


 The logo features a stylized star on the left with the word "NISOD" written across it. To the right, the words "INNOVATION" and "ABSTRACTS" are stacked in a large, bold, sans-serif font.

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## A STUDY OF SCIENCE COURSE SUCCESS AND A JOURNEY STARTED

What happens when instructors in advanced courses really expect students to have skills and knowledge from prerequisite courses? Not quite a Pandora's box, but the study we conducted on factors related to success in second-level biology courses revealed several avenues for improving science education at San Juan College (SJC).

### The Research – Faculty Involvement

When approximately 30%-40% of the students enrolled in my sections were failing to succeed in the first part of a two-semester Anatomy and Physiology (A&P I) course sequence (officially withdrew, simply stopped attending, or failed to get a grade better than C), my first reaction was to find out about the students, including their academic background and where were they going once they completed our science courses.

My own research background, San Juan College's quality initiative to support data-driven decision-making, and an emphasis on student learning outcomes assessment set the climate for a solid study of student success factors. The study had two major objectives: identify factors, especially prior science course preparation, related to student success in A&P I; identify effective approaches to increasing student success.

A survey instrument—the Course Expectations and Preparation (CEP) questionnaire—asked students a number of questions, including the number of college credits they had completed, whether they had taken prerequisite courses, their major, their immediate educational goals (transfer, enter health occupations programs), and how they saw A&P I in relationship to their career plans. In addition, a pretest was administered during the first week of the semester that examined student understanding of fundamental concepts and basic facts covered in the prerequisite Introduction to Biology course.

Data from the CEP questionnaire and the pre-test were analyzed for students enrolled in all five A&P I

sections. Based on their final course grade, students were categorized as (a) Successful—received a grade of C or higher or (b) Unsuccessful—received a grade of D or F or withdrew from the course. The final grades, in fact, divided the two groups evenly; 50% were successful, and 50% were unsuccessful.

These data provoked serious questions about student preparation, and our simple investigation quickly fanned out into a much larger project. I was able to obtain additional data on these 110 students from:

- Office of Institutional Research
  - Demographics
  - Academic data, such as completed credit hours, GPA, prior science course grades
- Instructors teaching the other A&P I classes
  - Pre-test scores
  - Mid-term grades
  - Final grades
- Counseling Office
  - Computerized Placement Test (CPT) scores

Even before beginning an in-depth analysis, some findings clearly stood out; e.g., less than 10% of the students passed the pre-test—so much for the expectation that students were starting A&P I with a certain level of biology comprehension. And half the students were unsuccessful!

In no time, the A&P I instructors, including adjuncts, were reviewing the syllabus from the prerequisite Introduction to Biology I course for its relationship to concepts needed for subsequent 200-level courses, such as A&P I. We met with Introduction to Biology I teachers and agreed additional meetings were needed to revise or update course content and alignment!

Subsequent data analysis revealed additional factors related to science student success. Statistically significant predictors of success were:

- Age—Older students tended to be more successful.
- CPT scores—Students with higher entry-level scores in reading, English, and math do better than others. Unsuccessful students generally entered with reading scores that placed them into a reading improvement course.
- Prerequisite completion—Students who took the



prerequisite Introduction to Biology I and Introduction to Chemistry course did significantly better. However, the sample was small in that less than 20% of the A&P I students had completed these courses. (It is possible that some students may have taken these courses at another college before enrolling at SJC.)

- Course pretest scores, overall GPA, and science course GPA all demonstrated positive correlations with student success.

Results were not earthshaking. However, they are *our* data, on *our* students. It is information that we can talk about first-hand with students, advisors, counselors, adjunct faculty, and the administration.

### Avenues for Improvement

As Division Dean of Math, Science and Health Careers at that time, I was pleased to hear the discussion and enthusiasm spilling out of the biology classroom—full-time and adjunct biology faculty going over the Introduction to Biology I syllabus—swapping teaching approaches, sharing concerns, and analyzing program objectives. Mainly, they were enjoying being with colleagues, talking about a subject they each loved.

We refocused attention on supporting our adjunct instructors and mentoring them, improving course coordination and giving them a contact for when there are questions or suggestions. We instituted an orientation for the science adjunct faculty at the beginning of each fall and spring semester—to get updates on administrative issues, meet with their full-time faculty partners, and review any changes in course content.

The biology faculty also arranged additional meetings during the semester, in which “norming and storming” discussions occur over the Introduction to Biology I syllabus. To help identify weaknesses in course content and delivery, a common final exam was developed and is administered across all Introduction to Biology I sections. Adjunct faculty are an integral part of the test development process, implementation, and results analysis.

### Informing Students of this Research

A Learning College Principal encourages making students full partners in the learning process. Too often, we have institutional research data about factors related to student success, but we neglect *to pass it on to the students*. Findings from this study that contribute to student success will be communicated to faculty teaching and students taking upper-level biology courses. Options for filling in the gaps that community college students often bring to the classroom will be offered, as well—including dropping back to the Introduction to Biology I course and taking advantage of tutoring services, study skills workshops, and open labs for group work and extra study time.

### Teacher Training to Incorporate Study Skills into Beginning Science Courses

The college reading instructor conducted a reading level analysis on the Intro to Biology textbook and found the readability at least at the 13<sup>th</sup>+ grade level. In his textbook evaluation summary, he commented: “I believe most students will find the textbook difficult to read for at least two reasons. First, although the average sentence length is about 20 words, there is a tremendous amount of new and technical vocabulary introduced. Also, even though the textbook theoretically is written at the (college) level, many students here are reading below the 12<sup>th</sup> grade level.”

He offered specific suggestions for teachers, including outlines and preview guides to stimulate interest and connect subject matter to prior knowledge or experiences.

### Curriculum Alignment—Within and Across Disciplines

How do you eat an elephant? One bite at a time. We have begun to nibble at this one. All SJC programs have learning outcomes, and science faculty are looking at the big picture of how individual courses lead to division- and college-level outcomes.

We need to be clear within the science department about how prerequisite courses contribute to success at the next level. We now know that students who have Intro to Chemistry under their belt clearly do better in the A&P biology course. Now we can communicate this to students.

By finding out about students in our courses and what factors contributed to their success, we were able then to identify avenues for improving science education at SJC. From haggling over a course objective to getting a handle on the big picture of sequencing curricula and program outcomes, solid data on our students give us more and more of an appetite for elephant.

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