measured by high school academic rank and/or GPA); and confidence in study habits (Tester et al., 2004). The majority of new students entering higher education leave their initial college of
choice without a degree and the most critical time is the first year (Cuseo, 2003). The best predictor of student academic success is the individual student’s academic preparation and motivation (Upcraft et al., 2005).

Student success is affected by many factors, both inside and outside the classroom. Qualitative factors that can affect a student’s success in college have been studied in recent years (Pritchard & Wilson, 2003). Students who are emotionally and socially healthy are more likely to succeed in college. Dropping out of college has been compared to suicide and the same social factors have been implicated in both phenomena (Tinto, 1975). A student’s peer interaction as well as institutional buy-in contribute to his or her likelihood of succeeding in college (Antonio, 2004). Pritchard and Wilson (2003) suggest that the major causes for the high drop out rate seen among first-year students are emotional rather than academic. Students who are emotionally and socially healthy are more likely to succeed in college.

There are several reasons that large universities have not traditionally implemented orientation and bridge programs to the same extent as smaller universities and colleges. These intervention programs can be expensive, both in terms of finances and time, and they are most effective with small groups of students. To provide a summer bridge program for all science majors might mean twelve to fifty students at a small liberal arts college, or 1,000 or more students at a large state university. Instead of two or three faculty and staff members at the college, the state university would require dozens of professionals to conduct the program. A short, intensive orientation program might be structured to introduce students to the institution’s support systems and help acclimate them to college and yet not require the commitment of faculty and staff for the entire summer or semester. However, there is very little in the literature describing a one-week stand-alone intensive format.

**Purpose of the Study**

The purpose of this study was to determine the impact of a one-week intensive pre-freshman preparation program on the academic achievement and enrollment retention of students majoring in biological sciences at a research extensive university in the southern United States.
**Research Question**

Can a one-week intensive pre-freshman orientation program positively influence the grades and retention rates of incoming biology majors at a research extensive university in the southern United States?

**Independent and Dependent Variables**

The independent variable in this study was whether or not an incoming freshman biology major participated in the pre-freshman Biology Intensive Orientation for Students (BIOS) before his or her first semester at a large research university in the Southern US. The dependent variables were the success rate of these students, as defined by grade point average and retention rate in the biology major, as they continue their university careers.

**Objectives**

1. To describe incoming college freshman biological sciences majors at a research extensive university in the southern region of the US on the following selected criteria:

   (a) Gender;

   (b) High school GPA;

   (c) College entrance examination scores (ACT, with SAT scores converted according to the ACT-SAT Concordance Table [2008]);

   (d) The grade achieved in the required two-semester sequence Introductory Biology courses (BIOL 1201 and 1202);

   (e) The grade point average (GPA) achieved in the first semester of college enrollment;

   (f) The semester GPA achieved in the second semester of college enrollment;

   (g) The overall GPA achieved at the end of the first year of college enrollment;

   (h) The semester GPA achieved in the third semester of college enrollment;

   (i) The overall GPA achieved at the end of the second year of college enrollment;

   (j) The grade achieved in the required Genetics course (BIOL 2051);

   (k) The grade achieved in the required Microbiology course (BIOL 2153);
(l) Whether or not the student is retained in college each of the first four semesters of college. Retention will be defined as the student receiving a final grade for coursework in the specified semester;

(m) Whether or not the student is retained as a major in biological sciences each of the first four semesters of college. Retention as a biological sciences major will be defined as the student indicating his or her major as Biological Sciences on the LSU VMS online student tracking system.

2. To compare incoming college freshmen biological sciences majors at a research extensive university in the southern region of the US who participated in a pre-freshman intensive preparation program to a control group who did not participate in the program on the following selected academic performance measures:

(a) The grade achieved in the required two-semester sequence Introductory Biology courses (BIOL 1201 and 1202);

(b) The grade point average (GPA) achieved in the first semester of college enrollment;

(c) The semester GPA achieved in the second semester of college enrollment;

(d) The overall GPA achieved at the end of the first year of college enrollment;

(e) The semester GPA achieved in the third semester of college enrollment;

(f) The overall GPA achieved at the end of the second year of college enrollment;

(g) The grade achieved in the required Genetics course (BIOL 2051);

(h) The grade achieved in the required Microbiology course (BIOL 2153).

3. To compare incoming college freshmen biological sciences majors at a research extensive university in the southern region of the US who participated in a pre-freshman intensive preparation program to a control group who did not participate in the program on the following selected measures of retention:
Whether or not the student is retained in college each of the first four semesters of college. Retention will be defined as the student receiving a final grade for coursework in the specified semester;

Whether or not the student is retained as a major in biological sciences each of the first four semesters of college. Retention as a biological sciences major will be defined as the student indicating his or her major as Biological Sciences on the LSU VMS online student tracking system.

**Definitions of Terms**

1. **Incoming freshman** – a student that has enrolled at a university for the upcoming fall semester for the first time, having never attended any university but not counting Advanced Placement or concurrent enrollment at a college or university during the student’s high school career.

2. **Biology or Biological Sciences major** – a student who reports on the application for enrollment at the university that he or she intends to pursue a degree in one of the following majors: biology, biological sciences, biochemistry, microbiology, or pre-medicine.

3. **Pre-freshman orientation program** – a program that offers incoming students an introduction to the campus in a general or specific way, typically in a short one- or two-week format.

4. **Pre-freshman preparation program** – a specific type of pre-freshman orientation program that stresses one or more content areas, rather than simply familiarization with the college campus and environment.

5. **Bridge program** – an orientation program, typically lasting more than two weeks and as much as a full summer, that targets specific student groups for training prior to their first freshman semester.

**References**


CHAPTER 2.

LITERATURE REVIEW

Importance of Post-High School Education

More people than ever are enrolling in college, and today’s college student is very different from his/her counterparts in the past. In the mid-seventies only 26-36% of high school graduates enrolled in college (Current Population Survey for the Nation, 2006). Today, 75% of US high school graduates enroll in college within two years of high school graduation (Somerville & Yi, 2002). The best students (high ACT/SAT scores, 3.5-4.0 high school GPAs) have always attended college, but the newly enrolling 50% is made up of “average” students with lower grades and standardized test scores. Although the best students are assumed to be ready for college work, very few students in either group are sufficiently prepared academically to succeed, and the trend is worsening. Incoming freshman science majors are among the least prepared for college work (Upcraft, et al. 2005).

Even if students do not plan to attend four years of standard “college,” modern high-tech jobs have increased the educational need of the general labor force (Somerville & Yi, 2002). “In 1950, 80% of jobs were classified as ‘unskilled.’ Now, an estimated 85% of jobs are classified as ‘skilled,’ requiring education beyond high school. At the same time, 60% of future jobs will require training that only 20% of today’s workers possess” (Broad & Rush, 2003, p. 7). Another study also estimates that within the next decade as many as 85% of high school graduates will have to have some sort of postsecondary education to be able to hold a job at all in the increasingly complex world (Upcraft & Schuh, 2002).

Misconceptions of Incoming Students

Today’s students and their parents have unrealistic ideas regarding college. They enter college with optimistic ideas of how much they will study, as well as a serious underestimation of how much work will be expected of them by college instructors. They have been successful in high school with minimal effort and see no reason to change their study habits, or lack thereof, for university coursework. This generation of students expects to get reasonably good grades for less academic effort compared with
students in the past (Upcraft, et al. 2005). Ninety percent of sixth through twelfth graders in a nationwide survey were expected by their parents to attend college (Lippman et al., 2008). However, studies show that nationally 50% of incoming students must take remedial courses to learn the basic skills of reading, writing and/or math (Somerville & Yi, 2002).

Confounding the student’s misperception of his ability is the existence of a perception gap between high school teachers and college/university faculty in how prepared students are for college work (Sanoff, 2006). Over 44% of polled college faculty thought students were not well prepared for college work, while only 10% of the high school teachers questioned indicated they thought students were not well prepared. Incoming students assume they have the answers and don’t know how to find help. In a survey of new freshmen at Wayne State University, respondents to the question “What is the one piece of information that you think is it most important for an incoming college student to know that they don’t know?” typically responded “Go to class,” “Get out there and meet new people,” “Know where and how to get help.” (Building Bridges for Access and Success from High School to College, 2005, p. 37).

**Factors Influencing College Retention and Graduation**

Retention of students in the major field of choice, as well as retention at the college or university in general, is of increasing importance to postsecondary institutions (Cuseo, 2003). Major national reports cite the need to increase the numbers of students pursuing baccalaureate and advanced degrees in science and math (Augustine, 2006; Stryer et al., 2003). The solution on which these and many other reports have focused involves increasing the numbers of students entering baccalaureate degree programs in science and mathematics, i.e. “expanding the pipeline.” In addition to this remedy, it is important to find ways to retain the students currently pursuing degrees in these programs, i.e. “plugging the leaks in the pipeline.” Retention indicators include academic preparation (as measured by ACT or SAT scores, with SAT scores converted according to the ACT-SAT Concordance Table [2008]); academic ability (as measured by high school grades [GPA]); learning styles, motivation (Garton et al., 2000; Upcraft et al., 2005) and confidence in study habits (Tester et al., 2004). Qualitative factors that can affect a student’s
success and retention in college have also been studied in recent years (Pritchard & Wilson, 2003). Students who are emotionally and socially healthy are more likely to succeed in college. The majority of new students entering higher education in the US leave their initial college of choice without a degree and the most critical time is the first year (Cuseo, 2003).

The research on student success and retention shows that the situation is even worse for minority students (Lee, 1999). With the overall increase in enrollment comes an increase in the diversity of the student body. Small percentages of new groups, like first-generation college students and students from underrepresented minority groups, have more difficulty in college than traditional students (Pascarella et al., 2004).

Biological Sciences majors at Louisiana State University have mirrored these trends (Engaged Learning: Fostering Success for All Students, 2004). With these and other issues, students, on average, are taking longer to graduate. In 1998, a report stated that fewer than two of five are able to graduate in four years (Levine & Cureton, 1998). LSU’s graduation rates over the last four years are similar and are summarized in Table 2.1 ("University & College Trend Data", 2007).

<table>
<thead>
<tr>
<th>Incoming Cohort</th>
<th>≤4 Year Graduation</th>
<th>≥4 - ≤5 Year Graduation</th>
<th>≥5 - ≤6 Year Graduation</th>
<th>Total Graduation at 6 Years</th>
</tr>
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<tbody>
<tr>
<td>1996</td>
<td>23.1%</td>
<td>26.5%</td>
<td>8.4%</td>
<td>58.0%</td>
</tr>
<tr>
<td>1997</td>
<td>23.0</td>
<td>26.1</td>
<td>8.3</td>
<td>57.5</td>
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<td>1998</td>
<td>25.4</td>
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<td>7.1</td>
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<tr>
<td>1999</td>
<td>26.5</td>
<td>24.8</td>
<td>7.6</td>
<td>58.9</td>
</tr>
</tbody>
</table>

Standards for Freshman Orientation Programs

The Council for the Advancement of Standards in Higher Education (Miller, 2003) has published a series of standards for “Student Orientation Programs (SOPs)” in which it describes the mission of a SOP:
Student orientation programs (SOPs) must incorporate student learning and student development in its mission. SOPs must develop, record, disseminate, implement and regularly review its mission and goals. Mission statements must be consistent with the mission and goals of the institution and with the standards in this document. SOPs must operate as an integral part of the institution’s overall mission.

The mission of the SOP must include…

- Facilitating the transition of new students into the institution,
- Preparing new students for the institution’s education opportunities,
- Initiating the integration of new students into the intellectual, cultural, and social climate of the institution (Miller, 2003, p. 233).

According to Chickering and Gamson (1987), successful undergraduate education includes seven practices:

1) Encourage contacts between students and faculty
2) Develop reciprocity and cooperation among students
3) Use active learning techniques
4) Give prompt feedback
5) Emphasize time on task
6) Communicates high expectations
7) Respect diverse talents and ways of learning.

**Components of A One-Week Intensive Orientation Program for Freshmen**

Orientation programs have, in recent years, moved away from “fun and games” to become more academic (Upcraft et al., 2005). Typical orientation programs can be divided into four components: academic activities, student services, social and recreational events, and special sessions for target populations (Upcraft et al., 2005). Because creating “learning communities” has been shown to give
students a sense of belonging and contributes to retention rates (Laufgraben & Shapiro, 2004), a sense of camaraderie should be fostered during an orientation program.

Comprehensive strategies for thinking and independent learning - metacognition (awareness and control of one’s learning) (Gourgey, 1998) – are important to student success in college. Students who use metacognitive strategies, which include identifying goals, self-monitoring, self-questioning, reasoned choice of behaviors and self-assessment, are more academically successful than students who do not use these strategies. Students can be taught to improve their metacognitive proficiency. Mentoring has long been associated with graduate education, but now research shows it can be a useful tool in teaching these proficiencies within undergraduate education (Jacobi, 1991).

Funding of orientation programs is an important issue. There are arguments for two different mechanisms of funding for these programs - institutional support versus student payment (Upcraft et al., 2005). Some studies stress that funding should impose as little financial burden on students and their families as possible (Miller, 2003) but research suggests that large public institutions tend toward funding by registration fees (Strumpf & Wawrynski, 2000).

**Freshman Orientation Program Successes**

Administrations of many universities across the US have recognized the need for some sort of intervention to bolster student success and retention rates in specific majors. They employ combinations of different approaches, including short (less than two-week) orientation sessions or multiple-week summer programs in conjunction with freshman year seminars and/or specific course loads; and sometimes even complete undergraduate academic intervention (Chevalier et al., 2001; Fletcher et al., 2001b; Gordon & Bridglall, 2004; Malave & Watson, 1998; Reyes et al., 1998). Participation in a first-year seminar has been shown to have a statistically significant positive impact on student academic success and retention (House & Kuchynka, 1997; Minchella et al., 2002). Longer-term bridge and orientation programs are common and effective in specific fields and/or for targeted groups, such as all engineering majors (Soulsby, 1999), minority engineering (Grimm, 2005; Marable, 1999; Reyes et al.,
women in engineering (Fletcher et al., 2001a), and first-generation college attendees (Pascarella et al., 2004).

Two short engineering programs show some similarities to the short, intensive structure of the BIOS Program. The FORTRAN Programming Course “Boot Camp” at the University of South Florida in Tampa (Fujinoki et al., 2001) for undergraduate computer science and engineering majors provides a 3-day workshop to prepare students for the mandatory first course in the major. The authors compare subsequent grades of participants and non-participants, and further offer the utilization of observational study (Cochran, 1965) to help remove the potential bias of self-selectivity of program participants. Using “matched sampling” Fujinoki, et al., demonstrated that their campers were twice as likely to stay in the required course as non-campers (p. 9). The other short program is the Discover Engineering (DE) Program at the Massachusetts Institute of Technology. This program is four to five days and includes content, faculty and graduate student participation, and social activities. After participation in the program, enrollment in subsequent courses went from 29% to 72% of the entering class (Thompson & Consi, 2007). The MIT DE Program is part of a campus-wide Freshman Pre-Orientation Program network in several areas that allow over half the incoming freshman class each year to gain college experience before their first fall semester.

Freshman programs contribute greatly to the success rate and retention of students in science and engineering majors, and Schools of Engineering have taken the lead in bridge programs for incoming majors. The three-day SUCCESS Week at Southern Illinois University Carbondale, offers a short, intensive timeframe with more social and fewer academic activities (Chevalier et al., 2001) than in BIOS. This program begins the week before classes in the fall semester and the main focus is to provide “a solid footing in the academic and social activities within the College of Engineering and among their peers” (Chevalier et al., 2001, p. 1). Hands-on engineering projects during the week offer students group interaction as well as academic support. Program administrators tracked students to degree and showed a
trend toward higher retention rates among participants. They report that the fourth year retention rate for their 1996 cohort was 36% versus 24% for non-participants.

Women in Applied Science and Engineering (WISE) at Arizona State University sponsors a Summer Bridge Program for incoming female engineering majors (Fletcher et al., 2001a). This program is also held the week before the freshman fall semester, and offers reviews in science courses as well as computer sessions and student services. This bridge program serves as the first step in continuing support for participating students in the program. WISE program administrators credit these efforts for both an increase in the enrollment of women in the engineering program (up from 17% in 1992 to 21% in 2000) and an increase in retention rates (up from 52% in 1992-95 to 64% in 1996-99).

The NSF Foundation Coalition, made up of engineering groups from Arizona State University, Maricopa Community College District, Rose-Hulman Institute of Technology, Texas A&M University and the University of Alabama, was established to produce innovative models of education in their engineering majors. In a two-step approach, this group worked to create a bridge program for incoming majors, as well as provide an overall strategic plan to revamp the entire undergraduate engineering curriculum (Frair et al., 1997).

The Freshman Integrated Curriculum at Texas A & M University (Malave & Watson, 1998) provides a common curriculum for all engineering students, beginning with the freshman year. Tracking of upperclassmen that had been in the program from the beginning of their college careers showed 10-15% higher freshman GPAs and grades through their first two years than non-participants.

A first year course-specific one-credit seminar at Purdue University (Minchella et al., 2002) combines academic and orientation aspects for freshman biology majors. Program participants did significantly better on exams in Introductory Biology and on final grades for that course. Retention rates in the major after three semesters were 48% for the participants and 36% for non-participants.

A freshman bridge program and seminar course at Arizona State University from the Office of Minority Engineering Programs (Reyes et al., 1998) was created to increase enrollment and retention of
minority engineering students. Their retention rates in the first year were 66% for program participants and 54% for non-participants.

At the University of Connecticut an optional first year course for freshman engineering majors has contributed to a 10% increase in retention of students in the engineering major after their freshman year (Soulsby, 1999).

**Assessment**

University administrations are beginning to make changes in an effort to transform higher education into a more useful endeavor to students, but to date there is very little published literature about how changes affect students (Astin et al., 2002). To alleviate this information vacuum, institutions have begun to put pressure on their faculty and staff to prove the worth of orientation programs (Upcraft et al., 2005). In addition, funding entities such as the Howard Hughes Medical Institute and other national agencies, have begun to stress that “assessment is essential to program planning and implementation, and necessary for funding agencies to evaluate the effectiveness of programs” (Felix et al., 2004, p. 189). In a May 2007 report on the effectiveness of federally-financed programs to improve science and math education, the US Department of Education reports that only 10 of the 115 programs reviewed had adequate scientific assessment (Report of the Academic Competitiveness Council, 2007).

In *Challenging and Supporting the First-Year Student: A Handbook for Improving the First Year of College*, Upcraft outlines the following model for assessment of freshman orientation programs:

1. Use existing institutional databases to learn and disseminate information about entering first-year classes, such as demographics, characteristics, academic preparation, and fields of study. When possible, compare current first-year students with previous cohorts.

2. Assess first-year student needs. This is best done by conducting focus groups or surveys of students after they have completed their first term or at the time they leave the institution.
3. Assess the satisfaction of first-year students with orientation programs and services. Immediate feedback may be gathered at the time of the program and web-based surveys administered at a later date.

4. Assess orientation outcomes. It may be very important to assess the relationship, if any, between participation in orientation and some desired outcome, such as learning, academic achievement, or persistence into the second year of college. These studies are difficult to conduct, but may be the most important of all efforts to assess the impact of orientation.

5. Assess orientation using national standards. The CAS standards may be used as a yardstick for assessing individual institutional efforts in orientation. These standards include assessment guides that provide valuable tools for program staff and advisory committees (Upcraft et al., 2005, p. 406).

   Assessment must be long term and based on well-documented theories to be effective. Making inferences with one-shot cross-sectional assessment can be a misleading snapshot of student success (Astin & Lee, 2003). Producing a program theory on which to base the evaluation of a program can provide the researcher with specific guidelines for assessing, improving and duplicating the program (Weiss, 1997). Wholey further articulated mechanisms for outlining the continued assessment of a program by the use of a logic model, which offers thorough formative and summative assessment along the planning and implementation process (Wholey et al., 2004).

   Few program administrators publish follow-up on their programs’ effectiveness. However, the WISE program at Arizona State University (Fletcher et al., 2001b) provides some assessment information. Although the authors did not show extensive data, the trends showed a marked increase in retention of women in the engineering major during the years after WISE began, 80% in 1998 and 70% in 1999, as compared with 60% of non-bridge participant women entering in the falls of 1998 and 1999.
Summary

This review of the literature demonstrated that incoming freshmen are not adequately prepared for college work, but that a college education is becoming increasingly important to prepare individuals to be successful in the workforce. Students do not understand what is expected of them, and this problem is confounded by unreliable advice from parents and high school faculty. Several factors contribute to the success and retention of college students, including academic ability and preparation, as well as learning styles and emotional health. In order to help students to transition from high school to college, universities employ various bridge and freshman programs. Standards for these programs indicate that they should also prepare the student for opportunities at the institution, as well as begin the process of integrating the student into the culture of the institution. Freshman programs take several forms, including summer-long academic camps, short, intensive workshops and first semester freshman seminars. Assessment of these programs is vital to the student and the institution, but to date little has been published about how they affect student success and retention.

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Engaged Learning: Fostering Success for All Students. (2004).). Indiana University: Center for Postsecondary Research, School of Education.


Program at the University of Maryland–Baltimore County. Baltimore, IL: University of Maryland–Baltimore County.


CHAPTER 3.

METHODS

Population and Sample

The target population for this study was defined as all incoming freshman biological sciences majors at a research extensive university. The accessible population was defined as all incoming, first-time freshmen at a research extensive university in the fall semesters 2005 and 2006, who self-identified as biological sciences majors (including “biology,” “biochemistry,” “microbiology,” or “pre-medicine”) and who pre-enrolled in the Introductory Biology for Science Majors course (BIOL 1201) for the upcoming fall semester, or who, because of an ACT score below the 23 prerequisite for immediate enrollment in BIOL 1201, were enrolled in CHEM 1201 and intended to enroll in BIOL 1201 in the subsequent spring semester. For the purposes of this study ACT scores were used, and the ACT equivalent for SAT scores were determined using a standard conversion chart ("ACT-SAT Concordance Table", 2008) (Appendix 1). The sampling plan consisted of the following steps:

1. Participants in this study were recruited by several methods to participate in an optional one-week intensive program to help prepare them for the transition from high school to college: a) during the university’s Spring Testing session for high achieving students, program staff spoke to prospective biology students and their parents at the respective meetings of those groups; b) during each of the summer orientation sessions program staff talked with students and parents; and c) through mass e-mails sent to all incoming freshmen that identified themselves a biological sciences major (biology, biochemistry, microbiology, pre-medical) (Appendix 2). The Office of Undergraduate Admissions provided this email address list. The email included a flyer in PDF format that was also available in print form at all student informational sessions (Appendix 3).

2. Program participants were chosen on a first come/first served basis, and enrollments were set at 60 students in 2005 and 120 in 2006. A control group was constructed that was composed of two groups of students: a) students who were similar to the BIOS group in high school GPA, ACT/SAT score, major,
and gender, that were selected by a staff member from the university’s Office of Testing and Measurements and whose identities remained anonymous to the researchers, and b) students who applied after the enrollment caps were reached and were placed on a waiting list but ultimately not accepted into the program.

3. Participants were required to be biology majors, as shown by being enrolled in the introductory biology course for science majors (BIOL 1201) for the upcoming fall semester. The vast majority of incoming freshman students had registered for their fall classes during Spring Invitational or during on one of the summer orientation sessions. BIOL 1201 class rosters were checked on a regular basis to ensure that applicants were enrolled. For the few students who had not signed up for classes by the program application deadline, they were tentatively accepted into the program, pending their enrollment in introductory biology.

4. An application in PDF format was available online at the program website (Appendix 4): http://www.biology.lsu.edu/introbio/bios/home.htm. Information from previous programs (as available) as well as a “Frequently Asked Questions” (FAQ) page were also available (Appendix 5). Students had the option of completing the submission online or printing off and faxing the form to the program office (Appendix 6).

Follow-up correspondence to keep students apprised of their application status included the following:

<table>
<thead>
<tr>
<th>Appendix #</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>BIOS Liability Release Form</td>
</tr>
<tr>
<td>8</td>
<td>BIOS IRB Consent to Participate form</td>
</tr>
<tr>
<td>9</td>
<td>Sample Email Applicant Updates</td>
</tr>
<tr>
<td>10</td>
<td>BIOS 2005 Schedule</td>
</tr>
<tr>
<td>11</td>
<td>BIOS 2006 Schedule</td>
</tr>
<tr>
<td>12</td>
<td>BIOS Campus Map</td>
</tr>
</tbody>
</table>
**Instrumentation**

The instrument used to collect data for this study consisted of a researcher-designed, computerized recording form into which information for the treatment and control groups was downloaded. Data for the treatment group included the following items:

<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information from Program Application</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Item number for sorting purposes</td>
</tr>
<tr>
<td>Housing</td>
<td>Whether or not they opted for campus housing</td>
</tr>
<tr>
<td>Biology major</td>
<td>Whether or not they indicated a major in Biological Sciences (In the end, several students who applied to the program and enrolled in BIOL 1201 were other majors, e.g. Biological Engineering or Kinesiology)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>First Name</td>
<td></td>
</tr>
<tr>
<td>Last Name</td>
<td></td>
</tr>
<tr>
<td>PAWS email</td>
<td>LSU student email address: <a href="mailto:____@lsu.edu">____@lsu.edu</a></td>
</tr>
<tr>
<td>Home address</td>
<td></td>
</tr>
<tr>
<td>Home phone</td>
<td></td>
</tr>
<tr>
<td>DOB</td>
<td>Date of Birth</td>
</tr>
<tr>
<td>SSN/LSUID#</td>
<td>Use of Social Security Numbers to identify students was phased out in 2007 and replaced by a unique LSUID# xx-xxx-xxxx</td>
</tr>
<tr>
<td>High School</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td></td>
</tr>
<tr>
<td>Roommate Preference</td>
<td></td>
</tr>
<tr>
<td>Roommate email</td>
<td></td>
</tr>
<tr>
<td>Student Aid &amp; Scholarship Status</td>
<td>Financial aid status from Student Aid and Scholarships</td>
</tr>
<tr>
<td>Requests Financial aid</td>
<td>Student requests financial aid on application form</td>
</tr>
<tr>
<td>Ok’s SAS check</td>
<td>Permission to check their financial aid status</td>
</tr>
<tr>
<td>Date paid</td>
<td>The date they paid their fee</td>
</tr>
<tr>
<td>Registration</td>
<td>Amount paid</td>
</tr>
<tr>
<td>Housing</td>
<td>Amount paid</td>
</tr>
<tr>
<td>HHMI charge</td>
<td>Amount paid for financial aid by the LSU/HHMI grant</td>
</tr>
<tr>
<td>T-shirt size</td>
<td></td>
</tr>
<tr>
<td>Parents Lunch RSVP</td>
<td></td>
</tr>
<tr>
<td>Liability forms returned</td>
<td></td>
</tr>
<tr>
<td>Medical Alerts</td>
<td></td>
</tr>
</tbody>
</table>

**Information from University Records**

- ACT
- HS GPA
- BIOL 1201 Section

**Information collected during the Program week**

- Group assigned by BIOL 1201 course section for fall
Grad Student Name of graduate students served as the group mentor
Ethnicity

Coursework information gathered in subsequent two semesters from instructors and university records
BIOL 1201 Final Grade
BIOL 1202 Final Grade
1st Fall GPA
1st Spring GPA
2nd Fall GPA
BIOL 2051 Final Grade
BIOL 2153 Final Grade
2nd Spring GPA

The following information was compiled for the control group:

<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSN</td>
<td>Social Security Number</td>
</tr>
<tr>
<td>Gender</td>
<td>Home state</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>act_engl</td>
<td>ACT score on the English Component</td>
</tr>
<tr>
<td>act_math</td>
<td>ACT score on the Math Component</td>
</tr>
<tr>
<td>act_comp</td>
<td>Composite ACT score</td>
</tr>
<tr>
<td>Course</td>
<td>BIOL 1201 section in which they are enrolled</td>
</tr>
<tr>
<td>hs_aca_gpa</td>
<td>High School GPA</td>
</tr>
<tr>
<td>hsrank</td>
<td>High School Rank</td>
</tr>
<tr>
<td>hsclass</td>
<td>Total High School Class Enrollment</td>
</tr>
<tr>
<td>College</td>
<td>In which College are they enrolled? All will be UCFY</td>
</tr>
<tr>
<td>sat_verb</td>
<td>SAT Verbal Score</td>
</tr>
<tr>
<td>sat_math</td>
<td>SAT Math Score</td>
</tr>
<tr>
<td>sat_tot</td>
<td>SAT Total Score</td>
</tr>
<tr>
<td>hsper</td>
<td>Percentage Ranking in High School Class</td>
</tr>
<tr>
<td>instate</td>
<td>Are they considered an instate LA student?</td>
</tr>
</tbody>
</table>

Coursework information gathered in subsequent two semesters from instructors and university records
BIOL 1201 Final Grade
BIOL 1202 Final Grade
1st Fall GPA
1st Spring GPA
2nd Fall GPA
BIOL 2051 Final Grade
BIOL 2153 Final Grade
2nd Spring GPA

Data Collection

Grades were compared during the subsequent academic year in BIOL 1201 (Introductory Biology for Majors I), BIOL 1202 (Introductory Biology for Majors II), BIOL 2051 (General Microbiology) and
BIOL 2153 (Genetics), as well as overall GPAs for the first four semesters. If a student was “on track” to graduate within four years in the biology major, they would be enrolled in one of the sophomore courses within the Biology Major sequence each semester during their second year. Their enrollment, as well as final grade in each course, were recorded. If a student was found not to be enrolled in a biology course, his/her records were checked for a change of major or withdrawal from the university.

Several different qualitative methods were used to assess the value of aspects of the pilot year of the program and then optimized in subsequent years. Focus groups both before and after the program evaluated various aspects of the camp. The focus groups were convened by staff members from the Center for Assessment and Evaluations to assess the impact of the program on the participants during their freshman year. The first session was held on the opening evening of the program (Appendix 13), and the second during the subsequent spring semester. Students completed an Exit Survey (Appendix 14) in the last session of the weeklong program to gauge their immediate reactions to the program. During week 7 of the Fall Semester, the participants were contacted and asked to respond regarding their experience, in the first year by a single open-end question (Appendix 15) and in the second year by an altered version of the Exit Evaluation (Appendix 16).

Data Collection Timeline

Student data was collected on the timeline in Figure 3.1 for each of the two cohorts, incoming class of 2005 and 2006. Final biology course grades, as well as semester and cumulative grade point averages, were compiled in the electronic data instrument. Students’ majors were also checked each semester to note if and when they changed from biological sciences to another major or left the university altogether.

The Treatment

Program Agenda

The program was designed to give the participants a realistic look at the pace of college life. The program began with a check-in dinner on Sunday evening, followed by an evening of introductions and
assessment by way of focus groups. The agenda Monday through Thursday runs from 8:00am through 9:00pm (Appendices 10 and 11). Friday’s schedule ended at lunchtime with a banquet to which their parents were invited.

Students were presented seven 90- to 120-minute lectures from the first weeks of the introductory biology course, along with three short computer-based exams (15 – 20 questions each) on the material. The final exam was comprehensive and computer-based. After each of the exams the results of the exams were discussed with the students as a group.

Along with the biology content lectures, the students had sessions with individuals representing relevant offices around the campus, as well as other professionals who offered advice in specific areas.

The complete program schedule for each year is included in Appendix 10 (2005) and Appendix 11 (2006). Talks that were given included:

**Study Skills Discussion** - note taking, listening, metacognition and learning styles - Associate Dean, University College, and Learning Strategies Counselor.

- **How to be a Student**
  - What are your responsibilities as a student?
  - What is the Center for the Freshman Year?
  - What is the College of Basic Sciences?
  - How do I get help?
  - How do I manage my money?
  - How do I survive?
  - What comes after you graduate?

**Director Career Services, Dean of Students Office**

**Wellness Education Coordinator, Student Health Center**

**Associate Dean, LSU Graduate School**

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Figure 3.1. The timeline for BIOS 2005 and 2006 data collection. Academic data was collected beginning in the first semester of the student’s LSU career.
Graduate students from the Department of Biological Sciences acted as mentors to groups of the program participants during the program. They attended the study hall sessions and were available to help answer questions and explain material. Because the participating students were already registered for their fall classes, they were assigned to groups based on their sections of the upcoming fall introductory biology course. This grouping allowed the students to know a minimum of three or four other students in the introductory class on the first day.

**Program Funding**

The program was primarily self-funded. The registration fee was $350, which included materials, the introductory biology textbook ($135 retail) and meals. Optional housing was available in campus dormitories for $100 for students who wished to live on campus. After the first year, the program operated on a combination of funding sources. Although most students were charged the registration fee, support for students exhibiting “financial need,” as identified by the university Office of Student Aid and Scholarships, was awarded to help offset the costs of participation in the program through funding from an outside grant. With this method, student confidentiality was more easily maintained because program staff did not require access to student financial data.

Arrangements were made with the Offices of Records and Registration and Bursar Operations to charge students the program fees through their student fee billing accounts. Housing was administered through the “Short Courses” office in the LSU Office of Residential Life. Students indicated a desire for housing on their application form, and a complete list of interested students was sent to Residential Life. Students were charged the $100 housing fee on their fee billing accounts, and were assigned to a dormitory room upon notice from the Office of Bursar Operations of receipt of payment.
Institutional Review Board Approval

The primary researcher has completed the *NCI Human Participant Protections Education for Research Teams* online course (Appendix 17), and all assessment instruments have been approved by the LSU Institutional Review Board (#3138 and #3279).

**References**

CHAPTER 4.

BIOLOGY INTENSIVE ORIENTATION FOR STUDENTS (BIOS):
A BIOLOGY “BOOT CAMP”

Introduction

Incoming freshman science majors are increasingly unprepared for college work (Upcraft et al., 2005). The Biology Intensive Orientation for Students (BIOS) Program was designed to give incoming biology majors a short, intensive preview of the expectations in introductory biology at Louisiana State University (LSU) and to help them learn the skills required to succeed in biology, and in college in general. The program combined content lectures, examinations, learning styles assessments, study skills, study hall group work and informational sessions over a period of five days.

Students enter college with optimistic goals of how much they will study as well as unrealistic ideas of how much work will be expected of them by college instructors (Upcraft et al., 2005). They have been successful in high school with minimal effort and see no reason to change their study habits, or lack thereof, for university coursework. Nationwide, 75% of high school graduates enroll in college within two years of high school graduation, and 50% of these must take remedial courses to learn the basic skills of reading, writing and/or math (Somerville & Yi, 2002). Students who have to take more remedial courses will take longer to graduate (Levine & Cureton, 1998). Confounding the student’s misperception of his ability is a perception gap between high school teachers and college/university faculty in how prepared students are for college work (Sanoff, 2006). Over 44% of polled college faculty thought students were not well prepared for college work, while only 10% of the high school teachers questioned indicated they thought students were not well prepared.

Retention of students in the major field of choice, as well as retention at the college or university in general, is of increasing importance to postsecondary institutions (Cuseo, 2003). Retention indicators include: academic preparation (as measured by SAT [ACT] scores); academic ability (as measured by

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high school academic rank (GPA); and confidence in study habits (Tester et al., 2004). The majority of new students entering higher education leave their initial college of choice without a degree and the most critical time is the first year (Cuseo, 2003). The best predictor of student academic success is the individual student’s academic preparation and motivation (Upcraft et al., 2005).

Course failure is costly both to the university and to the student. Nationwide, college remediation is estimated to cost as much as one billion dollars a year (Somerville & Yi, 2002). Duplication of coursework accounts for approximately 20-30% of the enrollment in the first course in LSU’s introductory sequence (BIOL 1201) each semester, according to data from the LSU Office of Budget and Planning ("University & College Trend Data", 2006). Because this and other general science courses have high unmet demand, that is many more students wish to enroll than there are spaces to accommodate, LSU and other large universities waste resources when students drop courses and re-enroll in subsequent semesters. When a student fails or drops a required course he/she must enroll in that class again.

In the past few years, over 25% of students in LSU’s Introductory Biology for Science Majors I (BIOL 1201) have been unable to earn a C or better grade in the course, leading to a high DFW rate (grade of “D”, “F” or Withdrawal from the course) ("University & College Trend Data", 2006). Although many factors are likely involved in this high DFW rate, one critical factor seems to be the time required for new students to learn and implement the skills required to meet the expectations of college courses (Upcraft et al., 2005). Because they lack an understanding of the expectations and the skills they need, many capable students perform poorly on the first, and sometimes second, exam. As a result, these students either drop the course or finish the semester with a low grade ("University & College Trend Data", 2006). Students in general are taking longer to graduate. A 1998 report stated that fewer than 2 of 5 are able to graduate in 4 years (Levine & Cureton, 1998). At LSU the 1998 four-year graduation rate was 23.7%, with only 57.5% graduating after six years. The 2002 class at LSU graduated only 26.2% of its students on track ("University & College Trend Data", 2006).
The BIOS Program has shown that a one-week intensive orientation can positively impact the long-term success of biological science majors at Louisiana State University. The students who participated in the pilot year of the program showed increases in their introductory biology course grades, overall GPAs and retention in the major and at the university.

**Methods**

**BIOS Recruitment**

All LSU incoming freshmen biological sciences majors were eligible to apply participate in BIOS. Students were recruited through e-mails sent to all incoming freshmen that identified themselves as a biological sciences major (biology, biochemistry, microbiology, pre-medical, pre-dental). A single face-to-face recruitment drive was conducted during LSU’s Spring Invitational orientation session for high achieving students. Participants were chosen on a first come/first served basis to a maximum of 60 students; these students were supposed to be registered as biology majors and enrolled in BIOLS 1201 for the fall 2005 semester. Fourteen additional applicants were placed on a waiting list, but were not able to be admitted. The wait-listed students agreed to serve as part of the control group in assessing the success of the BIOS participants.

**BIOS Funding**

The BIOS Program was entirely self-funded. The registration fee was $350, which included materials, the BIOL 1201/1202 textbook ($135 retail) and meals. The fee also funded instructor and graduate students’ stipends, as well as other program costs. Housing was available for an additional $100 for students who wished to live on campus.

**BIOS Agenda**

The 2005 BIOS Program was designed to give participants a realistic look at the pace of college life. The program dates corresponded with the beginning of the fall semester, therefore BIOS was conducted during the last full week before the fall semester in order to help the participants to retain as
much of the program content as possible into the fall, as well as to facilitate a smooth transition to fall
dormitory assignments for those who opted for BIOS housing.

The program began with a check-in dinner on Sunday evening, followed by an evening of
introductions and assessment by way of focus groups. The agenda Monday through Thursday went from
8:00am to 9:00pm. Friday’s schedule ended at lunchtime with a banquet to which their parents were
invited.

Dr. E. William Wischusen, Coordinator of the Introductory Biology Program and instructor in
BIOL 1201, presented seven 90- to 120-minute lectures from the content normally presented during the
first weeks of BIOL 1201, along with three short computer-based exams (15 – 30 questions each) on the
material. The final exam was comprehensive. After each of the exams the scores and exam questions
were discussed with the students as a group.

Along with the biology content lectures, the students were given presentations by individuals
representing relevant offices around the LSU campus, as well as other professionals who offered advice in
specific areas. The complete BIOS schedule follows as Appendix 10. Talks were given as follows:

*Study Skills Discussion* –

- Note taking, listening, metacognition
  
  Associate Dean, University College

- Learning styles
  
  Learning Strategies Counselor, University College

*How to be a Student* –

- What are your responsibilities as a student?
  
  Dean, College of Basic Sciences

- What is the Center for the Freshman Year?
  
  Associate Dean, University College

- What is the College of Basic Sciences?
  
  Counselor, College of Basic Sciences

- How do I get help?
  
  Director Career Services, Dean of Students

- How do I manage my money?
  
  Vice president, local bank

- How do I survive?
  
  Wellness Education Coordinator, Student
Five graduate students from the Department of Biological Sciences acted as mentors to groups of the BIOS participants during the program. Because the BIOS students had already registered for their fall classes, the BIOS students were assigned to groups based on their sections of BIOL 1201. Each group had three to five members, and each graduate student was given oversight of three groups. These groupings allowed the BIOS students to know a minimum of three to five other students who were also enrolled in the introductory class before the first day of class. This strategy enhanced the creation of “Learning Communities” which has been shown to give students a sense of belonging and contributes to retention rates (Laufgraben & Shapiro, 2004). The graduate students attended the study hall sessions and were available to help answer questions and explain material.

**BIOS Assessment**

Several different methods were used to assess the value of the pilot year of the BIOS Program. A control group (n=56) was selected by staff members in the LSU Center for Assessment and Evaluations (CAE) consisting of BIOL 1201 students who had not participated in BIOS, but were academically matched (high school GPA, ACT or SAT score, major and gender) to the BIOS participants. We also included the students who were on the BIOS waiting list (n=14) because their inclusion would help to alleviate the variable of self-selection bias that often plagues studies into which participants must enroll themselves. There were no statistical differences between the control and BIOS groups in either ACT Score or High School GPA (Table 4.1).

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>ACT Score</th>
<th>High School GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS</td>
<td>58</td>
<td>26.54</td>
<td>3.65</td>
</tr>
<tr>
<td>Control</td>
<td>70</td>
<td>26.87</td>
<td>3.64</td>
</tr>
<tr>
<td>All BIOL 1201</td>
<td>1,097</td>
<td>26.32</td>
<td>3.48</td>
</tr>
</tbody>
</table>

Table 4.1. Comparisons of BIOS, Control and all BIOL 1201 class enrollments.
Exam grades of BIOS students during the subsequent fall semester in BIOL 1201 were compared to those of students in the Control Group. In addition, final grades for the fall and spring semesters in BIOL 1201 and 1202, and overall GPAs for both semesters of BIOS versus control group were analyzed. Biology majors within the two groups were tracked into the fall semester of their sophomore year in order to assess the rates at which they remained in the biology major, as well as stayed on track toward graduation within four years. To remain on track, LSU biological sciences majors are enrolled in one of two sophomore biology courses during each semester of their second year, General Microbiology (BIOL 2051) and Genetics (BIOL 2153). Students who were not enrolled in either of these courses in the fall semester of their sophomore year were considered off track but will be followed in subsequent semesters to ascertain whether they remain in the major and enrolled at the university.

To gain qualitative assessment of the immediate reactions to the BIOS program, students completed an Exit Survey in the last session of the weeklong program. Focus groups both before and after the program evaluated various aspects of the camp. The focus groups, convened by staff members from the CAE, were used to assess the impact of BIOS on the participants during their freshman year. The first focus group session was conducted during the opening evening of the program, and the second focus group session was conducted during the subsequent spring semester.

**Results**

**BIOL 1201 Grade Comparisons**

Of the 60 students accepted into the program, 59 completed the program and enrolled at LSU, 58 enrolled in BIOL 1201 during the fall semester. (One student did not matriculate into LSU and one who completed BIOS did not enroll in BIOL 1201 in the fall). The performance of these 58 students on the
first and second exams and final grade in BIOL 1201 was tracked during the fall semester and compared to the control group (n=70). Overall fall and spring semester GPAs were also compared.

The BIOS participants performed significantly better on the first exam (89.13 versus 79.29, p<0.001, Mann-Whitney U) and second exam (85.02 versus 79.30, p<0.011, Mann-Whitney U), and also had a higher final course average than the students in the Control Group (86.30 versus 81.95, p<0.034, Mann-Whitney U) (Figure 4.1).

![Figure 4.1. Comparisons of average grades on BIOL 1201 exams 1 and 2, and final course average (Mean ± SE) for all BIOS participants (n=58) (Dark Bars) and all Control Group students (n=70) (Light Bars). *Significantly different from Control group (p < 0.05, Mann-Whitney U).](image)

The average final grade for the BIOS participants was also higher than the Control Group (3.21 versus 2.95, p<0.001, Mann-Whitney U). We compared the Fall 2005 semester GPA for each group and the mean semester GPA for the BIOS participants was 3.34 versus 3.09 for the Control Group students and 2.90 for all BIOL 1201 students. These values were not statistically different (p=0.051, Mann-Whitney U) (Figure 4.2).

At the end of Spring Semester 2006, we compared the performance of the students from both the BIOS and control groups who took the second semester continuation of introductory biology (BIOL 1202), as well as their semester and overall GPAs. No significant differences were observed in the
performance metrics between these groups. However, these comparisons were confounded by the fact that only students successful in BIOL 1201 continued on in BIOL 1202. In an effort to assess the overall impact of this program on student success in the two-semester biology sequence, we compared the cumulative success rates (completing the course/s with an A, B, or C) of BIOS participants to those of the Control Group (Figure 4.3), as well as the total course enrollments. The BIOS participants had higher success rates for both BIOL 1201, 93.10% (n=54/58) versus 81.43% (n=57/70) (p<0.015, Binomial test) and 1202, 77.59% (n=45/58) versus 62.86% (n=44/70) (p<0.015, Binomial test).

In addition, the number of BIOS biology majors remaining on track in the major as of the fall semester of their sophomore year was significantly higher than the Control Group biology majors (Figure 4.4). In the two introductory courses, there was no significant difference in the retention rates between the two groups (BIOL 1201 p=0.176, BIOL 1202 p=0.059, Binomial test). However, by the first semester of the sophomore year there was a significant difference between the two groups. In the BIOS group 31 of 52 biology majors (60%) successfully completed either General Microbiology (BIOL 2051) or Genetics (BIOL 2153), while only 21 of 54 Control biology majors (39%) successfully completed one course or the other (p=0.001, Binomial test).
Exit Survey

During the last session of the program, students completed an Exit Survey to assess their immediate feelings regarding BIOS. Their responses indicate that the BIOS Program was a success and would be a benefit to future classes of biological sciences majors, as well as to other students across the LSU campus. Answers to specific questions indicate that:

- 87% said the program clarified expectations of them as students
- 69% said they gained a great deal in their study skills
- 74% felt much more comfortable taking college exams
- 70% felt better about their abilities to study
- 72% stated that they had much greater self-confidence for the upcoming semester

Students were asked about their general BIOS experience. To the question about “in hindsight, would you do BIOS again?” 51 of 54 responded yes, while only three indicated that they would be unlikely to choose to participate again. The last three questions on the survey asked for their favorite and least favorite parts of BIOS, and then advice to help improve the program for next year. Sample answers included:

Figure 4.3. Percent of students successfully completing BIOL 1201 and 1202 (with a grade of A, B or C). BIOS participants (n=58) (Dark Bars) and Control students (n=70) (Light Bars). *Significantly different from Control (p<0.05, Binomial test).
Favorite:

Being able to get ahead in the college “experience”

Going home to study – doing it the wrong way and bombing the test which sounds awful but I know now what I need to do to improve myself

Getting to know faculty and other students early

Least Favorite:

The long schedule

Some of the How to be a Student sessions were repetitive

Study hall. I want to study by myself

Advice for Next Year:

Do more “fun” activities and less how to study

Possibly making the BIOS program longer so we could have more time learning more topics

Some kind of hands on or lab introduction

Figure 4.4. The percent of biology majors in each group, BIOS (Dark Bars) and Control (Light Bars), succeeding (achieving a grade of A, B, or C) in each of the Introductory Biology Courses (BIOL 1201 and 1202) and the first biology course of the fall sophomore year (either BIOL 2051, Microbiology, or BIOL 2153, Genetics). Incoming freshman BIOS biology majors n = 52; Control biology majors n = 54. *Significantly different from Control (p<0.05, Binomial test).
Focus Groups

Each student who attended the BIOS camp participated in a focus group on the first evening of the program designed to offer insight into their preparedness for studying in college. In the fourth week of the subsequent spring semester 12 students were randomly chosen by staff members from the LSU Center for Assessment and Evaluation (CAE) to participate in a second focus group to assess students’ self-analysis of the effectiveness of BIOS.

We had hypothesized that a major reason for many new students’ lack of success in entry-level Biology classes is their lack of effective study habits. These focus groups were an attempt to address the validity of that hypothesis. The protocol was created by the CAE with our input.

The results from the initial focus group as compiled by the CAE staff suggest that the students who came to Biology Boot Camp were poorly prepared to study in college. The focus group facilitators report that the students’ responses indicate that they had never been taught systematic ways to listen, take notes, study textbooks, or retain material. They seem eager to learn, but they simply do not know how. They have never developed a regular study schedule, and they seem to think study is something one only does as an act of desperation when a test approaches. In high school they typically relied on rote memorization to get them through tests. They never learned to analyze data through utilization of higher order thinking skills. These traits are likely to be major factors affecting their success in introductory college biology courses.

Answers to the specific questions indicated several problem areas including the following:

Most only studied 2-3 hours per week, and the majority agreed that they almost never studied on weekends.

The most common study aids were flashcards and rereading lecture notes.

The most common note taking was verbatim from lecture or board.

Several students indicated that studying helped them to feel more prepared, but they agreed that this did not always result in better grades.
Almost none of the students interviewed had used any reading/note taking/study skill aids, such as SQ3R, Brainstorming, Charting Data, Distractions List, Cornell or T-Notes.

By the second focus group students’ perceptions of what was required for success had changed. All of them credited the BIOS Program for making them realize that the playtime atmosphere of high school was over and that college biology was going to require a quantum leap in effort just to keep up in class. Most of the students interviewed felt that the Biology Boot Camp was a “kick start” to their college career. Without exception they cited the vast difference in pace of a college biology class from a high school class. Several told stories of their non-boot-camp colleagues getting off on the wrong foot because they were not used to the pace of their biology class. They cited the advantages to BIOS as: 1) making them aware of the accelerated pace of college so as not get off to a bad start 2) covering much of the same lecture material that was covered in class prior to the first test, making the first test less intimidating to participants, and 3) helping familiarize them with the location and procedures for computer-based testing. On the whole, they cited the camp’s bringing them to the realization that study for college classes must be an everyday process. Students mentioned also that BIOS made them realize how important it would be to pay attention during lectures in order to avoid falling behind. Program attendees were quick to point out that many of their classmates who did not attend the camp have to learn these lessons the hard way by failing the first test.

Participants in the second focus group also pointed out their change in attitude toward study groups. While most of the BIOS students tended to study alone, when they did study in groups they often sought out people from their camp experience as study partners. Those who preferred group study always studied with their former Boot Camp colleagues.

7th Week Email Responses

During Week 7 of the Fall 2005 Semester, BIOS participants were contacted by email and asked to respond to the following question: “Please send me back any feedback you think would be useful for next year's freshmen, what did we do right, what could we have done better, was BIOS worth a week of
your summer in hindsight?” Fifteen students responded and their email messages are attached as Appendix 20.

In the email responses several students commented that the advantage of BIOS was getting part of the coursework ahead of time (See students #1, 2 and 4) and cited this as the reason they performed well on the first BIOL 1201 exam, Others pointed to their new understanding and practice of study skills, commenting that they also did better in their other first semester classes as well (See students #4, 5, 6 and 7).

Friendships and study groups that were formed during BIOS lasted into the fall semester (See students #2, 3 and 4). Student #8 indicated a particularly strong study group tie. He summed up his feelings by saying “To this day, over half way through the semester, some of my best friends are the ones I made at BIOS.”

Discussion and Conclusions: The Future of BIOS

The success of students who participated in the pilot year of the BIOS Program supports our hypothesis that a one-week orientation can have a beneficial impact on student performance and retention. The BIOS participants scored better on BIOL 1201 exams (89.13 versus 79.29 on the first exam and 85.02 versus 79.30 on the second) and had higher final grades in the introductory biology course (86.30 versus 81.95). It could be argued that the differences in the first exam scores were due to repetition of content covered in BIOS, but the increase, although less, persists through the second exam in the course. Perhaps the most striking difference between the BIOS students and their academic matches is the persistence in the major into the sophomore year. At LSU, in order for a student to be considered on track to graduate in the biological sciences major in four years, he or she must complete the core sequence of four courses by the end of the sophomore year. These courses are Introductory Biology (BIOL 1201 and 1202), General Microbiology (BIOL 2051) and Genetics (BIOL 2153). The BIOS participants showed a significantly higher rate of being on track by their third semester of college than students in the Control Group.
Evidence for the value of freshman enhancement programs is documented in the literature. However, the BIOS Program at Louisiana State University appears to be unique in its one-week intensive approach. Only one other short program, the three-day SUCCESS Week at Southern Illinois University Carbondale, offers a similar timeframe but more social and fewer academic activities (Chevalier, et. al, 2001). That program reported a 12% increase in total retention over four years. Early in our tracking BIOS students show a total increase of 21% over the Control Group.

There is little in the literature describing a one-week stand-alone intensive format similar to BIOS. Administrations of many universities across the US have recognized the need for some sort of intervention to bolster student success and retention rates in specific majors. They employ combinations of different approaches, including short (less than two-week) orientation sessions or multiple-week summer programs in conjunction with freshman year seminars and/or specific course loads; and sometimes even complete undergraduate academic intervention (Chevalier et al., 2001; Fletcher et al., 2001b; Gordon & Bridglall, 2004; Malave & Watson, 1998; Reyes et al., 1998). Participation in a first-year seminar has been shown to have a statistically significant positive impact on student success (House & Kuchynka, 1997; Minchella et al., 2002). Longer-term bridge and orientation programs are common and effective in specific fields and/or for targeted groups, such as all engineering majors (Soulsby, 1999), minority engineering (Reyes et al., 1998), women in engineering (Fletcher et al., 2001a), and first-generation college attendees (Pascarella et al., 2004).

Examples of well-assessed freshman enhancement programs include the following:

1. The three-day SUCCESS Week at Southern Illinois University Carbondale, offers a short, intensive timeframe with more social and fewer academic activities (Chevalier et al., 2001) than in BIOS. This program begins the week before classes in the fall semester and the main focus is to provide “a solid footing in the academic and social activities within the College of Engineering and among their peers” (Chevalier et al., 2001, pp. 7E8-1). Hands-on engineering projects during the week offer students group interaction as well as academic support. Program administrators tracked students to degree and showed a
trend toward higher retention rates among participants. The fourth year retention rate for the 1996 cohort was 36% versus 24% for non-participants.

2. Women in Applied Science and Engineering (WISE) at Arizona State University sponsors a Summer Bridge Program for incoming female engineering majors (Fletcher et al., 2001a). This program is also held the week before the freshman fall semester, and offers reviews in science courses as well as computer sessions and student services. This bridge program serves as the first step in continuing support for participating students during the academic year. WISE program administrators credit these efforts for both an increase in the enrollment of women in the engineering program (up from 17% in 1992 to 21% in 2000) and an increase in retention rates (up from 52% in 1992-95 to 64% in 1996-99).

3. The Freshman Integrated Curriculum at Texas A & M University (Malave & Watson, 1998) provides a common curriculum for all engineering students, beginning with the freshman year. Tracking of upperclassmen who had been in the program from the beginning of their college careers showed 10-15% higher freshman GPAs and grades through their first two years than non-participants.

4. A first year course-specific one-credit seminar at Purdue (Minchella et al., 2002), combined academic and orientation aspects for freshman biology majors. Program participants did significantly better on exams in Introductory Biology and on final grades for that course. Retention rates in the major after three semesters were 48% for the participants and 36% for non-participants.

5. A freshman bridge program and seminar course at Arizona State University (Reyes et al., 1998) was created by the Office of Minority Engineering Programs to increase enrollment and retention of minority engineering students. Their retention rates in the first year were 66% for program participants and 54% for non-participants.

6. At the University of Connecticut an optional first year course for freshman engineering majors has contributed to a 10% increase in retention of students in the engineering major after their freshman year (Soulsby, 1999).
We placed the BIOS participants in groups according to their sections of BIOL 1021 for the fall semester in order to facilitate the formation of study groups. Based on student comments they have formed and sustained “learning communities” through their freshman year. Subjective answers to the qualitative questions in the Exit Evaluation and the 7th week email question indicated that they learned valuable study habits and felt more comfortable about starting college than they had before BIOS.

Our evaluation of the pilot year of this program revealed three areas of concern for subsequent years: 1) The short term nature of the assessment, 2) the impact of the cost of the program on student participation, 3) the potential of the program to gain administrative support and become more sustainable. To address these concerns we plan the following:

1) The BIOS staff will continue to track student progress. Studies have shown that “one-shot” assessments to gauge student success in college become problematic (Astin & Lee, 2003). We plan to track 2005 BIOS participants, as well as those in subsequent years, as to overall GPAs and retention rates among science majors, to offer areas for continued improvement of the program, and offer input for institutional change at Louisiana State University.

2) There are arguments for two different mechanisms of funding - institutional support versus student payment (Upcraft et al., 2005). Miller (2003) stresses that funding should impose as little financial burden on students and their families as possible, but research suggests that large public institutions tend toward funding by registration fees (Strumpf & Wawrynski, 2000). In the future, the LSU BIOS Program will operate on a combination of funding sources. Although most students will still be charged the registration fee, support for students exhibiting “financial need,” as identified by the LSU Office of Student Aid & Scholarships, will be awarded $250 scholarships to participate in BIOS through funding from a grant to LSU from the Howard Hughes Medical Institute through the Undergraduate Biological Sciences Education Program.

3) Due to the apparent success of the BIOS program, LSU and College of Basic Sciences administrators have encouraged us to expand the program (e.g., the 2006 BIOS Program had an
enrollment cap of 120 students instead of 60) and plan to continue to support it in the future in several ways, including adding the scholarships mentioned in #2 to the HHMI grant proposal, support for on-going assessment and expanding the concept to other departments and colleges across the campus. The College of Engineering has recently received an NSF-STEM grant that includes an engineering counterpart to the biology program. These two boot camps will share programmatic components where appropriate in the Fall 2007. Other departments, such as Chemistry, Geology and Geophysics and Mathematics, are closely observing the BIOS program to modify the model to help their incoming majors.

References


CHAPTER 5.

IMPACT OF A SHORT PRE-FRESHMAN PROGRAM ON RETENTION

Introduction

In an effort to improve the success and retention of Biology Majors the authors developed a one-week content and learning skills orientation program at Louisiana State University (LSU). The Biology Intensive Orientation for Students (BIOS) Program gives incoming Biology Majors a short, intensive preview of the expectations of the introductory biology course at LSU and helps them learn the skills required to succeed in biology courses and college. The program combines content lectures, examinations, learning styles assessments, study skills discussions, group work, and informational sessions, over a period of five and a half days.

In Phase 1 of this study (Wischusen & Wischusen, 2007) we reported the success of students during their first three semesters. The 2005 cohort showed improved grades and success rate in introductory biology courses, and this trend continued during their third semester biology courses (the first semester of their sophomore year). The 2006 cohort showed the same trend through their first semester. Phase 2 includes subsequent tracking of these students through two full years (4 semesters) of college in order to study the potential longer-term impacts of a short, intensive program.

Major national reports cite the need to increase the numbers of students pursuing bachelor and advanced degrees in science and math (Augustine, 2006; Stryer et al., 2003). The solution on which these and many other reports have focused involves increasing the numbers of students entering baccalaureate degree programs in science and mathematics, “expanding the pipeline”. In addition to this, it is important to find ways to retain the students currently pursuing science and math degrees, “plugging the leaks in the pipeline”. Retention of students in the major field of choice, as well as retention at the college or university in general, is of increasing importance to postsecondary institutions (Cuseo, 2003). University-level retention predictors include academic preparation (as measured by SAT or ACT scores), academic

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ability (as measured by high school academic ability [GPA]), learning styles, motivation (Garton et al., 2000; Upcraft et al., 2005), and confidence in study habits (Tester et al., 2004). Studies show that over 50% of new students entering higher education in the US leave their first institution without completing a degree, and over 42% leave higher education altogether (Cuseo, 2003). This is also the case at LSU (LSU Office of Budget at Planning, 2008), and in all cases the most critical time is the first year (Lee, 1999).

Student failure in courses is costly both to the university and to the student. Nationwide, college remediation is estimated to cost as much as one billion dollars a year (Somerville & Yi, 2002). Retaking coursework accounts for approximately 20-30% of the enrollment in BIOL 1201, the first course LSU’s introductory sequence, according to data from the LSU Office of Budget and Planning ("University & College Trend Data", 2006). Because this and other general science courses have high un-met demand, that is many more students wish to enroll than there are spaces to accommodate them, LSU and other large universities waste resources when students drop courses and re-enroll in subsequent semesters. When a student fails or drops a required course he/she must enroll in that class again, thus delaying progress toward graduation. Not only is this costly from a resource perspective, but this increase in the time to degree ultimately results in many students being discouraged due to slow degree progress and ultimately changing majors and thereby reducing the retention of students in the major. Students in general are taking longer to graduate. A 1998 report stated that fewer than 2 in 5 are able to graduate in 4 years (Levine & Cureton, 1998). Graduation rates at Louisiana State University are equally striking ("University & College Trend Data", 2005).

In the past few years, over 25% of students in LSU’s Introductory Biology for Science Majors I (BIOL 1201) have failed to earn a grade of C or better in the course, leading to a high DFW rate (grade of “D”, “F” or Withdrawal from the course) ("University & College Trend Data", 2006). Although many factors are likely involved in this high DFW rate, one critical factor is the time required for new students to learn and implement the skills required to meet the expectations of college courses (Upcraft et al., 2005). Because they lack an understanding of the expectations and the skills they need, many capable
students perform poorly on the first, and sometimes second, exam. As a result, these students either drop the course or finish the semester with a low grade ("University & College Trend Data", 2006).

Students in general are taking longer to graduate. A 1998 report stated that fewer than 2 in 5 are able to graduate in 4 years (Levine & Cureton, 1998). Graduation rates at Louisiana State University are equally striking ("University & College Trend Data", 2005).

Students enter college with optimistic goals of how much they will study as well as unrealistic ideas of how much work will be expected of them by college instructors. They have been successful in high school with minimal effort and see no reason to change their study habits, or lack thereof, for university coursework (Upcraft et al., 2005). Parental expectations are high. Nine out of ten sixth through twelfth graders had parents who expected them to continue their education beyond high school (Lippman et al., 2008). Nationwide, 75% of high school graduates enroll in college within two years of high school graduation, and 50% of these must take remedial courses to learn the basic skills of reading, writing and/or math (Somerville & Yi, 2002). Students who have to take more remedial courses will take longer to graduate (Levine & Cureton, 1998). Confounding the student’s misperception of his ability is a perception gap between high school teachers and college/university faculty regarding how prepared students are for college work (Sanoff, 2006). Over 44% of polled college faculty thought students were not well prepared for college work, while only 10% of the high school teachers questioned indicated they thought students were not well prepared. In a survey of new freshmen at Wayne State University, respondents to the questions “What is the one piece of information that you think is most important for an incoming college student to know? Why?” typical responses included “Go to class,” “Get out there and meet new people,” “Know where and how to get help,” (Building Bridges for Access and Success from High School to College, 2005, p. 37).

There is little literature describing a one-week stand-alone intensive format similar to BIOS. Administrations of many universities across the US have recognized the need for some sort of intervention to bolster student success and retention rates in specific majors. They employ varieties of
different approaches, including short (less than two-week) orientation sessions or multiple-week summer programs in conjunction with freshman year seminars and/or specific course loads; and sometimes even complete undergraduate academic interventions (Chevalier et al., 2001; Fletcher et al., 2001b; Gordon & Bridglall, 2004; Malave & Watson, 1998; Reyes et al., 1998). Participation in a first-year seminar has been shown to have a significant positive impact on student success (House & Kuchynka, 1997; Minchella et al., 2002). Longer-term bridge and orientation programs are common and effective in specific fields and/or for targeted groups, such as engineering majors (Soulsby, 1999), minority students in engineering (Grimm, 2005; Marable, 1999; Reyes et al., 1998), women in engineering (Fletcher et al., 2001a), and first-generation college attendees (Pascarella et al., 2004).

Two short engineering programs show some similarities to the BIOS Program, in that they are short and content-intensive. The FORTRAN Programming Course “Boot Camp” at the University of South Florida in Tampa (Fujinoki et al., 2001) for undergraduate computer science and engineering majors provides a 3-day workshop to prepare students for the mandatory first course in the major. The authors compared subsequent grades of participants and non-participants, and further offer the utilization of observational study (Cochran, 1965) to help remove the potential bias of self-selectivity of program participants. Using “matched sampling” Fujinoki, et al., demonstrated that their campers were 2.7 times less likely to drop the required course than non-campers (Fujinoki et al., 2001, p. 9). The other short program is the Discover Engineering (DE) Program at the Massachusetts Institute of Technology. This program is four to five days and includes content, faculty and graduate student participation, and social activities. After participation in the program, enrollment in subsequent courses went from 29% to 72% of the entering class (Thompson & Consi, 2007). The MIT DE Program is part of a campus-wide Freshman Pre-Orientation Program network in several areas that allow over half the incoming freshman class each year to gain college experience before their first fall semester.

While the students in these programs have shown short-term gains we were interested in studying the impact that a short pre-freshman program would have on the retention of students in the major two
years later. BIOS has been shown to have a very positive impact on student performance in the first and second semesters of introductory biology (Wischusen & Wischusen, 2007). Would the skills taught in such a short period have a lasting impact on the retention of students in the major?

Methods

Participants

Participants included incoming, first-time freshmen at LSU who were self-identified as biological sciences majors (including “biology,” “biochemistry,” “microbiology,” or “pre-medicine”) and who had pre-enrolled in the Introductory Biology for Science Majors I (BIOL 1201) course for the upcoming fall semester. Program participants were chosen on a first come/first served basis to program capacity. The program enrollment maximum was set at 60 students for the 1st year and 120 for the 2nd year. Additional applicants above these limits were placed on a waiting list. The wait-listed students who were not ultimately accepted into the program were asked to serve as one of our control groups for the program assessment.

Control Group

Control groups for each program cohort were generated from the course rosters of the fall semester Introductory Biology in which the BIOS students were also enrolled. There were multiple sections of this course and the BIOS and control group students were dispersed among the sections. Members of the control groups were similar to the BIOS students in regard to high school grade point average, ACT/SAT score, gender and intended LSU major. In order to help alleviate a potential self-selection issue with BIOS program enrollment, the students remaining on the wait-list, as mentioned above, were, after statistical comparison to both the BIOS and control groups, ultimately included in the control group.

Program Structure

The BIOS Program was designed to give participating students a realistic look at the pace of college life. Students were presented seven lectures (eleven hours) from the first weeks of the
introductory biology course, along with three exams on the material. A detailed program schedule has been published previously (Wischusen & Wischusen, 2007).

Analysis

To assess the long-term impacts of BIOS we tracked participants during the four semesters following the program. We recorded their grades in the first four core courses in the biological sciences curricula (BIOL 1201 and 1202, introductory biology; 2051, microbiology; and 2153, genetics), overall GPA at the end of each semester and their major. These data were compared with the control group. We compared the percentage of students on-track to graduate within four years, (completing the core courses with a grade of A, B, or C, retention in the major), and overall GPA.

Data were statistically analyzed using the non-parametric Binomial Test (Figures 1 & 2) or the Student T-test (Figure 3). P ≤ 0.05 was considered significant.

Results

On-Track to Graduate in Four Years

The impact of the BIOS program on percentage of Biology majors on-track to graduate in four years was determined by comparing the percentage of BIOS participants and the control group who had completed the appropriate biological sciences core curriculum courses with a grade of “C” or better on their first attempt (Figure 5.1). BIOS participants, 2005 and 2006 cohorts, were on-track to graduate in significantly higher percentages than students in the control group at the end of each of the first four semesters, except for the end of the first semester for the BIOS 2005 cohort (Figure 1).

Retention in the Major

The BIOS program had a positive impact on the percentage of students who had entered LSU as biological sciences majors and who continued as biological sciences majors through the end of their fourth semester (second year) (Figure 5.2). Students in both the 2005 and 2006 BIOS cohorts were retained in the major at significantly higher percentages than students in the control group; 2005 BIOS = 76.92%, 2005 Control = 55.56%; 2006 BIOS = 49.11%, 2006 Control = 34.86%.
Retention at the University

Retention at LSU was not impacted by BIOS participation (Figure 5.3). The difference in university retention for BIOS participants was not significantly different from the control group for either the 2005 (p=0.52) or 2006 (p=0.27) cohorts; 2005 BIOS = 79.66%, 2005 Control = 70.00%; 2006 BIOS = 85.83%, 2006 Control = 84.07%.

Figure 5.1. Comparison of BIOS participants (Dark Bars) and control students (Light Bars) in terms of the percentage of the initial biology majors on-track to graduate in four years. Original N’s: 2005 BIOS = 52, Control = 54; 2006 BIOS = 112, Control = 109. *Significantly different from the control, nonparametric Binomial test, P < 0.02.

Figure 5.2. Comparison of BIOS participants (Dark Bars) and control students (Light Bars) based on the percentage of the initial biology majors retained as biology majors at the end of their fourth semester. 2005 BIOS N = 40/52, Control = 30/54; 2006 BIOS N = 55/112, Control = 38/109. *Significantly different from the control, nonparametric Binomial test, P < 0.002.
BIOS participants had higher semester success rates and the percentages of BIOS students on-track to graduate in four years were almost double those of the control groups. Similarly their retention rate in the major was also greater than that of the control group. While the trends for both these variables were the same for both the 2005 and 2006 cohorts the 2005 cohort was consistently higher in all cases. One possible explanation was a difference in the recruiting strategies and program enrollments. In our first year, 2005, we capped the enrollment at 60 students, our roster filled with the students who had attended “Spring Invitational,” the orientation session for high-achieving high school students. In 2006, the enrollment was 120, therefore we were able to accommodate more students who had not attended the high-achieving student orientation session. On the other hand, BIOS and control students showed no differences in retention at the university. Even though more control students are leaving the biology major, they remain at LSU in another major. These retention rates are very similar to those of the remainder of the introductory biology course enrollment (76.3%) and across the university (2005 = 72% and 2006=75%) ("University & College Trend Data", 2007).

Figure 5.3. Comparison of BIOS participants (Dark Bars) and control students (Light Bars) based on the percentage of the initial cohorts who were still enrolled at LSU at the end of their fourth semester. 2005 BIOS N = 47/59, Control = 49/70; 2006 BIOS N = 103/120, Control = 95/115. (2005 p=0.52, 2006 p=0.27).
Our data support the hypothesis that a one-week pre-freshman orientation can significantly increase student success and retention in the major. In addition to the quantitative data, student answers to qualitative questions in the exit evaluation and post-program focus groups, indicated that the BIOS students learned valuable study habits and felt more comfortable about starting college than they had before BIOS. Students indicated they have formed and maintained study groups, i.e. “learning communities,” through their freshman year and in many cases these communities have been sustained for several years.

While the BIOS program was designed to improve student performance during their first semester in college, the program has had a more lasting impact on the participants, including increasing their progress towards their degree and their retention in the major. The key components of the BIOS Program include: 1) Content focused on a specific course. This is critical to capturing students’ initial interest in the program. 2) Assessment instruments which are similar to those that will be used in their fall biology course. This provides the students with a realistic view of their performance and college-level expectations. 3) Students are divided into small groups during the program based on their fall courses, especially the sections of the specific content course. This helps them form study groups, and provides an instant connection to other students in the course in the fall. 4) The program is infused with study skills training. While the students are not initially interested in study skills, their comments suggest that later they realize the benefits of these skills.

Limitations of This Study and Further Research

There are threats to validity that must be addressed regarding BIOS. First, a major threat to validity that can confound research on any voluntary program is that of selection bias – are the people who are in the program equivalent to those in the population? When a student takes steps to apply, pay the fee and attend a program that is not required, this self-selection can bias any research on the groups. In this study, the use of the wait-listed students alleviated this issue since those students applied to the program and were willing to pay the fee and wished to attend.
Testing exposure as a threat to validity is also an issue in the first semester after BIOS. Students who participated in BIOS had eleven hours of course content from the first weeks of the introductory biology course, as well as three small exams over the course of the week. This material was repeated early in the semester, therefore BIOS students were expected to be more successful on the first exam of the introductory course. This threat no longer exists as the semester continues and new material is presented in class.

The BIOS model is flexible enough to be useful to other departments and other universities, however further work should be done regarding its generalizability to other disciplines and on different size campuses. This study involved one science department at a large research extensive university over a two-year period. Other science departments at LSU, as well as at least two at other large universities have now offered a BIOS-based program, and the BIOS program has continued with increased enrollments in subsequent years. Careful analysis and comparison of the progress of students in these programs is essential to increase the validity of this model.

References


CHAPTER 6.

A ONE-WEEK SCIENCE PRE-FRESHMAN “BOOT CAMP” MODEL

Introduction

The Biology Intensive Orientation for Students (BIOS) Program was designed to help a large number of incoming biology majors learn the skills required to succeed in biology, and in college in general, as well as to give them a short, intensive preview of the expectations in introductory biology at Louisiana State University (LSU). The program combines content lectures, examinations, learning strategies, group work and informational sessions over a period of six days (Wischusen & Wischusen, 2007).

The need for intervention prior to the freshman year has been apparent at LSU, as well as at many large universities, for some time. In the past few years, over 25% of students in LSU’s BIOL 1201, Introductory Biology for Science Majors, were unable to earn a C or better grade in the course, leading to a high DFW rate (grade of “D”, “F” or Withdrawal from the course). Duplication of coursework accounts for approximately 20-30% of the enrollment in the introductory biology course for science majors each semester ("University & College Trend Data", 2006). Because this and other general science courses have high unmet demand, that is many more students wish to enroll than there are spaces to accommodate, LSU and other large universities waste resources when students drop courses and re-enroll in subsequent semesters. Nationwide, college remediation is estimated to cost as much as one billion dollars a year (Somerville & Yi, 2002). Not only is this costly from a resource perspective, but the increase in the time to degree ultimately results in many students being discouraged due to slow degree progress and ultimately changing majors.

Across the US, incoming freshmen are increasingly unprepared for college work (Upcraft et al., 2005). Students enter college with optimistic goals of how much they will study as well as unrealistic ideas of how much work will be expected of them by college instructors (Upcraft et al., 2005). Nationwide, 75% of high school graduates enroll in college within two years of high school graduation,
and 50% of these must take remedial courses to learn the basic skills of reading, writing and/or math (Somerville & Yi, 2002). Students who have to take more remedial courses will require longer to graduate (Levine & Cureton, 1998). A 1998 report stated that fewer than two of five are able to graduate in four years (Levine & Cureton, 1998). At LSU the 1998 four-year graduation rate was 23.7%, with only 57.5% graduating after six years. The 2002 class at LSU graduated only 26.2% of its students within four years ("University & College Trend Data", 2006).

A critical early factor in student success seems to be the time required for new students to learn and implement the skills required to meet the expectations of college courses (Upcraft et al., 2005). Because they lack an understanding of the expectations and the skills they need, many capable students perform poorly in their first courses. Providing intervention before students have a chance to fail an exam can be invaluable (Wischusen & Wischusen, 2007).

Retention of students in the major field of choice, as well as retention at the college or university in general, is of increasing importance to postsecondary institutions (Cuseo, 2003). Attraction of students to, and subsequent retention in, math and science is a critical need in the US (Augustine, 2006; Stryer et al., 2003). The majority of new students entering higher education leave their initial college of choice without a degree and the most critical time is the first year (Cuseo, 2003).

Evidence of the value of freshman enhancement programs is well documented in higher education literature. Administrations of many universities across the US have recognized the need for some sort of intervention to bolster student success and retention rates in specific majors. They employ combinations of different approaches, including short (less than two-week) orientation sessions or multiple-week summer programs in conjunction with freshman year seminars and/or specific course loads; and sometimes even complete undergraduate academic intervention (Chevalier et al., 2001; Fletcher et al., 2001b; Gordon & Bridglall, 2004; Malave & Watson, 1998; Reyes et al., 1998). Participation in a first-year seminar has been shown to have a statistically significant positive impact on student success (House & Kuchynka, 1997; Minchella et al., 2002). Longer-term bridge and orientation programs are common
and effective in specific fields and/or for targeted groups, such as engineering majors (Soulsby, 1999), minority students in engineering (Reyes et al., 1998), women engineering (Fletcher et al., 2001a), and first-generation college attendees (Pascarella et al., 2004). Wischusen and Wischusen (2007) provided details of the assessments of these programs.

The mission for a pre-freshman or freshman program has been outlined in The CAS Book of Professional Standards for Higher Education (Miller, 2003).

The mission of the Student Orientation Program must include:

- Facilitating the transition of new students into the institution,
- Preparing new students for the institution’s education opportunities,
- Initiating the integration of new students into the intellectual, cultural, and social climate of the institution (p. 233).

According to Chickering and Gamson (1987) successful undergraduate education includes seven practices:

1) Encourage contacts between students and faculty
2) Develop reciprocity and cooperation among students
3) Use active learning techniques
4) Give prompt feedback
5) Emphasize time on task
6) Communicate high expectations
7) Respect diverse talents and ways of learning

Because creating “Learning Communities” has been shown to give students a sense of belonging and contributes to retention rates (Laufgraben & Shapiro, 2004), a sense of camaraderie should be fostered during an orientation program.

Building on the successes of reported programs, and with the guidelines of CAS and Chickering and Gamson’s Seven Principles for Good Practice in Undergraduate Education (1987), several faculty
and staff members of the Department of Biological Sciences at LSU began the BIOS Program to help incoming freshman biology majors make the transition from high school to college more easily.

**Program Activities**

Orientation programs are often divided into four components: academic activities, student services, social and recreational events, and special sessions for target populations (Upcraft *et al.*, 2005). The BIOS Program at LSU incorporates these four components in a five-and-a half-day format.

**Academic Activities**

BIOS is built around the first course in the Biological Sciences major – BIOL 1201, Introductory Biology for Science Majors. Over thirteen hours of content lectures during the week give the participants a strong head start on the fall course material. The pace of this schedule also gives them a more realistic idea of the time commitment they will have during the semester. Even though they will have only three to four hours of biology lecture in a typical week of their first semester, their other courses will require thirteen or more hours of in-class time. Therefore the BIOS schedule offers little free time throughout the weeklong program.

The course textbook is distributed to each student as part of the first evening orientation session. This allows the faculty to get them using the textbook from the start of the week. Additionally, it alleviates potential problems of students not obtaining the book prior to the first day of the program, purchasing the wrong edition of the text or other possible mix-ups.

Three short exams are administered during BIOS, two non-cumulative, and a cumulative final exam on the last morning of the program. The final exam is equivalent to an exam during the regular semester. These exams are all computer-based, as are many exams for large classes at LSU. Having experience with this new and unfamiliar form of testing is beneficial to BIOS students. Immediately after each of the BIOS exams students participate in a review session to go through each question and discuss problems that might have caused them to choose a wrong answer.
The faculty members who lecture during the BIOS program are also among the instructors for BIOL 1201 in the fall semester. This provides a sense of continuity and familiarity between faculty and students that contributes to the students’ ease with the fall course, exam styles, and the personality of at least one professor they will likely encounter in their first semester.

Formal learning strategy discussions during the week of BIOS help the students to assess their individual learning styles. Faculty and staff from the university’s Center for Academic Success offer help in effective note-taking, listening and metacognition, which is simply defined as “thinking about thinking.” Sessions with these experts help students explore their most effective individual learning styles.

Study groups are formed from the beginning of the BIOS week. Because the students have already registered for their fall classes, BIOS participants are assigned to groups of four or five members based on their sections of BIOL 1201. This strategy enhances the creation of “Learning Communities” which has been shown to give students a sense of belonging and contribute to retention rates (Laufgraben & Shapiro, 2004). Graduate students from the Department of Biological Sciences act as mentors during the program. Each graduate student is given oversight of four groups. They attend the study sessions and are available to help answer questions and explain material from content lectures. Upperclass undergraduates who participated in BIOS when they were freshmen serve as peer mentors, helping the graduate student mentors with study groups and team activities.

**Student Services**

Although BIOS stresses biology content, the program also offers students other guidance as they adjust to the independence of a college lifestyle. Along with the biology content lectures, BIOS students are given presentations by individuals representing relevant offices around the LSU campus, as well as other professionals who offer advice in specific areas. “Student Discussion” sessions include the following topics:

What are your responsibilities as a student? – Dean, College of Basic Sciences

What is the Center for the Freshman Year? -- Freshman College
What is the College of Basic Sciences? – Upper Division College

How do I get help? -- Student Career Services

How do I manage my money? -- Financial Advice from a Local Banker

How do I survive? Student Health Center

What comes after I graduate? – Advice from Medical School Counselor and Graduate School Representative

Social and Recreational Events

Building a community of peers is an important component of BIOS, and this community begins with the formation of Study Groups, as described earlier. These groups are expected to study together, with the help of their student mentors, for the exams during the week, as well as work together on small projects and case studies during specified times.

A Biology Trivia Challenge each evening at dinner pits groups against each other and against a group comprised of the student mentors. Points are awarded and prizes given at the final luncheon.

Special Sessions for Target Populations

BIOS is intended to offer a head-start to all incoming freshman biology students, and therefore no other specific targeting has been done. The program administrators have, however, made sure that undergraduate and graduate mentors are as diverse as possible to offer positive role models for all participating BIOS students.

Logistics

BIOS Recruitment

All incoming freshmen biological sciences majors at LSU who are enrolled in BIOL 1201 for their first fall semester are eligible to apply to participate in BIOS immediately prior to their first fall at the university. Students are recruited through e-mails sent to all incoming freshmen that identify themselves as biological sciences majors (biology, biochemistry, microbiology, pre-medical). Face-to-face recruitment drives are conducted during LSU’s Spring Invitational orientation session for high achieving
students and during each Freshman Orientation session throughout the summer. BIOS alumni play an important role in recruitment. While conversation with the faculty and staff is important and beneficial to parents, prospective students want to talk to peers. Former BIOS participants can answer questions that the “adults” cannot.

BIOS participants are chosen on a first come/first served basis, and a waiting list is maintained to ensure that the roster is filled. The wait-listed students who are not accepted into the program are asked to serve as part of the control group in assessing the success of the BIOS participants in subsequent semesters.

**BIOS Funding**

The BIOS Program is predominantly self-funded by the registration fee. This fee provides funds for the following:

- Biology textbook and other course materials.
- Program binders – a 3-ring binder with the camp schedule and campus map, along with content lecture outlines, and materials from all other presenters.
- Meals – breakfasts and lunches in the form of a meal card with a set spending limit in a single dining hall to insure that students eat together. BIOS staff and student mentors also share this meal plan. Dinners are buffet-style in a large private hall that allows program activity around the meal. The final luncheon on Friday afternoon is a reception to which their families are invited.
- Stipends -- for instructors, graduate students and undergraduate peer mentors.
- Program supplies – these include office supplies, paper, materials for the group projects, an “I Survived Biology Boot Camp” t-shirt, and prizes to be awarded at the final luncheon.
- Optional housing is available for an additional cost for students who wish to live on campus. While campus housing remains optional, students are encouraged to live in the residence hall during the week in order to take better advantage of the group experience.
BIOS Agenda

The BIOS Program was designed to give participants a realistic look at the fast pace of college life. The program dates are determined based on the beginning of the fall semester, therefore BIOS is conducted during the last full week before the fall semester. This helps the participants retain as much of the program content as possible into the fall, as well as to facilitate a smooth transition to fall dormitory assignments for those who opt for BIOS housing.

The program begins on Sunday afternoon with check-in and a welcome dinner, followed by dispersal of textbooks, clickers and binders, then introductions and the first content lecture. The program Monday through Thursday runs from 8:00am to 7:00pm, with short breaks scheduled in the day around lectures, seminars and group activities. Friday’s schedule ends at lunchtime with a ceremony to which their parents are invited. The complete 2008 BIOS schedule, as well as other program materials, is available from S. Wischusen (sheri@lsu.edu). The BIOS schedule has been modified considerably in the four years of the program, as can be seen by comparing this outline with the earlier schedules (Wischusen & Wischusen, 2007).

Program Assessment

Several different methods, both quantitative and qualitative, are used to assess the BIOS Program. For quantitative analyses, a control group of BIOL 1201 students who did not participate in BIOS but are academically similar to the BIOS participants (by high school GPA, ACT or SAT score, major and gender) are chosen. Program administrators also include the students who were on the BIOS waiting list because their inclusion can help to alleviate the variable of self-selection bias that often plagues studies into which participants must enroll themselves. An additional comparison of the BIOS cohort to the total biology majors enrolled in the introductory biology course in the fall can also be useful.

Comparisons of final grades of the BIOS versus control groups for the fall and spring semesters in the Introductory Biology course sequence, as well as overall GPAs for both semesters, are analyzed. Biology majors within the two groups are then tracked through the second semester of their sophomore
year in order to assess the rates at which they remain in the biology major, as well as stay on track toward graduation within four years. To remain on track at LSU, biological sciences majors are enrolled in one of two sophomore biology courses during each semester of their second year, General Microbiology (BIOL 2051) and Genetics (BIOL 2153). Students who are not enrolled in these courses in the fall and spring semesters of their sophomore year are considered off track but are followed in subsequent semesters to ascertain whether they remain in the major and enrolled at the university. The “on-track” benchmark will be different for each institution and major.

Assessment of the immediate reactions to the BIOS program, as well as later thoughts about their experiences, are used to help improve BIOS for the next year. Students complete an Exit Survey in the last session of the weeklong program, as well as participate in focus groups both before and after the program. An email is also sent to all BIOS participants in the middle of the first fall semester to find out if they think BIOS was worth their time.

**Exit Survey**

The Exit Survey is a 20-question instrument that is a combination of Likert-type scale questions and open-ended response questions. It is designed to gauge the immediate feelings of each BIOS participant about the week, and is used by the staff to improve the BIOS program in subsequent years.

**Focus Groups**

The focus groups should be convened by university staff outside the BIOS program and can be used to gauge the impact of BIOS on the participants during their freshman year. The first focus group session is conducted during the opening evening of the program, and the second session during the subsequent spring semester. Depending on the number of students in the BIOS class, all students or a random selection of BIOS students are asked to participate in one of these groups on the first evening of the program. The questions in this session are designed to offer baseline insight into their preparedness for studying in college. In the fourth week of the subsequent spring semester these students are invited to participate in a second focus group to assess students’ self-analysis of the effectiveness of BIOS.
7th Week Email Responses

During Week 7 of the Fall Semester, roughly midterm, BIOS participants are contacted by email and asked to respond in one of the following ways:

1) A single, open-ended question: “Please send me any feedback you think would be useful for next year's freshmen, what did we do right, what could we have done better, was BIOS worth a week of your summer in hindsight?”

2) Print, complete and return a two-page PDF attachment to the email that contains a series of Likert-type Scale questions about the program, each staff member, and the student’s views on the value of BIOS. Students are able to return the completed surveys anonymously to an office secretary.

Logic Model

In order to provide systematic and long term assessment of the success of the BIOS program, evaluators have developed a Logic Model based on the work of Wholey et al. (2004) (Table 6.1). The strength of a Logic Model is that it provides a mechanism to describe both the workings of the program as well as the results that can be expected. This model was based on the program theory that the BIOS Program was designed to give incoming freshman biology majors a six-day, intensive head-start on the content in the first course in the major, and to introduce them to the study and organizational skills necessary to be successful in college. Incoming freshman science majors are often unprepared for college coursework. They often perform badly on their first exam, which undermines their confidence and can lead to a cycle of failure. BIOS is designed to help students have a successful first semester, and to give them tools that will serve them throughout their college education. A successful transition into college not only benefits students, but allows the university to make more efficient use of its resources by enhancing graduation rates and minimizing repeated coursework because of dropped classes.

Suggested Checklist

1 Year Before BIOS     Design program branding – logo for t-shirts, recruitment brochures, give-aways (pens, trinkets)
Send recruitment information to high school guidance counselors, principals, and teachers in appropriate subject areas.

Set enrollment number.

Contact campus offices to set up housing, meals, lecture room assignments, testing facilities. Begin necessary paperwork.

Set up fee payment mechanism with campus bursar office.

**6 Months Before BIOS**

Obtain list from Undergraduate Admissions Office of incoming freshman majors, with email addresses.

Send recruitment information by email to all incoming freshman majors.

Recruit graduate students and undergraduate mentors (optional) for appropriately sized groups – e.g. 1 graduate student and 1 peer mentor/ 20-25 students.

Arrange funding source for financial aid, if possible.

Arrange payments for graduate students, undergraduate mentors and faculty instructors.

Order textbooks.

**3 Months Before BIOS**

Keep current spreadsheet of applicants.

Tally t-shirt sizes and order appropriate numbers of shirts.

Order distinctive lanyards/name badge holders to distinguish participants from other groups on campus simultaneously.

Collect presentation material from all presenters and collate into binder packet for printing.

Submit final housing list to the Residential Hall

Order and/or collect items for prizes and awards – e.g. 250ml
beakers, vendor give-aways, flashdrives, optical mice, web cameras.

Organize meetings with student mentors for duties, case studies for group work

Make name badges for staff and students.

**Other Items to Consider**

Parking Permits for students and outside visitors

Parent reception at the end of the week

Tours of research laboratories or other contact with the broader department.

Be mindful of possible Americans with Disabilities Act issues with BIOS participants.

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Table 6.1. BIOS Logic Model.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Strategies</th>
<th>Outputs</th>
</tr>
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<tbody>
<tr>
<td>Human resources: science faculty and staff; graduate student mentors; undergraduate peer mentors. Fiscal resources: BIOS is funded by program fees; HHMI grant; Pearson Foundation grant. Materials include textbook, binder with program documentation, student response system “clicker”, housing and meals. Knowledge base: all teaching materials are produced by BIOS staff and faculty, based on BIOL 1201/1202 text.</td>
<td>Orient students to college life immediately before their first fall semester. Improve student study skills by providing practical experience with BIOL 1201. Peer mentors reinforce the importance of study skills. Form learning communities, “pods”, that will form the basis of continuing study groups. Develop time-management skills.</td>
<td>6-day “boot camp” for incoming freshman biology majors. Program Components - content lectures - assessment of study skills - workshop to develop study skills - group interaction with fellow member of “pod” - interaction with faculty, staff and peers - introduction to the university</td>
</tr>
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Table 6.1. continued

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Impacts (Long Term-Conditions)</th>
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<tbody>
<tr>
<td><strong>Incoming freshmen get a jump start on content material in Introductory Biology; they are exposed to computer-based testing; they become familiar with the campus and buildings in which they will have classes in the fall semester; they are introduced to faculty, graduate students and other undergraduates in their department. BIOS students learn study skills and learning styles that help them adjust to their first year in college; they develop learning communities that remain intact during their freshman year. Students indicate high satisfaction with program.</strong></td>
<td></td>
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<tr>
<td>Relative to non-BIOS students, BIOS students:</td>
<td>Higher graduation rates for students majoring in life sciences</td>
</tr>
<tr>
<td>- perform better in all academic classes.</td>
<td>More students pursuing careers in life sciences and related fields</td>
</tr>
<tr>
<td>- continue as majors in biological sciences at a higher rate.</td>
<td>Lower total cost of education for students who do not change major and who do not have to repeat classes</td>
</tr>
<tr>
<td>- make better progress toward timely graduation.</td>
<td>More efficient use of state resources invested in higher education</td>
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<tr>
<td>- independent of major, are more likely to graduate from college.</td>
<td>Share information about experiences with BIOS so that other departments and other institutions can implement this model</td>
</tr>
<tr>
<td>- are more likely to continue as a biology major.</td>
<td></td>
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<tr>
<td>- are more likely to graduating in four years.</td>
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<table>
<thead>
<tr>
<th>(Short Term-Learning)</th>
<th>(Medium Term-Action)</th>
<th>(Long Term-Conditions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming freshmen get a jump start on content material in Introductory Biology; they are exposed to computer-based testing; they become familiar with the campus and buildings in which they will have classes in the fall semester; they are introduced to faculty, graduate students and other undergraduates in their department. BIOS students learn study skills and learning styles that help them adjust to their first year in college; they develop learning communities that remain intact during their freshman year. Students indicate high satisfaction with program. <strong>Relative to non-BIOS students, BIOS students:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- perform better on 1st biology exams relative to non-BIOS students.</td>
<td>- continue as majors in biological sciences at a higher rate.</td>
<td></td>
</tr>
<tr>
<td>- have higher overall GPA after 1st semester than non-BIOS students.</td>
<td>- make better progress toward timely graduation.</td>
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<tr>
<td>- have more interaction with faculty and staff</td>
<td>- independent of major, are more likely to graduate from college.</td>
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<td>- are more likely to graduating in four years.</td>
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<tr>
<td>Evaluation Questions for OUTCOMES</td>
<td>Possible Indicators/Measures</td>
<td></td>
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</tbody>
</table>
| **Short-Term**  
  *Relative to non-BIOS students:*  
  Do the students become more familiar with the campus?  
  Are BIOS students more comfortable with the first material in BIOL 1201?  
  Are BIOS students more comfortable with computer-based testing?  
  Do BIOS students develop more effective study skills?  
  Do BIOS students maintain study groups?  
| BIOS students don’t use campus maps; help non-BIOS classmates find their way around campus  
  Grade on first BIOL 1201 exam  
  Grade on first BIOL 1201 exam  
  Response to survey questions. Grade on first BIOL 1201 exam. GPA at end of 1st semester  
  Responses to survey questions. |
| **Medium-Term**  
  *Relative to non-BIOS students:*  
  Are BIOS students retained in the biology major at higher rates?  
  Are BIOS students more on track to graduate in a timely manner?  
  Do BIOS students maintain a higher overall GPA?  
| Relative to non-BIOS students:  
  Number of students continuing as biology majors.  
  Successful completion of “critical classes” within major.  
  Grades within major and overall GPA. |
| **Long-term (Impacts)**  
  *Relative to non-BIOS students:*  
  Do BIOS students have higher graduation rates?  
  Are more BIOS students graduating with degrees in life sciences majors?  
  Does BIOS participation lower college costs for the student?  
  Does BIOS participation lower college costs for the state?  
  Are BIOS participants more likely to pursue careers in life sciences  
| 4-, 5-, and 6-year graduation rates.  
  4-, 5-, and 6-year graduation rates.  
  Number of courses repeated. Time to graduation.  
  4-, 5-, and 6-year graduation rates.  
  Numbers of students who go on to graduate or medical school, and/or to careers in life science industry. |
<table>
<thead>
<tr>
<th>Possible Data Collection Methods and Information Sources</th>
<th>Rank/Priority (include brief rationale)</th>
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<tbody>
<tr>
<td>Survey: How did your first week of classes go? Also poll nonacademic orientation participants as to familiarity with the campus during the first week. Obtain test grades from course instructors.</td>
<td><strong>Low</strong> (Not likely to be a primary factor in students success)</td>
</tr>
<tr>
<td>Survey: How comfortable were you with computer-based testing for the first fall exam? Also survey non-BIOS computer-based testing students. Obtain grades from course instructors.</td>
<td><strong>High</strong> (A good start on exams is critical to self confidence)</td>
</tr>
<tr>
<td>Survey: Are you employing metacognition techniques? Obtain test grades from course instructors. Obtain 1st semester grades from registrar.</td>
<td><strong>Medium</strong> (Comfort with new test format is important, but not as being prepared for the test material).</td>
</tr>
<tr>
<td>Survey: Do you study with members of your BIOS group? How many? How often?</td>
<td><strong>High</strong> (Appropriate study skills are critical prerequisite for success in class).</td>
</tr>
<tr>
<td>Status of student within the College of Basic Sciences obtained from registrar.</td>
<td><strong>Medium</strong> (Most, but not necessarily all students will benefit significantly from working in study groups).</td>
</tr>
<tr>
<td>Comprehensive Academic Tracking Sytstem (CATS) will provide information on the status of each students.</td>
<td><strong>High</strong> (A primary goal of the program is to enhance student success in life sciences).</td>
</tr>
<tr>
<td>Obtain grades from university registrar.</td>
<td><strong>High</strong> (Successful students will make steady progress toward completion of degrees).</td>
</tr>
<tr>
<td>Obtain graduation information from registrar.</td>
<td><strong>Medium</strong> (The expectation is that lessons learned in BIOS will improve overall academic performance ).</td>
</tr>
<tr>
<td>Obtain graduation information from registrar.</td>
<td><strong>Medium</strong> (More successful students should complete their degrees in a timely fashion).</td>
</tr>
<tr>
<td>Obtain graduation information from registrar.</td>
<td><strong>High</strong> (More successful students should stay in life science major and complete their degrees in a timely fashion).</td>
</tr>
<tr>
<td>Obtain graduation information and transcripts from registrar.</td>
<td><strong>Medium</strong> (More effective use of resources is an important, but secondary goal).</td>
</tr>
<tr>
<td>Obtain graduation information from registrar.</td>
<td><strong>Medium</strong> (More effective use of resources is an important, but secondary goal).</td>
</tr>
<tr>
<td>Post-graduation surveys.</td>
<td><strong>High</strong> (More students pursuing successful careers in life sciences is ultimate goal).</td>
</tr>
</tbody>
</table>
Conclusions

The success of students who have participated in the first four years of LSU’s BIOS Program supports the initial hypothesis that a one-week orientation can have a beneficial impact on student performance and retention. The program administrators began from their first fall semester tracking BIOS participants and comparing their progress to groups of academically similar students who did not attend the BIOS boot camp. The faculty saw immediate differences; and the improvements shown by the BIOS students have continued, and in most cases increased, after each semester in college. The major differences between the BIOS students and their non-BIOS peers are their persistence and success in the major through their sophomore year and the percentage of these students that remain on track to graduate in four years (Wischusen & Wischusen, 2007).

A significantly higher percentage of BIOS students from each cohort remained in the biological sciences major after four semesters than those in the control groups (2005 – 76.92% versus 55.56%; 2006 – 49.11% versus 34.86%) (Wischusen et al., 2009).

BIOS participants consistently show a significantly higher rate of being on track than students in the control group. In subsequent semesters, the students in the 2005 BIOS cohort were on-track to graduate at twice the rate (48.08% versus 24.07%), while the 2006 cohort was even more successful as compared to the control group (41.07% versus 13.76%) (Wischusen et al., 2009).

There are several major concepts within BIOS that could help to explain the increased success of participating students. We helped the students become familiar with the LSU campus, facilitated the formation of “learning communities,” and exposed them to potentially valuable study habits.

References


CHAPTER 7.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Purpose and Objectives

The purpose of this study was to determine the impact of a one-week intensive pre-freshman preparation program on the academic achievement and enrollment retention of students majoring in biological sciences at a research extensive university in the southern United States.

The objectives of this study included the following:

1. To describe incoming college freshman biological sciences majors at a research extensive university in the southern region of the US on the following selected criteria:
   
   (a) Gender;
   (b) High school GPA;
   (c) College entrance examination scores (ACT or SAT scores);
   (d) The grade achieved in the required two-semester sequence Introductory Biology courses (BIOL 1201 and 1202);
   (e) The grade point average (GPA) achieved in the first semester of college enrollment;
   (f) The semester GPA achieved in the second semester of college enrollment;
   (g) The overall GPA achieved at the end of the first year of college enrollment;
   (h) The semester GPA achieved in the third semester of college enrollment;
   (i) The overall GPA achieved at the end of the second year of college enrollment;
   (j) The grade achieved in the required Genetics course (BIOL 2051);
   (k) The grade achieved in the required Microbiology course (BIOL 2153);
   (l) Whether or not the student is retained in college each of the first four semesters of college.

Retention will be defined as the student receiving a final grade for coursework in the specified semester;
Whether or not the student is retained as a major in biological sciences each of the first four semesters of college. Retention as a biological sciences major will be defined as the student indicating his or her major as Biological Sciences on the LSU VMS online student tracking system.

2. To compare incoming college freshmen biological sciences majors at a research extensive university in the southern region of the US who participated in a pre-freshman intensive preparation program to a control group who did not participate in the program on the following selected academic performance measures:

   (a) The grade achieved in the required two-semester sequence Introductory Biology courses (BIOL 1201 and 1202);

   (b) The grade point average (GPA) achieved in the first semester of college enrollment;

   (c) The semester GPA achieved in the second semester of college enrollment;

   (d) The overall GPA achieved at the end of the first year of college enrollment;

   (e) The semester GPA achieved in the third semester of college enrollment;

   (f) The overall GPA achieved at the end of the second year of college enrollment;

   (g) The grade achieved in the required Genetics course (BIOL 2051);

   (h) The grade achieved in the required Microbiology course (BIOL 2153).

3. To compare incoming college freshmen biological sciences majors at a research extensive university in the southern region of the US who participated in a pre-freshman intensive preparation program to a control group who did not participate in the program on the following selected measures of retention:

   (a) Whether or not the student is retained in college each of the first four semesters of college. Retention will be defined as the student receiving a final grade for coursework in the specified semester;

   (b) Whether or not the student is retained as a major in biological sciences each of the first four semesters of college. Retention as a biological sciences major will be defined as the
student indicating his or her major as Biological Sciences on the LSU VMS online student tracking system.

Methods

Population and Sample

The target population for this study was defined as all incoming freshman biological sciences majors at a research extensive university. The accessible population was defined as all incoming, first-time freshmen at a research extensive university in the fall semesters 2005 and 2006, who self-identified as biological sciences majors (including “biology,” “biochemistry,” “microbiology,” or “pre-medicine”) and who pre-enrolled in the Introductory Biology for Science Majors course (BIOL 1201) for the upcoming fall semester, or who, because of an ACT score below the 23 prerequisite for immediate enrollment in BIOL 1201, were enrolled in CHEM 1201 and indicated an intention to enroll in BIOL 1201 in the subsequent spring semester. For the purposes of this study ACT scores were used, and the ACT equivalent for SAT scores were determined using a standard conversion chart ("ACT-SAT Concordance Table", 2008) (Appendix 1). The program enrollment maximum was set at 60 students for the first year and 120 for the second year. Additional applicants above these limits were placed on a waiting list. The wait-listed students who were not ultimately accepted into the program were asked to serve as one of the control groups for the program assessment.

Instrumentation

The instrument used to collect data for this study consisted of a researcher-designed, computerized recording form into which information for the treatment and control groups was downloaded. Data for the treatment group included the following items:

<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information from Program Application</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Item number for sorting purposes</td>
</tr>
<tr>
<td>Housing</td>
<td>Whether or not they opted for campus housing</td>
</tr>
<tr>
<td>Biology major</td>
<td>Whether or not they indicated a major in Biological Sciences (In the end, several students who applied to the program and enrolled in BIOL 1201 were other majors, e.g. Biological Engineering or Kinesiology.)</td>
</tr>
</tbody>
</table>
Gender
First Name
Last Name
PAWS email
LSU student email address: ___@lsu.edu
Home address
Home phone
DOB
Date of Birth
SSN/LSUID#
Use of Social Security Numbers to identify students was phased out in 2007 and replaced by a unique LSUID# xx-xxx-xxxx
High School
City
Roommate Preference
Roommate email
Student Aid & Scholarship Status
Financial aid status from Student Aid and Scholarships
Requests Financial aid
Student requests financial aid on application form
Ok’s SAS check
Permission to check their financial aid status
Date paid
The date they paid their fee
Registration
Amount paid
Housing
Amount paid
HHMI charge
Amount paid for financial aid by the LSU/HHMI grant
T-shirt size
Parents Lunch RSVP
Liability forms returned
Medical Alerts

Information from University Records
ACT
HS GPA
BIOL 1201 Section

Information collected during the Program week
Group
Group assigned by BIOL 1201 course section for fall
Grad Student
Name of graduate students served as the group mentor
Ethnicity

Coursework information gathered in subsequent two semesters from instructors and university records
BIOL 1201 Final Grade
BIOL 1202 Final Grade
1st Fall GPA
1st Spring GPA
2nd Fall GPA
BIOL 2051 Final Grade
BIOL 2153 Final Grade
2nd Spring GPA

The following information was compiled for the control group:

<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSN</td>
<td>Social Security Number</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
</tbody>
</table>
Coursework information gathered in subsequent two semesters from instructors and university records

BIOL 1201 Final Grade
BIOL 1202 Final Grade
1st Fall GPA
1st Spring GPA
2nd Fall GPA
BIOL 2051 Final Grade
BIOL 2153 Final Grade
2nd Spring GPA

Data Collection

Grades were compared during the subsequent academic year in BIOL 1201 (Introductory Biology for Majors I), BIOL 1202 (Introductory Biology for Majors II), BIOL 2051 (General Microbiology) and BIOL 2153 (Genetics), as well as overall GPAs for the first four semesters. If a student was “on track” to graduate within four years in the biology major, they would be enrolled in one of the sophomore courses within the Biology Major sequence each semester during their second year. Their enrollment, as well as final grade in each course, were recorded. If a student was found not to be enrolled in a biology course, his/her records were checked for a change of major or withdrawal from the university.

Several different qualitative methods were used to assess the value of aspects of the pilot year of the program and then optimized in subsequent years. Focus groups both before and after the program evaluated various aspects of the camp. The focus groups were convened by staff members from the Center for Assessment and Evaluations to assess the impact of the program on the participants during
their freshman year. The first session was held on the opening evening of the program (Appendix 13), and the second during the subsequent spring semester. Students completed an Exit Survey (Appendix 14) in the last session of the weeklong program to gauge their immediate reactions to the program. During week 7 of the Fall Semester, the participants were contacted and asked to respond regarding their experience, in the first year by a single open-end question (Appendix 15) and in the second year by an altered version of the Exit Evaluation (Appendix 16).

**The Treatment**

The BIOS Program was designed to give participating students a realistic look at the pace of college life. Students were presented eleven hours of lecture material from the first weeks of the introductory biology course, along with three short computer-based exams (15 – 30 questions each) on the material. The final exam was comprehensive. After each of the exams the scores and exam questions were discussed with the students as a group.

Along with the biology content lectures, the students were given presentations by individuals representing relevant offices around the LSU campus, as well as other professionals who offered advice in specific areas.

The program dates corresponded with the beginning of the fall semester, therefore BIOS was conducted during the last full week before the fall semester in order to help the participants to retain as much of the program content as possible into the fall, as well as to facilitate a smooth transition to fall dormitory assignments for those who opted for BIOS housing.

Graduate students from the Department of Biological Sciences acted as mentors to groups of the BIOS participants during the program. Because the BIOS students had already registered for their fall classes, they were assigned to groups based on their sections of Introductory Biology. Each group had three to five members, and each graduate student was given oversight of three groups. These groupings allowed the BIOS students to know several other students who were also enrolled in the introductory class before the first day of class. This strategy enhanced the creation of “Learning Communities” which has
been shown to give students a sense of belonging and contributes to retention rates. The graduate students attended group activity sessions and were available to help answer questions and explain material.

**Assessment**

Several different methods were used to assess the value of the pilot year of the BIOS Program. Control groups consisted of Introductory Biology course students who had not participated in BIOS, but were academically similar (high school GPA, ACT or SAT score, major and gender) to the BIOS participants. Students who were on the BIOS waiting list were also included in the control group because their data would help to alleviate the variable of self-selection bias that often plagues studies into which participants must enroll themselves. There were no statistical differences between the control and BIOS groups in either ACT Score or High School GPA.

Biology majors were tracked through the spring semester of their sophomore year in order to assess the rates at which they remained in the biology major, as well as stayed on track toward graduation within four years. To remain on track, LSU biological sciences majors are enrolled in one of two sophomore biology courses during each semester of their second year, General Microbiology (BIOL 2051) and Genetics (BIOL 2153). Students who were not enrolled in either of these courses in the fall semester of their sophomore year were considered off track but will be followed in subsequent semesters to ascertain whether they remain in the major and enrolled at the university.

To assess the long-term impacts of BIOS, students were tracked during the four semesters following the program. Their grades in the first four core courses in the biological sciences curricula, overall GPA at the end of each semester, and their major were recorded. These data were compared with the control groups. Data were statistically analyzed using the non-parametric Binomial Test or the Student T-test. $P \leq 0.05$ was considered significant.

To gain qualitative assessment of the immediate reactions to the BIOS program, students completed an Exit Survey in the last session of the weeklong program. Focus groups both before and after
the program evaluated various aspects of the camp. The focus groups were used to assess the impact of BIOS on the participants during their freshman year.

**Findings**

The BIOS Program combined content lectures and examinations for BIOL 1201 - Introductory Biology for Science Majors, as well as learning styles assessments and informational sessions to provide the students with a preview of the requirements of biology, and the pace of college. Students were tracked following their participation in BIOS, and their progress was compared to that of a control group composed of students on the BIOS waiting list and a group of BIOL 1201 students who were academically similar to the BIOS participants (by high school GPA, ACT score, and gender). While the BIOS Program was established to aid students’ transition from high school to college, data have shown that the impact of BIOS continued far beyond the first freshman semester. The BIOS participants performed significantly better on the first and second exams, had a higher course average, and had a higher final grade than the control group. These students also had higher success rates (grade of A, B or C) during both the fall and spring semesters and remained on track through the first semester of their sophomore year to graduate in four years at a significantly higher rate than the control group. BIOS participants show increased retention in the biology major and remained on track to graduate in four years than students who did not participate in BIOS.

**First Year Success**

Students who participated in BIOS performed better than students in the control groups on each of the measured criteria, beginning with the first semester biology course. The 2005 BIOS participants performed significantly better on the first exam (89.13 versus 79.29, p<0.001, Mann-Whitney U) and second exam (85.02 versus 79.30, P = 0.011, Mann-Whitney U), and also had a higher final course average than the students in the Control Group (86.30 versus 81.95, P = 0.034, Mann-Whitney U) (Figure 7.1).
The average final grade for the BIOS participants was also higher than the Control Group (3.21 versus 2.95, P < 0.001, Mann-Whitney U). BIOS administrators compared the Fall 2005 semester GPA for each group and the mean semester GPA for the BIOS participants was 3.34 versus 3.09 for the Control Group students and 2.90 for all BIOL 1201 students. These values were not statistically different (P = 0.051, Mann-Whitney U) (Figure 7.2).

Figure 7.1. Comparisons of average grades on BIOL 1201 exams 1 and 2, and final course average (Mean ± SE) for all BIOS participants (n=58) (Dark Bars) and all Control Group students (n=70) (Light Bars). *Significantly different from Control group (p < 0.05, Mann-Whitney U).

Figure 7.2. Final grade in BIOL 1201 and first semester GPA (Mean and ± SE) for BIOS participants (n=58) (Dark Bars) and Control students (n=70) (Light Bars). *Significantly different from Control group (p < 0.05, Mann-Whitney U).
On-Track to Graduate in Four Years

The impact of the BIOS program on percentage of Biology majors On-Track to graduate in four years was determined by comparing the percentage of BIOS participants and the control group who had completed the appropriate biological sciences core curriculum courses with a grade of “C” or better on their first attempt (Figure 7.3). BIOS participants were on-track to graduate in significantly higher percentages than students in the control groups at the end of each of the first four semesters, except for the end of the first semester for the BIOS 2005 cohort. These results are consistent for each of the first two cohorts, 2005 and 2006.

Figure 7.3. Comparison of BIOS participants (Dark Bars) and control students (Light Bars) in terms of the percentage of the initial students on-track to graduate in four years. Original N’s: 2005 BIOS = 52, Control = 54; 2006 BIOS = 112, Control = 109. *Significantly different from the control, nonparametric Binomial test, P< 0.02.

Retention in the Major

The BIOS program had a positive impact on the percentage of students who entered LSU as biological sciences majors and who continued as biological sciences majors through the end of their second year (fourth semester) (Figure 7.4). Both the 2005 and 2006 BIOS cohorts were retained in the major at significantly higher percentages than students in the control group.

Retention at the university was not impacted by BIOS participation (Figure 7.5). The difference in university retention for BIOS participants was not significantly different from the control group for either the 2005 (p=0.52) or 2006 (p=0.27) cohorts.
Exit Surveys

During the last session of the program, students completed an Exit Survey to assess their immediate feelings regarding BIOS. Their responses indicate that the BIOS Program was a success and would be a benefit to future classes of biological sciences majors, as well as to other students across the LSU campus. Answers to specific questions indicate that:

87% said the program clarified expectations of them as students
69% said they gained a great deal in their study skills
74% felt much more comfortable taking college exams
70% felt better about their abilities to study
72% stated that they had much greater self-confidence for the upcoming semester

Focus Groups

BIOS program administrators had hypothesized that a major reason for many new students’ lack of success in entry-level Biology classes is their lack of effective study habits. These focus groups were an attempt to address the validity of that hypothesis. The results from the initial focus group suggest that the students who came to Biology Boot Camp were poorly prepared to study in college. In high school

Figure 7.4. Comparison of BIOS participants (Dark Bars) and control students (Light Bars) in terms of the percentage of the initial students on-track to graduate in four years. Original N’s: 2005 BIOS = 52, Control = 54; 2006 BIOS = 112, Control = 109. *Significantly different from the control, nonparametric Binomial test, P< 0.02.
they typically relied on rote memorization to get them through tests. They never learned to analyze data through utilization of higher order thinking skills. These traits are likely to be major factors affecting their success in introductory college biology courses.

![Figure 7.5](image)

Figure 7.5. Comparison of BIOS participants (Dark Bars) and control students (Light Bars) based on the percentage of the initial cohorts who are still enrolled at LSU at the end of their fourth semester. P > 0.35.

By the second focus group students’ perceptions of what was required for success had changed. All of them credited the BIOS Program for making them realize that the playtime atmosphere of high school was over and that college biology was going to require a quantum leap in effort just to keep up in class. Most of the students interviewed felt that the Biology Boot Camp was a “kick start” to their college career. Participants in the second focus group also pointed out their change in attitude toward study groups. While most of the BIOS students tended to study alone, when they did study in groups they often sought out people from their camp experience as study partners. Those who preferred group study always studied with their former Boot Camp colleagues.
Conclusions, Implications and Recommendations

The success of students who participated in the BIOS Program supports the hypothesis that a one-week orientation can have a beneficial impact on student performance and retention. While the BIOS program was designed to improve student performance during their first semester in college, the program has had a more lasting impact on the participants, including increasing their progress towards their degree and their retention in the major. BIOS participants had higher semester success rates and the percentages of BIOS students who remained on-track to graduate in four years were close to double those of the control groups. Similarly their retention rate in the major was also greater than that of the control group.

The key components of the BIOS Program include:

1) Content focused on a specific course. This is critical to capturing students’ initial interest in the program.

2) Assessment instruments which are similar to those that will be used in their fall biology course. This provides the students with a realistic view of their performance and college-level expectations.

3) Students are divided into small groups during the program based on their fall courses, especially the sections of the specific content course. This helps them form study groups, and provides an instant connection to other students in the course in the fall.

4) The program is infused with study skills training. While the students are not initially interested in study skills, their comments suggest that later they realize the benefits of these skills.

In addition to the quantitative data, student answers to qualitative questions in the exit evaluation and post-program focus groups, indicated that the BIOS students learned valuable study habits and felt more comfortable about starting college than they had before BIOS. Students indicated they have formed and maintained study groups, i.e. “learning communities,” through their freshman year and in many cases these communities have been sustained for several years.
While summer-long bridge programs are difficult to fund and staff with large numbers of students, and first semester programs offer help too late for many students, a one-week “boot camp” can be feasible at large universities and provide help for students before they make their first semester mistakes.

**Conclusion 1**

Based on the findings of this study the researcher concluded that students who participated in the BIOS program were more successful in the first two years of college than students who did not participate in such a program. For the purpose of this study, success was defined as receiving a grade of A, B or C in biological science courses. That students can be helped by intervention before and during the first year is supported by the previously published work of House and Kuchynka (1997) who reported that students who participated in a first-year seminar were more successful than students who had not taken the seminar course; and Malave and Watson (1998), who reported a 12% increase in grade point average for students who had been in a freshman engineering program at Texas A & M University. Other programs have reported increased student success after participation in an academic first-year program (Chevalier et al., 2001; Fletcher et al., 2001; Gordon & Bridglall, 2004; Reyes et al., 1998). The implication of this body of work is that pre-freshman programs are valuable to incoming students. Based on this conclusion, it is recommended that the BIOS program be continued and used as a model for other departments and universities for incoming students.

**Conclusion 2**

Based on the findings of this study the researcher concluded that students who participated in the BIOS program were retained in the biological sciences major at higher rates than students who did not participate in such a program. This finding similar to those reported by Fujinoki, et al. (2001), whose 3-day FORTRAN Programming “Boot Camp” showed a two-fold increase in retention in the required course over non-participants. The SUCCESS Week at Southern Illinois University (Chevalier, et al., 2001) and the Women in Applied Science and Engineering program at Arizona State University also showed significant increases in the retention of students in the major. These findings imply that
intervention between high school and the freshman year of college increases the student’s chances of being retained in the major field of study. This conclusion also leads to the recommendation that the BIOS program be continued and used as a model for other departments and universities for incoming students.

Conclusion 3

Based on the findings of this study the researcher concluded that students who participated in the BIOS program remained on track to graduate in four years at a higher rate than students who did not participate in such a program. Major national reports cite the need to increase the numbers of students pursuing and successfully completing baccalaureate and advanced degrees in science and math (Augustine, 2006; Stryer et al., 2003). However, Levin and Cureton (1998) report that fewer than 40% of students are able to complete a baccalaureate in four years, and at Louisiana State University, only 60% are able to graduate within six years (“University & College Trend Data,” 2007). The implication of this body of work is that students who participated in BIOS were more likely to remain on track to graduate in four years. Because there is much emphasis on increasing student numbers in the Science, Technology, Engineering and Mathematics (STEM) disciplines, this conclusion leads to the recommendation that the BIOS program be continued and expanded to other STEM areas.

Conclusion 4

Based on the findings of this study, the researcher concluded that the BIOS program had an overall beneficial impact on student participants. The components of BIOS are those of a successful orientation program that are reported in the literature. These programs should contain academic activities, student services, social and recreational events (Miller, 2003; Upcraft et al., 2005) that work together to create learning communities among the students (Laufgraben, 2004), including mentoring opportunities (Jacobi, 1991). Although much is written about the need to shorten time to graduation, little is reported on successful ways of doing so. The implication of this conclusion is that programs that provide students with mechanisms to learn study skills and form learning communities can help them to stay on track.
toward a four year graduation and remain in the biology major. It is recommended that further study of BIOS and other pre-freshman programs be undertaken. Although the Biology Intensive Orientation for Students (BIOS) has proven to be successful in helping incoming freshman biology majors transition into a large research university, more research is needed to optimize the “boot camp” model. As the numbers of BIOS alumni increase each year, analysis of data can be done on different groups that have as yet had small sample sizes. Areas of further research include the following:

1) Comparing student success rate by ACT and high school GPA. Is BIOS more beneficial to higher achieving students or those who have marginal incoming scores?

2) Comparing student success rate by gender. Does the existing “boot camp” model help men more or less than women? Further modification of the program might aid one gender more than the current model.

3) Comparing student success rate by ethnicity. Does the existing “boot camp” model affect ethnic groups differently? Further modification of the program might aid minority ethnic groups more than the current model.

4) Adding a laboratory component to the BIOS program. Hands-on activities can be an important part of a science class experience. Would the addition of laboratory experiments increase the effectiveness of BIOS?

While summer-long bridge programs are difficult to fund and staff with large numbers of students, and first semester programs offer help too late for many students, a one-week “boot camp” can be feasible at large universities and provide help for students before they make their first semester mistakes.

References


APPENDIX 1.

ACT-SAT CONVERSION CHART

<table>
<thead>
<tr>
<th>SAT CR+M (Score Range)</th>
<th>ACT Composite Score</th>
<th>SAT CR+M (Single Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600</td>
<td>36</td>
<td>1600</td>
</tr>
<tr>
<td>1540-1590</td>
<td>35</td>
<td>1560</td>
</tr>
<tr>
<td>1490-1530</td>
<td>34</td>
<td>1510</td>
</tr>
<tr>
<td>1440-1480</td>
<td>33</td>
<td>1460</td>
</tr>
<tr>
<td>1400-1430</td>
<td>32</td>
<td>1420</td>
</tr>
<tr>
<td>1360-1390</td>
<td>31</td>
<td>1380</td>
</tr>
<tr>
<td>1330-1350</td>
<td>30</td>
<td>1340</td>
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</tr>
<tr>
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</tr>
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<td>22</td>
<td>1030</td>
</tr>
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<td>510-550</td>
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Note: Derived using ACT sum.
APPENDIX 2.

RECRUITMENT EMAIL MESSAGE

Subject: New Program for Biology Majors
Date: Monday, May 9, 2005 1:40 PM
From: Sheri Wischusen <swischu@lsu.edu>
To: Freshmen 2005 <swischu@lsu.edu>
Cc: Bill Wischusen <ewischu@lsu.edu>, Sheri Wischusen <swischu@lsu.edu>
Conversation: New Program for Biology Majors

Are you a biology major who would like to get a head start on your first semester at LSU?

Would you like to learn how to study efficiently so that you can really learn the material rather than hoping that you will remember enough to do well on the exams?

You might be interested in BIOS (an intensive orientation program for incoming biology majors). This program, which was first announced during the Spring Invitational, is open to all incoming freshman biology majors.

For more information please see the attached program flyer or visit the BIOS web site (for an application):
http://www.biology.lsu.edu/introbio/bios/home.htm

+++++++++++++++++++
Sheri Wischusen
BIOS Coordinator
Manager, LSU/HHMI Program
Office: 535 Choppin Hall
Mailing address:
College of Basic Sciences
338 Choppin Hall
Louisiana State University
Baton Rouge, LA 70803
Phone: 225–578–0405
Fax: 225–578–7627 (LSU-SOAR)
UNDERGRADUATE RESEARCH PROGRAM
http://www.biology.lsu.edu/hhmiprog/undergrad/
SCOPE–ON–A–ROPE (SOAR) http://www.scopeonarope.lsu.edu
MOLECULAR BIOLOGY OUTREACH PROGRAM (MBOP) http://www.biology.lsu.edu/mbop
BIOS (Biology Intensive Orientation for Students) http://www.biology.lsu.edu/introbio/bios/home.htm
Would you like to get a jump start on your first semester at LSU and a head start on medical or graduate school?

**BIOS** is an intensive one-week program specifically designed to help Biological Sciences students make the transition to college, learn skills for professional or graduate school, and take the stress out of the first semester at LSU.

**Participants will**
- Gain important learning/study skills.
- Get a jump start on course content.
- Meet faculty, graduate students, and staff.
- Receive a free copy of the EIO1.1201 textbook.

The program combines course lectures, sessions on effective and efficient learning, and information on becoming a successful student in an effort to provide participants with tools and skills required to excel.

**Program Dates: August 13 - 18, 2006**
**Program Cost:** $350, plus $100 for housing if needed

For information contact:
Sheri Wischusen
LSU-HMI Program Manager
225-578-6406
sherid@lsu.edu

or visit [www.biology.lsu.edu/inb/bios/home.html](http://www.biology.lsu.edu/inb/bios/home.html)
BIOS is a one week intensive program specifically for incoming Biological Sciences majors. This program is designed to help these students make the transition to the expectations of college prior to the start of the fall semester.

The participants will:

• Learn important study skills
• Get a jump start on the course content
• Get a copy of the BIOL 1201 textbook (a $130 value)
• Meet faculty, graduate students, and university staff

See comments from previous participants, 2005 comments

See a tentative schedule, link to BIOS flyer
Program Dates: 13-18 August, 2006

Program Cost: $350, plus housing, if needed

Program FAQs

Registration Deadline: 15 July, 2006 (spaces to be filled on a "First Come/First served" basis, participants must be enrolled in BIOL 1201 in the Fall semester, priority given to incoming LSU students intending to major in Biological Sciences)

BIOS is now Full, we are no longer accepting applications

No refunds after 15 July, 2006

To apply download and print the application form. Once complete "Click" submit to send the application electronically or send the application to:

Sheri Wischusen
LSU/HHMI Program Manager
338 Choppin Hall
Baton Rouge, LA 70803

or

Fax the application to Sheri Wischusen
(225) 578-7627

For additional information contact:

Sheri Wischusen
(225) 578-0405
sheril@lsu.edu

http://www.biology.lsu.edu/introbio/bios/home.htm
APPENDIX 5.

BIOS WEBSITE “FREQUENTLY ASKED QUESTIONS”

BIOS FAQs

Q. When do I show up for BIOS and where do I go?
A. If you have opted for housing during BIOS you can check into Acadian Hall after 3:00pm on Sunday, August 13.
Program check-in will be at 5:00pm in the Magnolia Room (formerly Plantation Room) on the 3rd floor of the Union. Dinner will be provided for participants and program activities will begin during dinner.

Q. Can I plan to do other things after hours and between BIOS activities during that week?
A. NO. BIOS is an intensive orientation program that requires your participation 8:00am until 9:00 each evening. The tentative schedule for the week is available on the BIOS website.

Q. If I choose to stay in a dormitory during BIOS will I get to move directly into my Fall housing assignment?
A. No, BIOS participants are housed together in Acadian Hall. However, we have made arrangements to move into your Fall dorm room on the last day of BIOS, immediately after the awards luncheon. You will be charged for the extra days that you stay in your fall room before the official move-in date. You will be contacted by Residential Life staff during BIOS to schedule your move. You will be charged a daily rate for the extra days that you are in your room before the official beginning of the fall semester.

Q. If I choose to stay in a dormitory during BIOS will I need to bring linens from home?
A. Yes, your dorm room will not have sheets or towels. You will need to bring your fall bedding, etc.

Q. Will I have to buy a Parking Permit for the BIOS week?
A. No. The LSU Parking Office intends to mail out fall parking permits during the first week of August. If BIOS participants have not received their permits before arriving on campus for BIOS, the parking office will make special arrangements for those students’ cars.

Q. Will I receive course credit for participating in BIOS?
A. No, this is an optional orientation program. No official LSU credit will be given for BIOS.

Q. Can I participate in BIOS even if I don’t intend to take BIOL 1201 in the fall?
A. Enrollment in BIOL 1201 is a prerequisite for participation in BIOS. The week is geared toward specific help with the beginning of Introductory Biology and will not be as helpful to non-Biology students. Students who are registered for BIOL 1201 in the fall semester will be given priority, and those who intend to take the course in the spring will be placed on a waiting list.

Q. Will meals be provided during BIOS?
A. A meal card will be provided for breakfast and lunch during and a hot meal will be served each evening. The meal card will only be valid in the Tiger Lair, 2nd floor, area of the Union so that our participants and their graduate student mentors can eat together. The meal plan is limited to $4 for each breakfast and $6 for lunch. Friday’s lunch will be a banquet to which parents are invited.
Q. Will there be a final banquet to which I can invite my parents?
A. Yes. We will have a celebration and awards banquet on Friday afternoon. Parents are encouraged to attend but must RSVP ahead of time on the Liability Form that was emailed to each participant.

Q. Will I need to bring school supplies and a textbook?
A. The textbook for BIOL 1201 will be provided as part of the BIOS program, along with a notebook with paper for taking notes. You will need to bring any other school supplies (pens, pencils, calculator, etc.) that you will need to take notes and study for exams.
Applicants must complete all fields in the “BIOS Course” Section. Those requesting on-campus housing in 2-person dormitory room must complete “Housing” Section. When you are accepted you will be notified by email to your PAWS email address and the applicable charges will be posted to your PAWS account. The email will also provide instructions for how to pay these charges through your PAWS account. You must pay the applicable charges through your PAWS Account within two weeks of the email notification in order to reserve a space. Enrollment is limited, all spaces assigned on first come/first served basis. Refunds cannot be given after July 15, 2006.

Costs:
- Registration: $350
- Housing: $100

Complete Online Application below or Print and Fax to: Sheri Wischusen
225-578-7627

Submit Application

BIOS Course
Name_________________________________________________ PAWS e-mail address____________________

Date of Birth ______________________________ SS #________________________

High School__________________________ City, State______________________________

Housing YES NO

Optional:
Roommate preference________________________ Roommate email address ________________

Home Address_________________________________________ Phone__________________________
APPENDIX 7.

BIOS LIABILITY RELEASE FORM

Acknowledgement of Risk and Agreement to Follow All University Rules, Regulations and Directives

I (Print name) ______________________ understand and acknowledge that all the activities I engage in are by choice and may entail certain risks and possible injury. Accordingly, I agree that I assume the full risk of physical and/or emotional injury.

By signing this form I also agree to abide by all University rules and regulations, including directives from University staff. I understand that I am subject to the Code of Student Conduct and University housing and conference policies.

Signature: ___________________________ Date: __________________

(If participant is under 18 years of age, parent or legal guardian must also sign)

Parent/Guardian Signature: ___________________________ Date: __________________

EMERGENCY CONTACT: Name: ___________________________
Phone: ___________________________
Cell Phone: ___________________________
e-mail: ___________________________

Do you have any allergies, physical limitations or medical needs we should be aware of? __________________________________________________________

__________________________________________________________

Adult T-Shirt Size (Circle one): Small   Medium   Large   XL   XXL

Parent RSVP for Friday Awards Luncheon and Closing Ceremonies,
12:00 noon   Atchafalaya Room, LSU Union
# to attend ______________

Complete and fax to 225-578-7627 before the beginning of the BIOS Program
APPENDIX 8.

BIOS IRB CONSENT TO PARTICIPATE FORM

Biology Intensive Orientation for Students (BIOS)
College of Basic Sciences, Dept. of Biological Sciences

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH ACTIVITIES

Principal Investigator
Sheri Wischusen,
Asst. Director, Undergraduate Research, BASC Office of Multidisciplinary Research
225-578-0405  FAX 225-578-7627
sheri@lsu.edu

The purpose of this research is to follow the progress of undergraduate biological sciences majors to judge the merit of a pre-freshman year orientation program. You are asked to sign this form allowing your program officers to track your college progress. You may be asked to participate in interviews and/or to complete questionnaires about your academic experiences. You also agree to allow program officers access to your LSU academic transcripts. You agree that your program administrators may use your photographs in program publications. All information gathered will be held in strict confidence. Any information learned from a study by which you might be identified will be confidential and disclosed only with your permission. By signing this form, you allow the research study investigator to make your records available to the Louisiana State University (LSU) Institutional Review Board (IRB) Office and regulatory agencies as required by law.

The researchers do not foresee any risks. In order to protect your confidentiality, academic transcripts, questionnaires, and interview tapes will be kept in a locked office. Any identifying information will be shared only with the funding agency. Statistics for general publication will be anonymous.

Your participation in this study is voluntary. You are free to withdraw your consent for participation at any time, via written communication.

The Program Administrator, Sheri Wischusen, is responsible for this research study. If you have any further questions, or in the event of a research related injury, you can contact her at the numbers above.

This study has been reviewed and approved by the LSU Institutional Review Board (IRB). A representative from that board is available to discuss and review your rights as a research participant. The telephone number for the IRB office is (225) 578-8692.

I have read the description above, had any questions answered, and agree to be a participant in this study.

_________________________________ _____________
Print Participant’s Name

Date

_________________________________ _____________
Participant’s Signature

Date

Currently, I will NOT participate in the research project.

_________________________________ _____________
Signature
Louisiana State University •
Baton Rouge, Louisiana •

Date
APPENDIX 9.

SAMPLE EMAIL APPLICANT UPDATES

Subject: BIOS@LSU
Date: Friday, June 30, 2006 11:34 AM
From: Sheri Wischusen <sheri@lsu.edu>
To: Sheri Wischusen <sheri@lsu.edu>
Conversation: BIOS@LSU

Your application has been accepted to allow you to participate in the 2006 BIOS Program at LSU. Your PAWS account will be charged for the $350 registration fee, plus $100 housing if you asked for this option.

All correspondence for this program will be through your PAWS email account, so please check your email often.

We will send further program information soon. In the meantime, please contact me if you have questions or concerns.

Sheri Wischusen

Sheri Wischusen, MS
Assistant Director for Undergraduate Research
College of Basic Sciences
Manager, LSU/HHMI Program

Phone: 225-578-0405
Fax: 225-578-7627 (LSU/HHMI)
Office: 535 Choppin Hall

Mailing address:
338 Choppin Hall
Louisiana State University
Baton Rouge, LA 70803

"It is a miracle that curiosity survives formal education." - Albert Einstein
Subject: BIOS@LSU
Date: Monday, April 25, 2005 10:58 AM
From: Sheri Wischusen <swischu@lsu.edu>
To: Bill Wischusen <ewischu@lsu.edu>, Wanda Bush <wbush@lsu.edu>
Cc: Sheri Wischusen <swischu@lsu.edu>
Conversation: BIOS@LSU

Good Morning!!

The charges for your participation in BIOS Biology Camp @ LSU have been posted on your PAWS page. Please make arrangements pay as soon as possible.!!

These charges will only remain on your account for two weeks, after which unpaid balances will be removed and you will be dropped from the registration list.!!

In order to fill our program, if your circumstances change so that you cannot attend the camp, please notify me as soon as possible. Refunds can only be made before July 15, 2005.!!

Feel free to contact me if you have questions about your bill or any other part of the BIOS program.!!

Sincerely,!!

Sheri Wischusen
Manager, LSU/HHMI Program
Office: 535 Choppin Hall
Mailing address:
College of Basic Sciences
338 Choppin Hall
Louisiana State University
Baton Rouge, LA 70803
Phone: 225-578-0405
Fax: 225-578-7627 (LSU-SOAR)

UNDERGRADUATE RESEARCH PROGRAM
http://www.biology.lsu.edu/hhmiprograms/undergrad/

SCOPE-ON-A-ROPE (SOAR) http://www.scopeonarope.lsu.edu

MOLECULAR BIOLOGY OUTREACH PROGRAM (MBO) http://www.biology.lsu.edu/mbo

BIOS (Biology Intensive Orientation for Students)
http://www.biology.lsu.edu/IntroBio/BIOS/home.html
APPENDIX 10.

BIOS 2005 SCHEDULE

BIOS 2005

Sunday (7 August)

4:00-6:00 pm Check-in for students needing housing (ACADIAN Residence Hall)
6:00-7:00 pm Program check-in (French House)
7:00-9:00 pm Orientation (LSB A101)

Monday (8 August)

Morning
8:00-10:00 Introduction, Content Lecture 1, basic chemistry (atomic structure, valence, bonds). (LSB A101) (Dr. Wischusen)
10:00-10:30 Break (LSB Annex Lobby)
10:30-12:00 Study Skills Discussion 1, note taking, listening and metacognition. (LSB A101) (Dr. McGuire)

Afternoon
12:00-1:30 Lunch in the Magnolia Room, LSU Union
2:00-3:30 Content Lecture 2, basic chemistry II (properties of water, pH, hydrogen bonding). (Williams 103) (Dr. Wischusen)
3:30-3:45 Break
3:45-5:00 Study Skills Discussion 2, learning styles. (Williams 103) (Dr. McGuire, Ms. Baird)
### Wednesday (10 August)

**Morning**
- 8:00-10:00 Content Lecture 4, biological molecules II.  (Coates 143) (Dr. Wischusen)
- 10:00-10:30 Break (outside Coates 143)
- 10:30-12:00 How to be a Student Session 3, what is the College of Basic Sciences? (Coates 143) (Ms. Junek)

**Afternoon**
- 12:00-1:30 Lunch in the Magnolia Room, LSU Union
- 2:00-3:30 Content Lecture 5, chemical reactions/enzymes.  (Dodson 100) (Dr. Wischusen)
- 3:30-3:45 Break
- 3:45-5:00 How to be a Student Session 4, how do I get help?  (Dodson 100) (Dr. Feduccia, Ms. Wischusen)
- 5:00-6:30 Dinner in the Magnolia Room, LSU Union
- 6:30-7:00 Research Presentation (109 Tureaud)
- 7:00-9:00 Study Hall.  (Tureaud 109, 112, 116, 117)

### Thursday (11 August)

**Morning**
- 8:00-9:00 Exam 2 (Himes Hall)
- 9:00-9:15 Break (outside Dodson 100)
- 9:15-10:30 Content Lecture 6, cell membrane structure and function.  (Dodson 100) (Dr. Wischusen)
- 10:30-12:00 How to be a Student Session 5, how do I survive? (Dodson 100) (Ms. Cavender)

**Afternoon**
- 12:00-1:30 Lunch in the Magnolia Room, LSU Union
- 2:00-3:30 Discussion of Exam Results.  (LSB A101) (Dr. Wischusen)
- 3:30-3:45 Break
- 3:45-5:00 Content Lecture 7, cell structures.  (LSB A101) (Dr. Wischusen)
- 5:00-6:30 Dinner in the Magnolia Room, LSU Union
- 6:30-7:00 Research Presentation (109 Tureaud)
- 7:00-9:00 Study Hall.  (Tureaud 109, 112, 116, 117)

### Friday (12 August)

**Morning**
- 8:00-9:00 Exam 3.  (Himes Hall)
- 9:00-9:15 Break (LSB Annex Lobby)
- 9:15-11:00 How to be a Student Session 6, what comes after you graduate?  (LSB A101) (Dr. Monroe and Dr. Farrar)
- 11:00-12:00 Discussion Results Exam 3.  (LSB A101) (Dr. Wischusen)

**Afternoon**
- 12:00-1:30 Awards Luncheon and Closing Ceremonies
- 1:30-2:30 Checkout of rooms
APPENDIX 11.

BIOS 2006 SCHEDULE

BIOS 2006 Schedule
Sunday (13 August)

3:00-5:00 pm Check-in for students needing housing (Acadian Hall)
4:00-6:00 pm Program check-in and dinner (Royal Ballroom, LSU Union)
6:00-8:00 pm Orientation (part 1) (LSU Parade Ground)
8:00-9:00 pm Orientation (part 2) (A101 Life Sciences Bldg.)

Monday 14 August

Morning (103 Williams)
7:00-8:00 Breakfast (Tiger Lair, LSU Union)
8:00-10:00 Introduction, Content Lecture 1, Basic Chemistry
10:00-10:30 Break
10:30-12:00 Study Skills Discussion 1, note taking, listening and metacognition (McGuire)

Afternoon (143 Coates)
12:00-1:30 Lunch (Tiger Lair)
2:00-3:30 Content Lecture 2, Basic Chemistry II
3:30-3:45 Break
3:45-5:00 Study Skills Discussion 2, Learning styles (Baird)
5:00-6:30 Dinner (Magnolia Room, LSU Union)
6:30-7:00 Research Presentation (Tureaud Hall)
7:00-9:00 Study Hall (Tureaud Hall)

Tuesday (15 August)

Morning (143 Coates)
7:00-8:00 Breakfast (Tiger Lair)
8:00-9:30 Exam 1 (Pentagon Dining Hall Testing Facility)
9:30-9:45 Break
9:45-11:00 Content Lecture 3, Biological Molecules
11:00-12:15 How to be a Student Session 1, What are your responsibilities as a student? (Carman and Wischusen)

Afternoon (100 Dodson)
12:15-1:30 Lunch (Tiger Lair)
2:00-3:30 Discussion of Exam Results (Baird and Wischusen)
3:30-3:45 Break
3:45-5:00 How to be a Student Session 2, What is the Center for the Freshman Year? (Ivey)
5:00-6:30 Dinner (Magnolia Room)
6:30-7:00 Research Presentation (Tureaud Hall)
7:00-9:00 Study Hall (Tureaud Hall)
**Wednesday (16 August)**

*Morning (100 Dodson)*
- 7:00-8:00 Breakfast (Tiger Lair)
- 8:00-10:00 Content Lecture 4, Biological Molecules II
- 10:00-10:30 Break
- 10:30-12:00 How to be a Student Session 3, How do I manage my schedule (Bruch) and What is the College of Basic Sciences? (Junek)

*Afternoon (Campbell Auditorium)*
- 12:00-1:30 Lunch (Tiger Lair)
- 2:00-3:30 Content Lecture 5, Chemical Reactions/Enzymes
- 3:30-3:45 Break
- 3:45-5:00 How to be a Student Session 4, How do I get help? (White) and Student organizations (Pomarico)
- 5:00-6:30 Dinner (Magnolia Room)
- 6:30-7:00 Research Presentation (Tureaud Hall)
- 7:00-9:00 Study Hall (Tureaud Hall)

**Thursday (17 August)**

*Morning (Campbell Auditorium)*
- 7:00-8:00 Breakfast (Tiger Lair)
- 8:00-9:30 Exam 2 (Pentagon Dining Hall Testing Facility)
- 9:30-10:30 Content Lecture 6, cell structures
- 10:30-10:45 Break
- 10:45-12:00 How to be a Student Session 5, How do I survive? (part 1) Money Matters, (Epperson) and Undergraduate Research (Wischusen)

*Afternoon (Lockett 2)*
- 12:15-1:30 Lunch (Tiger Lair)
- 2:00-3:30 Discussion of Exam Results
- 3:30-3:45 Break
- 3:45-5:00 Content Lecture 7, cell membrane structure and function
- 5:00-6:30 Dinner (Magnolia Room)
- 6:30-7:30 How to be a Student Session 5, How do I survive? (part 2) Wellness (Saichuk)
- 7:30-8:00 Research Presentation (Tureaud Hall)
- 8:00-10:00 Study Hall (Tureaud Hall)

**Friday (18 August)**

*Morning (Lockett 2)*
- 7:00-8:00 Breakfast (Tiger Lair)
- 8:00-9:30 Exam 3 (Pentagon Dining Hall Testing Facility)
- 9:30-9:45 Break
- 9:45-11:00 How to be a Student Session 6, What comes after you graduate? (Farrar and Bowen)
- 11:00-12:30 Team Building II (Parade Ground)

*Afternoon*
- 12:30-1:00 Final Exam Results (A101 LSB)
- 1:00-2:30 Awards Luncheon and Closing Ceremonies (Cotillion Ballroom)
- 2:30-3:30 Checkout of rooms
APPENDIX 12.

BIOS CAMPUS MAP
From Bobby Matthews, Director CELT

Draft Focus Group on Study Habits Draft Protocol  BIOS Program

1. During the past year, on a typical school-week evening, how much did you study?

2. How do you study? (in general)

   Then . . . (if these topics haven't come up)

   How do you study for a test?

Do you use a reading study system?

   Do you take notes in class? If yes, how do you use notes?

Do you use shortcuts or memory tricks to help you remember important facts? (Probing here for Note cards, Acronyms, Mnemonics, Outlining, and etc.)

3. Do you find it easier to study alone, with one other person, or in a group? If you study with someone else (one or more people), please tell me how your study session is structured.

4. Some researchers think where you study is more important than how you study. Please tell us about your usual study environment.

5. Do you feel that your study time is productive? In other words, do you feel that the more you study, the better your grade on the test will be? Why or why not?

6. Do you often study by cramming for a test at the last minute? If so, how well does that usually work for you?

7. Are you at your best for learning at a specific time of day? If yes, what use do you make of that information?

8. Below is a list of common study aids. Do you know anything about any of them?
   SQ3R (Reading Study System)
   Brainstorming (Mind Mapping)
   Data Chunking (Connection systems)
   Charting Data
   A Distractions List
   Cornell Notes (T-Notes)
BIOS Program Exit Evaluation

In this section of the survey you will be asked to consider a variety of possible benefits you may have gained from your experience in the week of BIOS. If for any reason you prefer not to answer, or consider the question irrelevant to you, please circle the "NA or prefer not to answer" option. The scale for measuring your gain is from 1 (no gain at all) to 5 (very large gain).

Here is the scale for measuring your gain on each item:
1=no gain 4=large gain
2=small gain 5=very large gain
3=moderate gain 0=NA or prefer not to answer

Please Circle the “best” choice.

1 Clarification of expectations of me as a student.
1 2 3 4 5 0

2 Skill in taking notes during lecture.
1 2 3 4 5 0

3 Skill in studying for exams.
1 2 3 4 5 0

4 Comfort in learning lecture material.
1 2 3 4 5 0

5 Understanding how the material is constructed
1 2 3 4 5 0

6 Comfort in taking a college exam.
1 2 3 4 5 0

7 Comfort in taking an exam on a computer.
1 2 3 4 5 0

8 Self-confidence for the upcoming semester.
1 2 3 4 5 0

9 Learning to study in a group
1 2 3 4 5 0

10 Learning to study alone.
1 2 3 4 5 0

Here are questions about your overall experience.

1 Think about the expectations you had about the BIOS experience before the program began. Check the statement below that most closely describes your current feelings.
☐ The experience was much less than I expected.
☐ The experience was a little less than I expected.
☐ The experience met my expectations.
☐ The experience was a little better than I expected.
☐ The experience was much better than I expected.
☐ NA or prefer not to answer.

2 Think about the biology content lectures. Use the scale below to evaluate your feelings about the content.
☐ I knew all the information from high school courses.
☐ I knew some of the information from high school courses.
☐ I had heard of some of the concepts but most of the information was new to me.
☐ All of the information was new to me.
☐ NA or prefer not to answer.
3 Think about the other students in your Study Group. Choose a statement that describes your experience with other students.

- Studying with other students was the worst part of BIOS.
- Studying with other students moderately detracted from my experience.
- Studying with other students did not affect my experience one way or another.
- Studying with other students moderately enhanced my experience.
- Studying with other students was one of the best parts of BIOS.
- NA or prefer not to answer.

4 In hindsight, would you choose to do BIOS again?

- I would choose to not participate in BIOS.
- I would be unlikely to choose to participate in BIOS.
- I would be likely to choose to participate in BIOS.
- I would be very likely to choose to participate in BIOS.
- NA or prefer not to answer.

5 Evaluate your overall sense of BIOS as a learning experience using the scale below.

- BIOS was a waste of time for me- I didn't learn much.
- Well, it was better than hanging around home one more week, but I don't think I learned a lot.
- I feel neutral about it- there are definitely good things, but also not so good things about a week of BIOS.
- I had a good time, I learned a lot, I'd do it again.
- The program was fantastic! In my mind, I really learned what being a biology major is about.
- NA or prefer not to answer.

For each of the non-science topics that were presented during BIOS, evaluate each by ranking it 0-5, with 0 being not useful at all and 5 being extremely useful.

- University Structure and Services (Center for the Freshman Year, College of Basic Sciences)
- Student Health Center Services and Wellness
- Student Financial Advice
- Overall BIOS Program Administration

For each of the BIOS staff members with whom your interacted, evaluate their usefulness in your BIOS experience, 0 being Not Helpful at All, 5 Being Extremely Helpful

- Dr. Bill Wischusen, BIOS Lecturer
- Your Graduate Student Mentor (name ________________)
- The Other Graduate Students
- Ms. Sheri Wischusen, BIOS Administrator

What was your favorite part of the BIOS program?

What was your least favorite part of the BIOS program?

What advice can you give the organizers to make next year’s BIOS be more helpful to its participants?
APPENDIX 15.

“WEEK 7” EMAIL QUESTIONS TO 2005 PROGRAM PARTICIPANTS

Subject: Re: BIOS Follow-up
Date: Thursday, October 6, 2005 11:03 AM
From: Joshua Fontenot <jfont65@lsu.edu>
To: Sheri Wischusen <swischu@lsu.edu>
Conversation: BIOS Follow-up

----- Original Message -----
From: "Sheri Wischusen"
To: "Bill Wischusen"
Subject: BIOS Follow-up
Date: Tue, 04 Oct 2005 13:45:15 -0500

Hi Boot Camp Alumni!
Congratulations on surviving your first Intro Bio exam at LSU! I hope you all did as well as you wanted to.

Now that you have been an LSU student for several weeks, give or take a hurricane or two, we would like your thoughts on how BIOS has affected your start in college.

Please send me back any feedback you think would be useful for next year’s freshmen, what did we do right, what could we have done better, was BIOS worth a week of your summer in hindsight?

Thanks for any comments you can offer us. Please contact me any time if you have questions, concerns, ideas that I might be able to help you with.

Take care,
Sheri

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Sheri Wischusen, MS
Assistant Director for Undergraduate Research
College of Basic Sciences
Manager, LSU/HHMI Program
Coordinator, BIOS Program
APPENDIX 16.

MIDSEMESTER QUESTIONNAIRE TO 2006 PROGRAM PARTICIPANTS

BIOS Program Mid-Semester Evaluation

This is an anonymous survey. Please give your completed form to Ms. Virginia Johnson in the Introductory Biology Program Office, 102 LSB.

The BIOS program was designed to give you a head start in BIOL 1201 and to make the transition to your first semester of college easier. With this in mind please answer the following questions concerning the program.

In this section you are asked to consider possible benefits from your BIOS experience. If for any reason you prefer not to answer, or consider the question irrelevant to you, please circle the "NA or prefer not to answer" option. The scale for measuring your gain is from 1 (no gain at all) to 5 (very large gain).

5 = very large benefit  
4 = large benefit  
3 = moderate benefit  
2 = small benefit  
1 = no benefit  
0 = NA or prefer not to answer

Please Circle the “best” choice.

|   | Clarification of expectations of me as a student. |   | Skill in taking notes during lecture. |   | Skill in studying for exams. |   | Comfort in learning lecture material. |   | Understanding how the material is constructed |   | Comfort in taking a college exam. |   | Comfort in taking an exam on a computer. |   | Self-confidence during the semester. |   | Learning to study in a group |   | Learning to study alone. |
|---|-----------------------------------------------|---|--------------------------------------|---|-------------------------------|---|-------------------------------------|---|------------------------------------------|---|----------------------------------|---|------------------------------------------|---|-------------------------------------|---|-------------------------------|
| 1 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 2 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 3 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 4 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 5 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 6 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 7 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 8 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 9 | 5                                             | 4 | 3                                    | 2 | 1                             | 0 |
| 10| 5                                             | 4 | 3                                    | 2 | 1                             | 0 |

Here are questions about your overall experience.

1 Think about the expectations you had about the BIOS experience before the program began. Check the statement below that most closely describes your current feelings.

- The experience was much less than I expected.
- The experience was a little less than I expected.
- The experience met my expectations.
- The experience was a little better than I expected.
- The experience was much better than I expected.
- NA or prefer not to answer.
2 Think about the biology content lectures. Use the scale below to evaluate your feelings about the content.
☐ The content helped me prepare for the first exams.
☐ The content increased my understanding of the important concepts.
☐ The content was mostly review and only helped me marginally.
☐ The content did not help me during the first half of the semester.
☐ NA or prefer not to answer.

3 Think about the other students in your Study Group. Choose a statement that describes your experience with other students.
☐ Studying with other students was the worst part of BIOS.
☐ Studying with other students moderately detracted from my experience.
☐ Studying with other students did not affect my experience one way or another.
☐ Studying with other students moderately enhanced my experience.
☐ Studying with other students was one of the best parts of BIOS.
☐ NA or prefer not to answer.

4 In hindsight, would you choose to do BIOS again?
☐ I would choose to not participate in BIOS.
☐ I would be unlikely to choose to participate in BIOS.
☐ I would be likely to choose to participate in BIOS.
☐ I would be very likely to choose to participate in BIOS.
☐ NA or prefer not to answer

5 Evaluate your overall sense of BIOS as a learning experience using the scale below.
☐ BIOS was a waste of time for me- I didn't learn much.
☐ Well, it was better than hanging around home one more week, but I don't think I learned a lot.
☐ I feel neutral about it- there are definitely good things, but also not so good things about a week of BIOS.
☐ I had a good time, I learned a lot, and I’d do it again.
☐ The program was fantastic! In my mind, I really learned what being a biology major is about.
☐ NA or prefer not to answer.

Now that you are well into your freshman fall semester, what part of the BIOS program do you think has helped you the most so far?

What part of the BIOS program do you think has helped you the least so far?
APPENDIX 17.

WISCHUSEN IRB COURSE COMPLETION CERTIFICATE

Completion Certificate

This is to certify that

Sheri Wischhusen

has completed the Human Participants Protection Education for Research Teams online course, sponsored by the National Institutes of Health (NIH), on 08/15/2005.

This course included the following:

• key historical events and current issues that impact guidelines and legislation on human participant protection in research.
• ethical principles and guidelines that should assist in resolving the ethical issues inherent in the conduct of research with human participants.
• the use of key ethical principles and federal regulations to protect human participants at various stages in the research process.
• a definition of informed consent and components necessary for a valid consent.
• a description of the role of the IRB in the research process.
• the roles, responsibilities, and interactions of federal agencies, institutions, and researchers in conducting research with human participants.

National Institutes of Health
http://www.nih.gov

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APPENDIX 18.

CBE LIFE SCIENCES EDUCATION PERMISSION LETTER

CBE—Life Sciences Education
Publications Office
cbe@ascb.org
Phone: 301-347-9304
Fax: 301-347-9350

April 7, 2008

To Whom It May Concern:

The American Society for Cell Biology grants permission for you to include in your dissertation the following published article: Sheri Maples Wischhusen and F. William Wischhusen (2007), Biology Intensive Orientation for Students (BIOS): A Biology "Boot Camp," CBE Life Sci Educ 6(2): 172-178, subject to proper ASCB copyright credit and link to the original publication of the manuscript in CBE—Life Sciences Education.

Sincerely yours,

[Signature]

William R. Wood
Editor-in-Chief
CBE—Life Sciences Education

THE AMERICAN SOCIETY FOR CELL BIOLOGY
From: Alan Seidman <aseidman@cscsr.org>
Date: Wed, 21 Jan 2009 08:20:16 -0500
To: 'Sheri Wischusen' <sheri@lsu.edu>
Subject: RE: Wischusen permission request

Sheri:
You retain the right to use the manuscript as you see fit. So it is ok to include. Incidentally you will be receiving publication information soon, but it will be published sometime in 2010.

Alan

Dr. Alan Seidman
Executive Director: Center for the Study of College Student Retention
Editor: Journal of College Student Retention: Research, Theory & Practice
30 Windsong Circle
Bedford, NH 03110 USA
603.471.1490
aseidman@cscsr.org

www.cscsr.org
APPENDIX 20.
RESPONSES TO 7TH WEEK EMAIL QUESTION

Student Anecdotal Feedback

Question: Please send me back any feedback you think would be useful for next year's freshmen, what did we do right, what could we have done better, was BIOS worth a week of your summer in hindsight?

1. Hi! It is funny to get your email today because I was telling my friend about the class and how much it helped. We just had our first exam on chapters one through six and I made a 98 on it. I could not have done that without attending the Bios program. I used my notes to help study and I could focus more on the details because I already had a general idea of what was going on. I could even help other people in the class. It helped to get a feel for college before it really counted and to see what the exams were like. I would recommend continuing the program next year. I feel that it was really worth my time. Thanks for the opportunity.

2. BIOS was well worth a week of my summer. Not only did I feel confident on the first exam, but was much less stressed my first few weeks in school because I already had the notes and understood the material for one of my classes. I realize that BIOS put me ahead of many of the students who did not attend the program; this allowed me to help them, which in turn helped me grasp the material even further. Most important, was that I made some really great friends at BIOS. Actually a good majority of my friends I either met at BIOS or met through someone from BIOS. It’s a great opportunity to learn and meet people who are as serious about learning as you are. I really feel that if I had not attended your program I would not love LSU as much as I do.

3. In hindsight, I really enjoyed BIOS. I liked the way you put us in groups with people in our Bio lectures and labs. BIOS really helped to prepare me for my biology course.

4. I have to say that it helped me out a lot. Knowing people in my Biology class was great, and I actually have most of my science classes with other students from BIOS. I have 'aced' all of my first exams,
which I give BIOS credit for, because I used the study and learning strategies provided by the Center for Academic Success. Learning the beginning chapters in Biology helped me significantly! Being comfortable with LSU's campus also helped me to know where I was! BIOS is a great program that should be continued! Thanks again,

5. After the first Intro Bio exam, I am positive that BIOS was worthwhile. I have felt prepared and comfortable with the material in 1201 since the first day and have your program to thank. The study tips, orientation, and early exposure to college biology have truly proved to be extremely helpful and I appreciate all of your efforts over the summer!

Thanks again,

6. I definitely think that BIOS was worth my time, especially after receiving As on all of my first exams, not just Biology. I find just knowing a little bit about the information before hand helps out a lot even though I have a Biology teacher with a completely different style of teaching. I also found the study skills area of the program helpful because I hate to say it, but they really do work. They take a lot of the pressure off of studying so much information. The only parts of BIOS I may have to complain about are: a) the group study sessions until 9:00, b) the lack of variety in our lunchtime menu, c) order size small t-shirts. Good Luck with next year!

7. I think that BIOS has really helped me so far. Not only did it help me with Biology, but it also has helped with other classes. I am taking notes better than in high school. I also use the studying strategies I learned in the program. The only thing that could have been better were some of the speakers said the same thing. Other than that, BIOS was a really good experience, and I am really glad I participated in it.

8. The BIOS program was amazing. It made the first test a lot easier and kind of broke the ice between the transfer from high school to college. I feel like the course is almost a must for biology majors and I am sure it also helps the other majors as well. Thank you so much for the experience and helping me get a 98 on my first college test.
9. Sorry about the delay, but here it is, better late than never I guess. I want to start by saying that by far the best thing I got out of BIOS initially was something y'all didn't even advertise: I met people before I started college. The first week was enormously stressful and it helped immensely already having friends from BIOS, as well as a friend from home, to fall back on. To this day, over halfway through the semester, some of my best friends are the ones I made at BIOS. Just as a quick example, I ate lunch with two of them today, my old roommate and a group-mate. I guess there's something about 3 of Dr. Wischusen's test in a week that tends to bring people together. My grades have also been much higher than they would have been without. The jump on the biology work gave me that much less to worry about while transitioning to college life, and is currently my highest grade at a 97.7. The skills learned at BIOS have also transferred well to other classes, even if only at times it tells me I'm not doing well in a class.

10. I can't think of much in the way of improvement, although perhaps losing one of the later 'being a student' sessions in place of a little downtime, not so much for a break, but for a bit of socialization/study time. Plus, the sessions towards the end seemed to get a bit repetitive and got harder and harder to pay attention to. The initial ones were great, though, giving useful information that I still use (or forget to and soon regret it).

All in all, I'd say it was definitely worth my week of summer. I must admit, I went to BIOS mostly on my father's suggestion and was not looking forward to giving up one of my final weeks of summer before college life began, but all in all, I'm glad I did.

11. BIOS did me very well. With Bio II AP and BIOS I felt very comfortable, perhaps too comfortable, with the material presented. Everyone I talked to aced it because of BIOS and I found it easy as well. I really wouldn't change much of anything, other than the minor detail that entropy and all are covered in the Unit 2 test part and perhaps you could substitute that information with more information for unit 1 test so they do even better? No complaints, thank you.
12. I definitely think BIOS was worth a week of my summer. I aced my first exam. The material on the exam was basically review of what BIOS had covered during that one week. I just feel a bit uneasy about my upcoming exam; I don't feel as if I know the material as well as I did for the first exam. I know that the reason is because this is new material in much more detail. The point I'm trying to make is that most BIOS participants may feel as if they may have some room to slack off a bit because he or she may have performed well on the first exam. However, I don't want students to feel as if they won't have to study for the upcoming exams. Who knows...grades may drop as a result of this "overconfidence"? But, as long as students adhere to the intense study sessions like Dr. McGuire suggested; I don't think they'll have this problem. BIOS was extremely helpful to me, and I am very satisfied with the results based on my performance of my first exam. I will wait and see how this second exam goes in order to see if BIOS study tips have helped as well.

13. BIOS was well worth the time. Since classes have started, work has been piling up, but because I went to BIOS and learned so much there, I was able to spend more time studying and doing work for other classes. I was still studying for Biology but not as long as I had to for other classes. The tips for studying really helped and it seems to be working really well for all my classes. The schedule was organized very well. The thing that I noticed being the least beneficial were the group study sessions. If the point was to demonstrate the benefit of group study sessions, then that did not come across that great. Many people left to study on their own leaving only a few people in the study session. Besides that, everything else was well worth it and I am glad that I went.

14. I was very pleased with the program and am so glad that I attended. Just being able to recognize and recall the information we were learning in class was a big help. The study tips have also helped and I have been trying to stick to what we were taught. Also some of the sessions we had gave very useful information that I sometimes forget we had the advantage of learning until a friend says that they are clueless about where to go if they need help or something like that. I can't think of anything right now to
improve the program, but if I do I will be sure to email you my thoughts. I am so appreciative you all did this program and I know others will find it useful in the future.

15. I thought the BIOS program was a great opportunity to learn the material that is taught in BIOL 1201. I learned a lot of material in that short of time which most of it ended up being on my first test. I thought the BIOS program was well worth the time and effort. Even though I knew the material for the first test, and studied a whole lot, I made a 66 on it. I knew the information really good, but the questions confused me on what they were asking. Some of the material on the test I had never seen before. It was not in the lectures notes, so I guess he got them from the book. Next time I will study my lectures notes and the book. On a bright note, I made a 93 on my first chemistry test and a 100 on my second chemistry test. I also have an "A" in BIOL 1208.
VITA

Sheri Maples Wischusen was born in Huntsville, Alabama, in March 1957. She graduated from Lee High School and attended the University of North Alabama in Florence, Alabama, where she was awarded a Bachelor of Science degree in biology, with a minor in chemistry, in 1978. She received a Master of Science degree in biochemistry at the University of Alabama in 1982. While at the University of Alabama she met and married Everett William “Bill” Wischusen. They have two sons, Peter and Alexander. She was awarded the degree of Doctor of Philosophy in the Louisiana State University Spring 2009 Commencement Ceremony.