

Introduction

Throughout the state of Oregon colleges and universities are examining their pre-requisites for Anatomy and Physiology (A&P) courses to insure that students entering these programs are well prepared and successful. Between 2004 and 2005, faculty from Lane Community College attended state sponsored workshops on Best Practices in Anatomy and Physiology which resulted in the formation of suggested learning outcomes for A&P sequences and pre-requisites. Pre-requisites are quite variable at community colleges throughout Oregon and Washington across a spectrum from requirements of high school background in chemistry on one end to college level courses in chemistry, cell biology, math, and English on the other.

BioBonds is a learning community at Lane Community College composed of Bi 112 (3 credit Cell Biology) and Ch112 (3 credit Introduction to Chemistry) intended for pre-health students. Over 400 students register for BioBonds each academic year which has served as the pre-requisite for the A&P (Bi 231-233) sequence since 2001. Before 2001, Ch 104 (Introductory Chemistry) was the only pre-requisite to A&P, and the content from Bi 112 was covered during the first two weeks of Bi 231. Anecdotally, A&P faculty at Lane have reported over the past five years that the student retention rate in Bi 231 has improved, and students are now better prepared than they were before the BioBonds pre-requisite was introduced. The goal of this project was to examine BioBonds as a program and assess how well the program is preparing students to be successful in Anatomy and Physiology through gathering qualitative data from students, tutors, and faculty.

Methods

Student retention data

Data on student retention and success was provided by Institutional Research, Assessment, and Planning. Data were collected for Fall 1999, Spring 2000, Fall 2000, and Winter 2001 from Ch 104, Bi 231, Bi 232, and Bi 233 when Ch 104 was the requisite for the A&P sequence. Data were also collected for Fall 2003, Winter 2004, Spring 2004, Fall 2004, Winter 2005, and Spring 2005 for Ch 112, Bi 112, Bi 231, Bi 232, Bi 233, and Ch 104 (only for the 2003-04 school year) when BioBonds was the sole prerequisite for A&P.

Retention rates (percentage) were calculated comparing the second week enrollment with the end of the term. Success rates (percentage) were calculated comparing the second week enrollment with the number of students who finished the course and received at least a C- as a passing grade.

Surveys

Students who had completed BioBonds as of Winter term 2006 were asked to complete a survey rating twenty-seven concept areas identified by faculty at A&P Best Practices II as topic areas that students should understand before starting A&P. Students were asked to rate if they felt their understanding in each area was strong, okay, or weak after completing BioBonds. Students were also asked to identify how well prepared they felt overall and how well connected their Bi 112 and Ch 112 classes were within the learning community. Content areas were divided into four categories i) Chemistry content, ii) Biology content, iii) Biology and Chemistry content, iv) Non-scientific content.

Faculty who teach A&P were given a similar list of concept areas, but were asked to identify i) how important each concept area is, ii) how prepared students are in each concept area, and iii) whether each topic should be part of the BioBonds curriculum. Faculty were also asked additional questions about students skills and abilities identified at Best Practices II.

Forums

After the surveys were compiled, small group discussions were held with current A&P students, faculty, and personnel from the Science Resource Center to address some of the key concerns identified on surveys. Three student forums were held that included students currently enrolled in each of the three A&P classes (Bi 231-233) and Microbiology (Bi 234). Students were asked a variety of content related questions based on the answers compiled from the student surveys. A&P faculty met to review preliminary survey data collected from students and faculty to specifically address areas where responses regarding student preparedness in content areas were different between the two groups. The coordinator and tutors from the Science Resource Center were asked to identify areas where students request the greatest amount of tutor support and the types of questions that students ask.

Process Challenges

The greatest challenge to this project was collecting the data from students and faculty. While we collected 188 surveys, that only represents approximately half of the students who are enrolled in the A&P sequence this quarter. An initial test version of the survey questions was given to students as a paper survey and subsequent surveys were collected online.

Fortunately, we received assistance from the Faculty Webmasters to set up the php coding required to send the html survey via email. As instructors we are constantly completing classroom level assessment. However, because this project was aimed at the next level of scale for program assessment, it required greater participation from a wider diversity of faculty. Consequently it required regular communication and assistance from instructors (to get students to participate and to fill out their own surveys). Completing such a project without course release time or curriculum development funds for full-time or adjunct faculty would make finding the time to complete the project more challenging. The program assessment course led by Mary Brau and Sarah Ulerick, provided excellent resources and guidance for the best methods for creating program assessment and continuing the process after this term.

Results

Retention and student success rates

Student retention and success rates for 1999-2001 include Ch 104 (23 sections), Bi 231 (19 sections), Bi 232 (13 sections), and Bi 233 (9 sections). Student retention and success rates for 2003-05 include Ch 104 (8 sections), Ch 112 (29 sections), Bi 112 (29 sections), Bi 231 (25 sections), Bi 232 (24 sections) Bi 233 (21 sections). The data shows that there is a trend across Bi 231-233 toward higher average student retention (from 87.4% to 92.2%) and success (from 83.9% to 85.9%) since the addition of the BioBonds pre-requisite (Figure 1). There is also a trend towards increased student retention (from 72.6% to 90.2%) and success (from 63.8% to 81.6%) in the required pre-requisites courses.

Survey Data

Surveys were collected from 188 students and 8 faculty who teach A&P. Several specific content areas such as gas laws, domains of cells, surface/volume area, and buffers were identified as areas where students are under-prepared. Additionally, students indicated that the courses in their learning community were only somewhat connected (time-wise and in content). Students were asked to identify “one thing about BioBonds that should be changed”. The 156 comments we received can be divided into ten main categories (from most common to least common): pace of course, instructor specific comments, connections of content to A&P coursework, Ch 112 specific content, course materials, connectivity within learning community, classroom activities, course structure/organization, general dissatisfaction, and Bi 112 specific content. Students were also asked to identify “the one best thing about BioBonds that should not be changed.” We received 131 comments that can be subdivided into eight main categories (from most common to least common): connectivity within learning community, student’s preparation for A&P, classroom activities, Bi 112 specific content, instructor specific comments, general satisfaction, course materials, and Ch 112 specific content.

Student Forums

From the student forums five key themes emerged.

- 1) Connectivity: Students would like to have greater connectivity between their Bio 112 and Ch 112 content and instructors in the learning community.
- 2) Content: Students want to see more direct links between BioBonds and A&P curriculum, and request additional emphasis on a few topic areas.
- 3) Activities: Students find hands on activities (labs, worksheets, group activities) to be helpful in understanding the material and require direct instruction from teachers.
- 4) Materials: Students want to have clear expectations from instructors regarding expectations for studying from the textbook and lab packet.
- 5) Credits: Students who have a background in science feel that the course credits are adequate. Students who are returning to the science classroom would like to have additional instruction to help cement their knowledge.

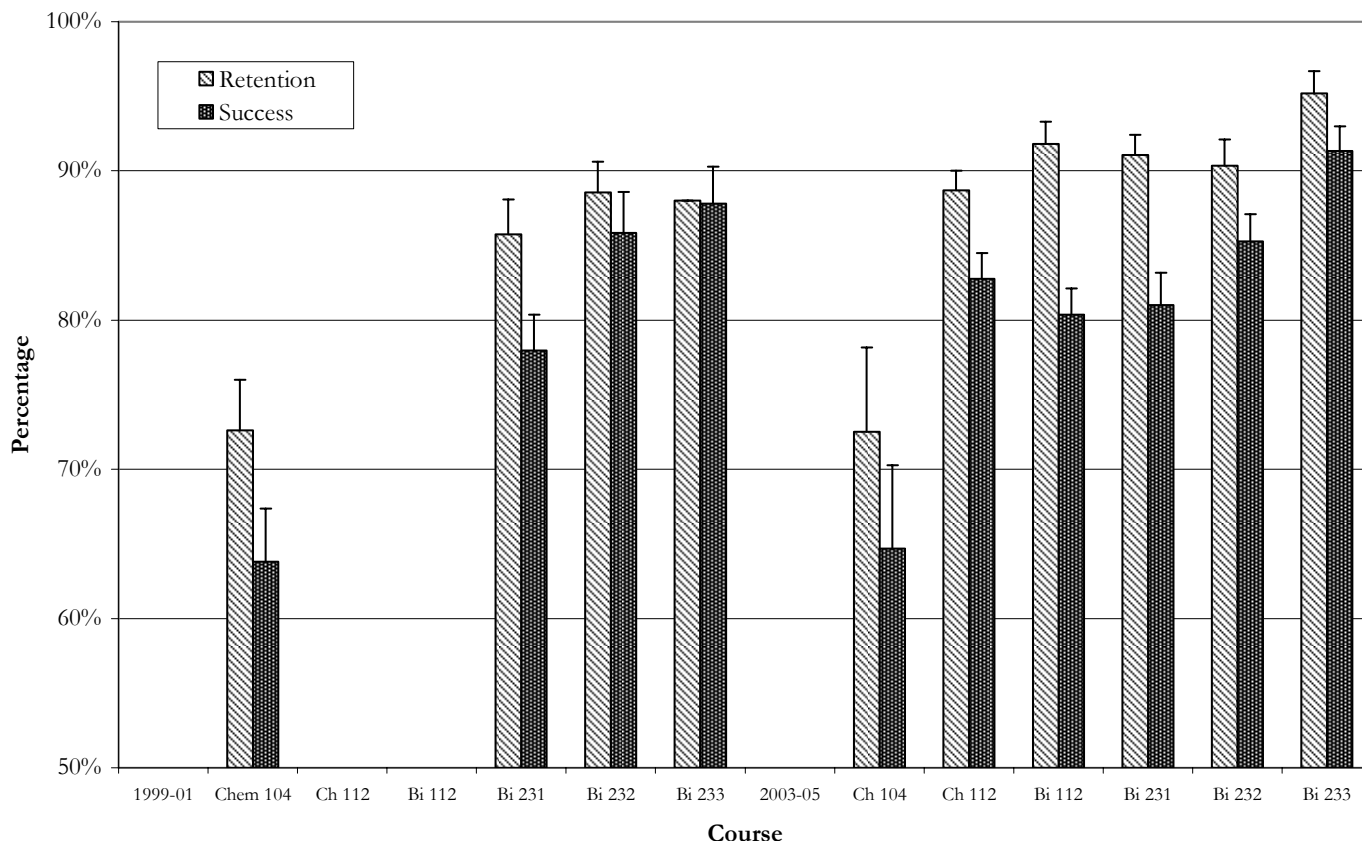
Conclusions and Next Steps

Overall our surveys and discussions find that students who complete the BioBonds program are prepared to be successful in the Anatomy and Physiology sequence at Lane Community College. We have identified several areas where the faculty can make improvements (some simply related to communication with the students and other involving curriculum redesign) that will continue to create a better learning environment for students. One area of focus will be to finalize program level outcomes for BioBonds (Appendix 1). Currently, there are course outcomes for Ch 112 and Bi 112, but nothing formally drafted that ties the two courses together as the pre-requisite for Anatomy and Physiology.

The BioBonds faculty meet once a term to stay current with one another, and we have a full-day retreat each summer. Our spring meeting and summer retreat this year will be devoted to presenting the results from this program assessment study. Between the spring meeting and summer retreat, faculty will be given an extended version of this assessment report and asked to write a reflection relating their BioBonds experiences with the collected data. At our summer retreat we will discuss the assessment findings and use them to determine what projects we should undertake with 140 hours of curriculum development we were awarded to better link the curriculum of Bi 112 and Ch 112. We hope that the curriculum development projects will

allow us to “close-the-loop” on some of the weaker program areas identified this spring. These projects should include methods for assessing whether the new activities are meeting the stated learning outcomes for students. Ultimately, we hope to continue to provide students with the opportunity to be well prepared and successful scholars of Anatomy and Physiology.

Figure 1: Comparison of Retention and Success Rates (students receiving at least a C- to pass a course) for the Anatomy and Physiology Sequence and Associated pre-requisite classes (1999-2001 and 2003-2005)



Appendix 1: Potential BioBonds Program Outcomes

Upon completion of Bi 112 and Ch 112 student will be able to

1. Summarize the structural, chemical, and functional diversity of living organisms and differentiate between eukaryotic and prokaryotic cells.
2. Describe how structural components relate to the functional properties of eukaryotic cells.
3. Apply knowledge of chemical properties (bonding, pH, gas laws, etc.) to biological and physiological functions of human cells.
4. Use appropriate terminology to effectively communicate information related to basic chemistry and cellular biology.
5. Be prepared to use and apply knowledge of basic chemistry and cellular biology to concepts presented throughout the study of anatomy and physiology and microbiology (Bi 231-234).