Summary of Formative Student Evaluation of the NIH-NSF Southern California Bioinformatics Summer Institute held at California State University, Los Angeles during summers 2003-2005. A total of 37 first year students responded to the survey over the 3 year period; 13 in 2003, 10 in 2004 and 14 in 2005. Items are listed in rank order for the complete 3 year time period. The number of students who identified each item is indicated to the left of the item. The years that an item was identified and the rank (average for ties) for the item that year are indicated in parentheses following the items. Interesting direct quotes or paraphrased comments are included in sections II and III. Totals may exceed 37 if some students entered several responses to a question.

I. Evaluate your preparedness for the project itself.

A. What are the strengths you bring to this project with respect to

1. computer knowledge?

29 programming knowledge/experience (2003/1, 2004/1, 2005/1)
7 general computer skills/Microsoft applications (2003/2, 2004/3.5, 2005/2)
3 MatLab (2003/4, 2005/3.5)
3 minimal computer knowledge (2003/4, 2004/3.5. 2005/5.5)
2 NCBI Blast (2004/2)
2 problem-solving skills (2005/3.5)
1 knowledge of EXCEL (2005/5.5)
1 UNIX (2003/4)

2. math knowledge?

15 probability/statistics knowledge (2003/1, 2004/2, 2005/2)
14 calculus or other college-level math (2003/2, 2004/5.5, 2005/1))
8 not required in internship project (2003/3, 2004/2, 2005/3)
3 adequate for project (2004/5.5, 2005/4)
2 understand algorithms (2004/2)
2 none (2004/5.5, 2005/5)
1 lots of applied math (2003/4)
1 mathematical notation (2004/5.5)

3. biology knowledge?

16 basic biology knowledge (2003/1, 2004/2.5, 2005/1)
16 advanced biology knowledge (biochemistry/genetics/cell biology; 2003/2, 2004/2.5, 20052)
3 knowledge of microarrays (2003/5.5/2004/2.5)
2 none (2003/3.5)
2 able to research as needed (2003/5.5, 2005/3.5)
2 know how to read research articles (2003/3.5)
1 cis-element detection (2003/5.5)
1 wet laboratory experience (2004/5.5)
1 not much needed (2005/3.5)
1 able to interpret biological data (2004/5.5)
1 no answer (2004/5.5)

B. What are your apparent weaknesses as they apply to the project with respect to

1. computer knowledge?

16	need to learn new or re-learn language (2003/1,2004/1,2005/1)
9	need more programming experience (2003/2, 2004/4, 2005/3)
7	none (2003/3, 2004/2, 2005/3)
3	database design/knowledge (2004/4, 2005/5)
3	no MATLAB experience (2005/3)
1	no Mathematica experience (2005/6.5)
1	installation of new software (2005/6.5)
1	need better knowledge of EXCEL (2004/4)

2. math knowledge?

16	none (2003/3, 2004/1.5, 2005/1)
15	need more probability and statistics (2003/1.5, 2004/1.5, 2005/2)
7	advanced math concepts (2003/1.5, 2005/3)

3. biology knowledge?

13	specific or advanced biology knowledge associated with projects (2003/2.5,2004/1.5, 2005/1)
10	none (2003/2.5, 2004/1.5, 2005/2.5)
5	genetics/advanced biochemistry (2003/1)
5	recall of biology knowledge (2003/5, 2004/3.5, 2005/2.5)
1	“challenge to correlate computer-related aspects of project to the biological significance” (2003/5)
1	only a basic knowledge of biology (2005/4.5)
1	no answer (2005/4.5)
1	no formal training in biology (2004/3.5)

C. With respect to weaknesses, what have you and/or your mentor done to make up for them?

26	self-teaching (ex. Using references, often supplied by mentor, practicing with programs and languages) (2003/1, 2004/1, 2005/1)
13	mentor tutorials/discussions (2003/3.5, 2004/2, 2005/2)
10	help from others in lab/at worksite (2003/1, 2004/3, 2005/4)
4	nothing (2003/3.5, 2004/4.5)
2	partner does all programming (2003/5.5/2004/4.5)
2	help from other students (2005/3)
1	mentor and student crafted appropriate project for strengths/weaknesses (2003/5.5)

D. Cite the courses you took as an undergraduate/graduate student that were helpful to your internship and explain why.

COURSES –

26	programming/software engineering courses (2003/1, 2004/1.5, 2005/1.5)
25	molecular biology/biochemistry/genetics (2003/2, 2004/1.5, 2005/1.5)
11	general biology (2003/4, 2004/5, 2005/4)
10	probability and statistics (2003/3, 2004/4, 2005/6)
10	algorithms/data structures (2003/5.5, 2004/3, 2005/3)
6	college level math courses (2005/3)
4	general/physical chemistry (2003/5.5, 2004/7, 2005/8.5)
4	bioinformatics (2003/7.5, 2004/6, 2005/8)
1	computer approaches to molecular life science (2003/7.5)
1	data mining (2005/8.5)
1	computer graphics (2005/8.5)

WHY?

advanced or general biology – allows understanding of biological basis of internship project; central dogma; data interpretation; allowed to learn on own; can read research articles
programming courses – made learning a new language easier; learn to program efficiently; formal training in software design; needed in project
probability/statistics/bioinformatics – needed to understand microarrays; needed to understand other analysis for project
statistics/computer simulation/physical chemistry/algorithms – practice using mathematical methods and framing questions quantitatively; microarray analysis; used differential equations and computer simulations
general chemistry – learned to use primary literature
data mining – introduction to R language, algorithms and statistics
college level math courses – project uses; allowed to learn on own; used algorithms
computer graphics – user interfaces and automation
all courses – develop problem solving skills

E. Cite the SoCal BSI lecture/workshop topics that were helpful to your internship and explain why.

LECTURES/WORKSHOPS

13	microarrays (2003/1, 2004/1, 2005/1)
10	programming (2003/2, 2004/2.5, 2005/3)
6	probability and statistics (2003/10.5, 2005/1.5)
4	literature/database searches (2003/3, 2004/6.5)
4	most topics in didactic phase (2003/5.5, 2004/6.5, 2005/5.5)
3	sequence alignment (2003/4.5, 2004/6.5)
3	NCBI resources (2004/2.5, 2005/5.5)
2	clustering of genes (2003/5.5)
2	proteins (2003/5.5)
2	signaling pathways (2003/10.5)
1	all biology sections (2003/10.5)
1	“my own writing assignment” (2003/10.5)
1	scoring matrices (2003/10.5)
1	phylogenetic analysis (2003/10.5)
1	ethics (2004/6.5)
1	Blast and Smith-Waterman algorithms (2004/6.5)

WHY?

literature/database searches – locate references/web-based resources
proteins/microarrays/phylogenetic analysis – needed for internship project
programming – good refresher; new programming concepts/coding; required in project
all biology/most didactic topics – provided general review
probability and statistics – cannot evaluate algorithms without understanding of probability; MATLAB experience; had been weak spot for student
NCBI resources – knowledge of duplicate entries; used in project
ethics – importance of patient privacy

F. What necessary background was completely lacking or inadequate in your preparation for your internship?

13 nothing (2003/1, 2004/1, 2005/1)
8 statistics/statistical packages (2003/2, 2004/3, 2005/3.5)
6 programming experience in multiple languages (2003/5, 2004/2, 2005/3.5)
4 computer programming skills/experience (2003/5, 2004/4.5, 2005/3.5)
3 biology knowledge (2003/5, 2004/4.5, 2005/8.5)
3 microarray analysis (2003/5, 2005/3.5)
1 databases (2005/8.5)
1 MATLAB experience (2005/8.5)
1 needed more math (2005/8.5)
1 needed more physics (2005/8.5)
1 no answer (2005/8.5)
1 use of different software programs (2003/5)

II. Comments on your work ethic

A. Your responsibilities. Have you been

1. Arriving at work on time? 30 yes/5 no pressure to keep regular hours/1 no answer/1 inconsistent

2. Putting in a full, wisely-spent workday? 33 yes/2 somewhat/1 no (mentor not available first 2 weeks)/1 no answer

comments – “waiting for help”, “mostly learning”, could have improved, flexible worksite

3. Responding to suggestions and criticisms positively? 34 Yes/1 N/A/1 “mostly”/1 no answer

comments - “I believe so,…fun to receive guidance.”, has made mistakes, but is eager to fix them

4. Asking yourself to adjust to the individualities of others so that you can interact productively with all persons in the workplace? 31 yes/5 not an issue at worksite/1 no answer

5. Taking initiative? 30 yes/5 no/1 I don’t know/1 no answer

some positive statements include - “making independent decisions about programming project”, I have volunteered to help on other projects, “I ask for the next project and put my thoughts in”, having to learn things on my own so far, “given quite a bit of freedom”

some negative statements include – “hard to take initiative this early”, “I just do mostly what he asks me to”, “I could probably do a little better in this regard.”, “most of the time”, “could have been improved”, feels uncomfortable having an opinion different from the mentor’s; “given quite a bit of freedom”

6. Using good judgment about who, when and how frequently to ask for help? 35 yes/1 “still haven’t gotten started”/1 no answer

comments - only ask for help after self-reflection and research of the problem; mentor available so easy to ask for help; “could ask more often”, only ask when exhausted all other options, wonders if asks for too much help

7. Studying on your own time to make up for deficiencies? 31 Yes/4 no/1 no answer/1 N/A

comments - “I think each night how to solve problems for the next day”, I have spent several nights/weekends on the project so far, “I can always study more”, do not need to, have read lots of literature, “Too tired”

B. Your mentor’s responsibilities. Has your mentor

1. made clear his/her expectations with respect to

a) the project? 31 yes/3 no/2 not initially/1 no answer

comments - “Generally, but not a programmer so some expectations are too high/low”, “he thinks I can do magic with code”, “he thinks I don’t know basic biology”; “as much as he knows about it”, “…and he is adding to it very appropriately as we make more progress”, “Not at first; afterwards when he found time to talk to us, he explained the project more clearly.”; “work in progress”; “to some extent”, doesn’t really have expectations; makes suggestions, but doesn’t follow through

b) workplace “rules”? 28 yes/6 there are no rules/2 no/1 no answer

2. provided help when you needed and ask for it? 34 Yes/1 no/1 “sometimes a little late”/1 no answer

comments - “mentor asked postdoc to help me”; 1 student had very positive comments about mentor’s interest in student and project, – “quality of help is outstanding”; often grad student is assigned to help in mentor’s absence; works more closely with others in lab, than the mentor

III. Please provide any additional comments you feel would be helpful at this time. Include issues you would like to see addressed by subsequent evaluations.

- “7 weeks is not enough to do anything substantial at the worksite”, learning a new language and statistical theory takes time, here to get experience and not to worry about publishing or a patent?
- “The value of any internship is only as much as what you are willing to make of it. No one is going to hand anything off to you on a silver platter or necessarily expect much from you. I am not sure that all my fellow students necessarily “get” that.”
- “I feel that I have a very strong sense of work ethics, I try my best on whatever I am working on, and to stay organized and focused.”
- “Right now I’m pretty much waiting for someone to help get me started…I can’t really do it myself and the guy who is supposed to help me comes in at weird hours of the day so I spend most of my time waiting and just reading”.
- “I am glad to learn so much about microarray analysis.”

- “For our internship…, things were not prepared and set up ahead of time. It would be much appreciated if the mentors for each site prepares or at least have some options available for the incoming student. That way, things can get underway much more quickly.”
- enjoyable internship; “I definitely feel respected and I feel like my work is important and counts.”; “I have nothing but good words to say about the internship.”
- great praise for mentor’s responsiveness
- “I don’t think that mentor X expected me to get anything done, so was motivated to prove otherwise.”
- project was not well defined and mentor was off site for the first week; student felt that time was wasted because site was not really prepared for them
- “…I was hoping that I would have had the chance to do actual research to solve a biological problem.”
- some problems with worksite, similar to those last year
- “I believe that a crucial part of being a bioinformaticists is being able to understand and use the data that is produced by software programs. I have the knowledge I need for this project and doing it helps me gain experience working with genomes.”
- “I suppose the internship was not what I expected. I was hoping to get the opportunity to program or help start in the development of a significant biological software while at the same time learning about the biological significance.”
- program should impress upon the mentors that students have only a short time to accomplish their work
- not qualified for project - not a programmer, not as efficient as someone with more experience
- lectures in BSI deal with only one aspect of bioinformatics
- need better explanation of Python programming language - less information re. "tricks and shortcuts"
- descriptions of internships inadequate - should include list of required skills and the specific task the student will accomplish
- "Everything is going good so far."
- "mentors are encouraging and easy to talk to”
- suggests a workshop on EXCEL
- would have liked a mixture of biology (wet lab) and programming in the internship
- notes that BSI workshops "skimmed over" the biology and focused on bioinformatics tools, suggests emphasizing more biology