Best practices for interdisciplinary computing degree programs

Cal Poly: Bioinformatics Cross-Disciplinary Studies

Best practices (based on year 1 of program)

1. Present at Freshman Orientation and Transfer Student Orientation
2. Work with Scheduler in CS to facilitate enrollment in hard-to-get classes
3. Support BIO/BCHEM students in intro-level CS courses

Cal Poly: Bioinformatics Cross-Disciplinary Studies

Lessons learned

1. Interest ‘melt’ in Year 1 (typical??)

   66 signal interest → 34 attend advising session → 16 enroll
2. BIO/BCHEM students in CSC 101 were successful (14 A/A-)
3. Probably better to recruit among SECOND-year students…but they would *almost* be starting too late to complete our curriculum.

SJSU: Applied Computing for Behavioral and Social Sciences

Best practices

1. Provide ample in-class opportunities to practice/fail/get feedback
2. Student assistants are very helpful for providing non-intimidating, friendly help and feedback
3. Don’t use standard CS materials/examples; students relate better to domain-relevant materials/examples

SJSU: Applied Computing for Behavioral and Social Sciences

Lessons learned

1. To allow sufficient time to complete the minor, recruit students at transfer orientation sessions
2. Domain faculty teaching intro courses is less intimidating / more welcoming for students
3. Theoretical/abstract explanations can be challenging; using concrete and visual examples is helpful

SJSU: Bioinformatics

Best practices

1. Increase women in computing by recruiting from other scientific disciplines with higher representation (Biology)
2. Recruit students by developing modules for use in lower division Biology courses
3. Increase research opportunities for students in bioinformatics minor

SJSU: Bioinformatics

Lessons learned

1. 14 students graduated with the Bioinformatics minor (3 semesters); 12 female (8 Bio. majors), 2 male (Bio. majors); 6 more declared minors + dozens expressed interest
2. New module implemented in sophomore level Genetics course; increased interest in pursuing the major
3. New CS faculty hire Dr. Wendy Lee; developing a summer internship program in Bioinformatics with NASA Ames (Dr. Phil Heller)

Berkeley: Data Science Major

Best practices

1. Few core classes (Data 8 Data 100) and wide range of possible upper division classes (Domain Emphasis)
2. Low barrier to entry - no math or coding pre-req for introductory class, *new students empowered by success*
3. Range of ways for students to interact - Modules, Connectors, Discovery Research, Student Teams, Scholars

Berkeley: Data Science Major

Lessons learned

1. Build bridges to other disciplines, majors; find allies across campus; make the interdisciplinarity explicit and transparent
2. Compromises between building capacity in own classes, vs requiring other department's classes
3. Diversity in Intro class doesn't always translate to diversity in Upper Division and Major

SFSU: Computing Applications

Best practices

1. Focus on “asset approach” instead of “deficit approach”
2. Focus on building and strengthening interpersonal relationships (between all combinations of program faculty, students, mentors)
3. Focus on project-based learning and coursework applications that appeal to students' interests

SFSU: Computing Applications

Lessons learned

1. Mentors need training to be effective, and it's important to have clear expectations and regular communication
2. Starting recruitment earlier (Freshman), so students have enough time before they graduate.
3. Acknowledging the culture difference is important

San Francisco State's

GOLD

NSF Innovations in Graduate Education grant:
Graduate Opportunities to Learn Data Science

1st cohort starts Fall 2020

Cornerstone course offered Spring 2021

4 modules working with data from SFSU's faculty!

WHY DATA SCIENCE?

Data Science is a powerful tool for Biologists and Chemists!

With data science skills you can:

1. Skillfully use computer programming to analyze large, cutting edge data sets
2. Write scripts to create compelling visualization of your results
3. Use statistics to demonstrate the

FOR MORE INFORMATION CONTACT GOLD FACULTY

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CERTIFICATE IN DATA SCIENCE

— 9 UNITS —
(4 COURSES)
COMPLETE:

CSC 306
BEGINNING COMPUTATION FOR LIFE SCIENTISTS

— OR —

AN ELECTIVE IN YOUR FIELD

AND TAKE:

CHEM OR BIO 806
EXPLORATORY DATA SCIENCE

SUPPORT BY NEAR-PEER MENTORS

+

CHEM OR BIO 807
CODING COMMUNITY

+

CHEM OR BIO 808
PROFESSIONAL DEVELOPMENT & NETWORKING

BRIDGE TO PROFESSIONAL OPPORTUNITIES

SJSU SAN JOSÉ STATE UNIVERSITY

ICSI 2020 Interdisciplinary Computing Summer Institute

CSU - East Bay : CS Minor for Health Sciences

Best practices

1. Introduce more health science case studies and real-world projects in the courses
2. Apply group-based activities and assignments to engage students in learning
3. Motivate students using project-based learning and other student-centered pedagogy to promote retention

CSU - East Bay : CS Minor for Health Sciences

Lessons learned

1. Face-to-face classes are more effective than online learning in programming courses for non-CS majors
2. Break down large project into smaller phases and require student presentations at the end of each phase
3. Approval for new courses/programs take longer than expected processing time, and successful advanced course offering relies on having sufficient qualified and interested student enrollment

UC Riverside: Data Science

Best practices

1. We test run two of the new courses designed for the Data Science Major this past Spring and Summer quarters, before the inaugural class of Fall'20.
2. We finalized the "change-of-major" and "transfer" requirements in collaboration with the BCOE and CNAS undergraduate advising office and elected two Faculty Advisors for the new program, one from each participating department.
3. Project-based learning is an effective technique for DS courses (incorporated as a course final project), and active learning (in the form of lab assignments) is important as well.

UC Riverside: Data Science

Lessons learned

1. The initial course offerings prepared us for the DS incoming class; the pace needs to be slower as some students may not be prepared for a large-scale team project.
2. Students liked having speakers from industry talking about real DS problems and experiences and especially enjoyed discussion about DS in different domain areas.
3. The move to online teaching in Spring identified some issues with setting up the class project development environment.

Breakout Discussions

Suggested timeline:

- Select a group member to be a scribe and another to report out at the end, take notes using your assigned Google Doc
- 15 min: Discussion
- 5 min: Summarize discussion, choose one key highlight to share with larger group
- Leave breakout room and rejoin main meeting
- 10 min: Each of seven groups presents one key takeaway

Breakout Discussions

- Interdisciplinary collaboration
- Attracting funding
- Advertising and recruiting students
- Pedagogical approaches
- Supporting students