Evaluation Report
Research Experiences for Undergraduates
June 10-August 2, 2012

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REU Evaluation Report

Background

Introduction

The NIMBioS *Research Experiences for Undergraduates* (REU) program took place on the University of Tennessee, Knoxville (UT) Knoxville campus June 11–August 3, 2012. Eighteen undergraduates were chosen to participate in the program.

During the eight-week program, participants lived on campus at UT, and worked in teams with UT faculty to conduct research at the interface of mathematics and biology. The award included a stipend, housing and some funding to support travel.

The six research projects for the 2012 program included:

- Modeling the evolution of sexual imprinting,
- Modeling protein translation and genome evolution,
- Harnessing the arsenal of nature: Developing natural pesticides,
- Modeling Salmonella transmission in swine,
- Agent-based mathematical model for Johne's disease epidemiology and economy, and
- Modeling early evolution of human immunodeficiency virus.

Program organizers were Suzanne Lenhart (Dept. Mathematics/NIMBioS), and Kelly Sturner (NIMBioS). Mentors in the program included J.J. Chai (Mathematics, NIMBioS), Shigetoshi Eda (Wildlife Health), Heather Finotti (Mathematics), Vitaly Ganusov (Microbiology), Mike Gilchrist (Evolutionary Bioinformatics), Tucker Gilman (Biology, NIMBioS), Kimberly Gwinn (Plant Pathology), Andrew Kanarek (Biology, NIMBioS), Cristina Lanzas (Veterinary Medicine), Maud Lelu (NIMBioS), Suzanne Lenhart (Mathematics, NIMBioS), Calistus Ngonghala (Mathematics, NIMBioS), Tuoc Phan (Mathematics), Valdimir Protopopescu (Mathematics), and Dan Ryan (Mathematics, NIMBioS).

Project Backgrounds

Participants were selected to work on one of six research projects. Descriptions of the projects have been provided by program mentors:

Title: Modeling the evolution of sexual imprinting

Mentors: Dr. Heather Finotti (Mathematics) and Dr. Tucker Gilman (Biology)

Sexual imprinting is a process by which an individual's mate preference is learned through interaction with the environment. Young individuals that imprint on parents, siblings, or neighbors will look for similar traits in potential mates. Learned mate preferences are believed to play an important role in speciation, but how imprinting strategies evolve is only partly

understood. We will use novel mathematical models to ask how imprinting strategies evolve, and how evolved strategies are likely to differ between males and females.

Title: Modeling protein translation and genome evolution

Mentors: Dr. J.J. Chai (Mathematics) and Dr. Mike Gilchrist (Evolutionary Bioinformatics)

Protein translation, an important step in gene expression that assembles the proteins used throughout the cell, is one of the most fundamental and conserved biological processes. Yet, like all biological processes, translation has intrinsic costs and processing errors. Due to redundancy inherent in the genetic code (e.g. codons GAA and GAG both code for glutamic acid), the evolution of coding sequences will be influenced by these costs and errors. The goal of this summer's research will be to use mathematical models of the intra-ribosomal processes responsible for the costs and errors during protein translation in order to study the patterns found within the genomes of different organisms. The outcome of this work will be a better understanding of how the ribosome works, and, in turn, our ability to extract information from genomic sequences.

Title: Harnessing the arsenal of nature: Developing natural pesticides

Mentors: Dr. Valdimir Protopopescu (Mathematics), Dr. Kimberly Gwinn (Plant Pathology), and Dr. Dan Ryan (Mathematics)

Plants, insects, and microorganisms ensure their survival by producing an arsenal of natural chemical weapons to escape herbivores, predators, and competitors. Research in the laboratory of Dr. Kimberly Gwinn is aimed at achieving and maintaining the critical goal of sustainability by developing highly effective, environmentally friendly, low-toxicity bioactive natural products from food preservation, and as viable alternatives to conventional chemical pesticides. In the REU program, students will examine the effects of essential oils on spore germination and growth of biological control fungus. The goal of this research is to develop predictive models for the development of 'stacked' natural control systems.

Title: Modeling Salmonella transmission in swine

Mentors: Dr. Cristina Lanzas (Veterinary Medicine), Dr. Maud Lelu (Ecology), Dr. Suzanne Lenhart (Mathematics), and Dr. Tuoc Phan (Mathematics)

Salmonellosis is one of the most common bacterial food-borne illnesses. Farm animals, including cattle, pigs, and chickens, are reservoirs for Salmonella. In recent years, the proportion of Salmonella resistant to several antimicrobial drugs (multidrug resistant strains) has increased. Humans infected with multidrug resistant strands are at greater risk of hospitalization and death than patients infected with susceptible strands. Prevention of human salmonellosis depends on decreasing the prevalence of infections in farm animal hosts, as well as identifying and intervening along key transmission routes. This REU project will focus on developing mathematical models of Salmonella transmission in swine farms to better understand the factors that favor the transmission and the persistence of these multidrug resistant Salmonella in different farm environments.

Title: Agent-based mathematical model for Johne's disease epidemiology and economy

Mentors: Dr. Shigetoshi Eda (Wildlife Health), Dr. Suzanne Lenhart (Mathematics), and Dr. Andrew Kanarek (Biology)

Johne's disease is one of the most economically important diseases in the dairy industry. We recently developed a discrete deterministic model for Johne's disease epidemiology. The model was used to evaluate cost-effectiveness of disease control measures based on an improved diagnostic test. In the 2012 REU program, we aimed to build an agent-based model based on the existing model for a better understanding of Johne's disease epidemiology and economy. Students will have a chance to visit a dairy farm to learn cattle management practice, interact with veterinarians, and learn how to build/evaluate an agent-based model with user-friendly software.

Title: Modeling early evolution of human immunodeficiency virus

Mentors: Dr. Vitaly Ganusov (Microbiology) and Dr. Calistus Ngonghala (Mathematics)

HIV establishes a life-long chronic infection in the vast majority of infected individuals, despite strong antiviral responses elicited by the host. The high mutation rate of HIV is thought to be one of explanation for the ability of the virus to avoid the host's immune response, yet it is unclear whether the observed rates of mutation are sufficient enough to explain the rapid appearance of viral variants escaping recognition by T cell immunity. During the project, we will formulate models of HIV evolution, and investigate the role of mutation and recombination in the early diversification of HIV in patients.

Evaluation Design

Evaluation Questions

This evaluation consisted of two parts: a participant evaluation and a mentor evaluation. The evaluation of the program was both formative and summative in nature, in that the data collected was intended to both gain feedback from participants and mentors about the quality of the current program and also to inform next year's program. A pre/post evaluation design was used to measure self-reported changes in participant skills and knowledge as a result of taking part in the program.

The participant evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning program (Kirkpatrick, 1994[1]). Several questions constituted the foundation for the evaluation:

1. How satisfied were participants satisfied with the program overall?
2. Did the research experience meet participant expectations?
3. Did the research experience impact participant plans to go to graduate school?
4. To what extent did participants increase their research skills during the program?
5. To what extent do participants feel they gained knowledge about the research process?
6. How satisfied were participants with their mentors?
7. How satisfied were participants with the accommodations offered by NIMBioS?
8. What changes do participants feel NIMBioS should make in the program for next year?

The mentor evaluation was guided by the following questions:

1. How satisfied were mentors satisfied with the program overall?
2. Were the training and supports for their participants were adequate?
3. How satisfied were mentors with the training they received?
4. What changes do mentors feel NIMBioS should make in the program for next year?

Evaluation Procedures

Electronic surveys aligned to the evaluation questions were designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Associate Director for Education, Outreach, and Diversity, and the Education and Outreach Coordinator. The final instruments were hosted online via the University of Tennessee's online survey host mrInterview.

Links to the participant pre-survey were emailed to the 18 REU participants on May 22, 2012. A reminder email was sent to non-responding participants on May 28 and June 4, 2012. By June 11, 2012, 18 participants had given their feedback, for a response rate of 100%.

Links to the participant post-survey were sent to the 18 REU participants on August 15, 2012. Reminder emails were sent to non-responding participants on August 22 and 27, 2012. By September 3, 2012, 15 participants had given their feedback, for a response rate of 83%.

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[1] From Kirkpatrick, D.L. (1994). *Evaluating Training programs: The Four Levels.* San Francisco, CA: Berrett-Koehler.

Links to the mentor feedback survey were sent to 14 REU mentors (Suzanne Lenhart, program organizer, was excluded from the mentor evaluation) on August 15, 2012. Reminder emails were sent to non-responding mentors on August 22 and 27, 2012. By September 3, 2012, 11 participants had given their feedback, for a response rate of 79%.
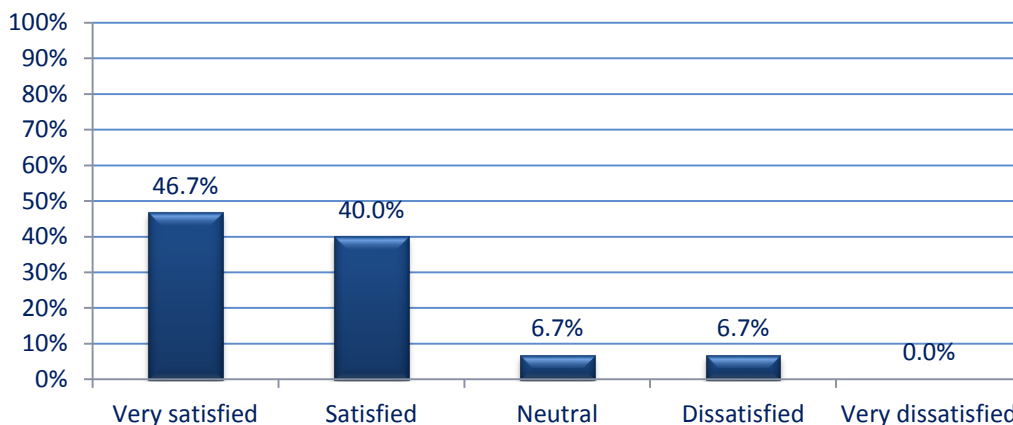
Data Analysis

Data from the electronic surveys included both forced-response and supply-item questions. All data were downloaded from the online survey host into the statistical software package SPSS for analysis.

Participant Evaluation Data

Respondent Satisfaction

Overall Satisfaction

Figure 1. Overall satisfaction with the research experience

Overall comments:

> I had a wonderful time this summer and will definitely recommend this REU program to other students at my college.

> Overall, I expected to be challenged more by this experience. I expected that the bar would have been set higher for us. The non-research aspects of the program (social activities, SMB Conference, grad student panel, etc) greatly exceeded my expectations. I learned a lot about the field of mathematical biology, modeling, and navigating academia that will definitely help me in the future.

> Definitely an awesome experience in everything. I wouldn't have changed anything about it.

> I would suggest making it more clear on the website for [those] applying that it is mostly if not all computer work.

I really enjoyed getting to meet people and attend the SMB conference and it was a great opportunity. I was just frustrated with the research experience since it seemed like we ended up wasting a lot of our time on ideas that really weren't thought through very well.

Figure 2. Would you recommend the NIMBioS REU program to others?

Yes
100%

If you would not recommend the program, please explain why:

No comments.

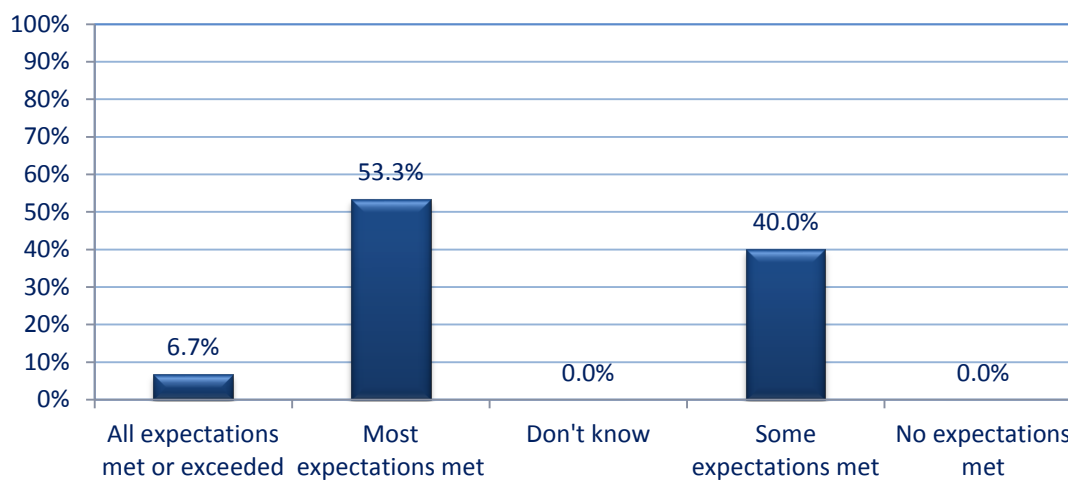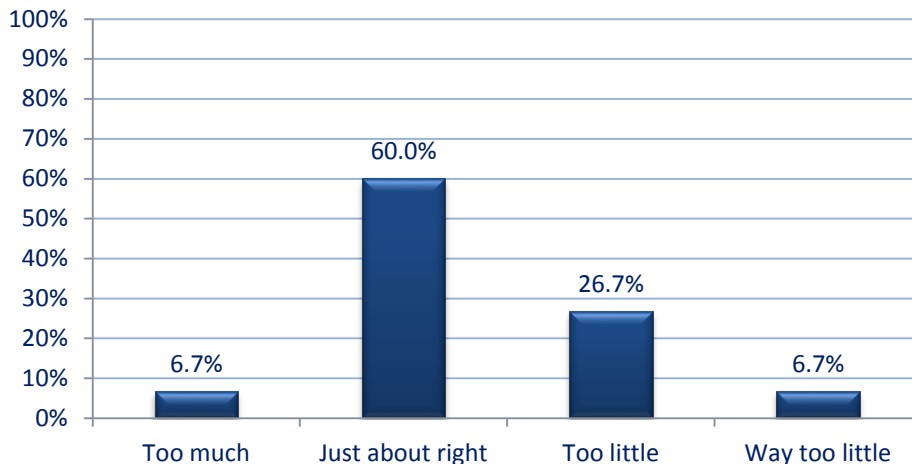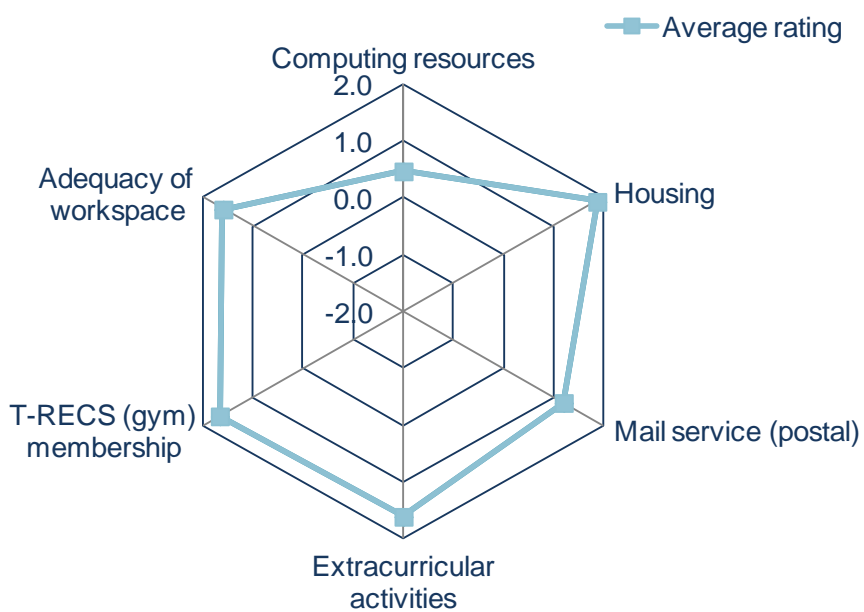*Figure 3. To what extent did this research experience meet your expectations?*

Figure 4. How did you feel about your workload overall?

Satisfaction with Accommodations

Figure 5. Satisfaction with accommodations

Scale: -2 = Very dissatisfied to 2 = Very satisfied

Please describe any accommodations/supports you needed that were not supplied (if any):

> *I would have liked to have learned more about non-academic jobs in the field of math biology.*
>
> *I got everything I needed.*
>
> *Everything was supplied.*
>
> *We were lacking in supplies for our experiments - no fresh spores were available and the ones we were using were extremely old.*

Satisfaction with Lectures and Sessions

Figure 6. Ratings for Lectures and sessions

Scale: -1 = Not useful to 1 = Very useful
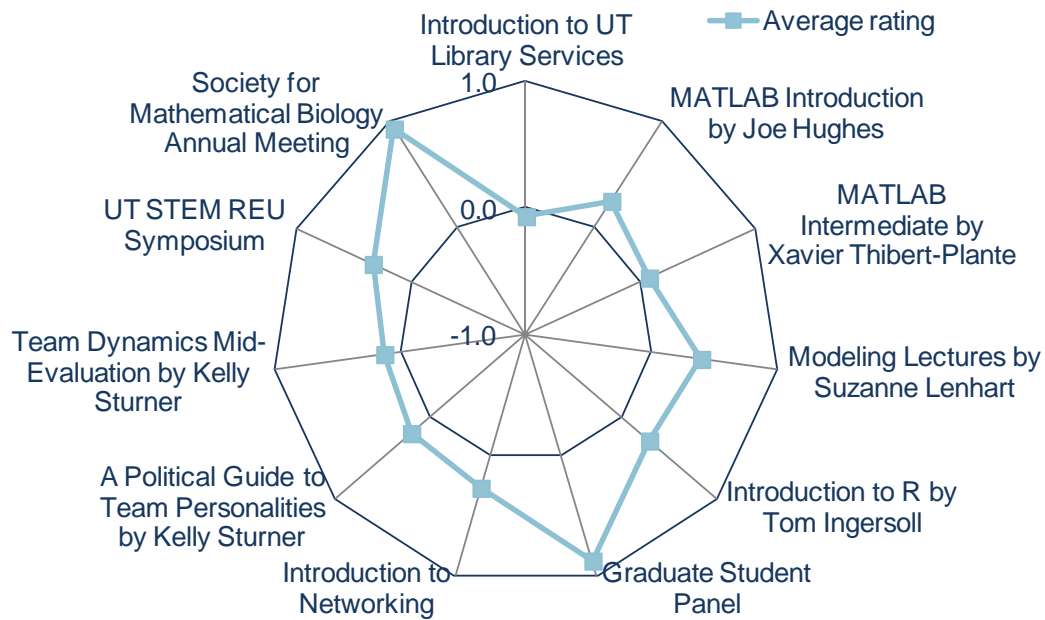
Comments about sessions or lectures:

> *The intro to MATLAB was good but I felt a lot of information was crammed into a short amount of time. The intermediate session was way over my head and went way to quickly and I didn't get anything out of that session. I felt the UT STEM REU Symposium was great practice for the SMB meeting we presented at later.*
>
> *I most enjoyed the sessions that dealt with helping us look toward our futures and giving us advice for doing so. Of all the talks we heard close to the beginning of the program, my favorite by far was Cristina Lanzas'. It was presented in a way that was*

on our level but still challenged us, and it was presented very well.

Matlab and R would maybe have been more helpful if the group was on more on the same page, also with the lecturer.

Please list any other sessions or lectures you found valuable:

Math model lectures.

Exit meeting with Lou Gross.

Satisfaction with Mentors

Figure 7. Average rating by mentor characteristic for all mentors

Scale: -2 = Strongly disagree to 2 = Strongly agree

My mentor:

Figure 8. Average rating for all characteristics, by mentor
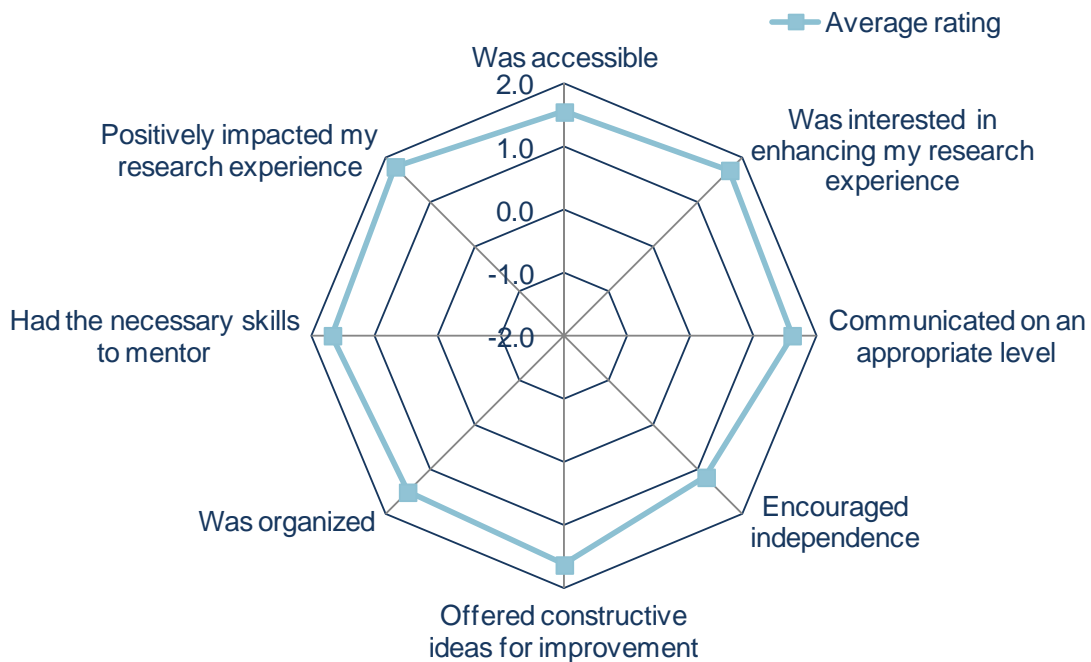
Scale: -2 = Strongly disagree to 2 = Strongly agree with each characteristics from Figure 7
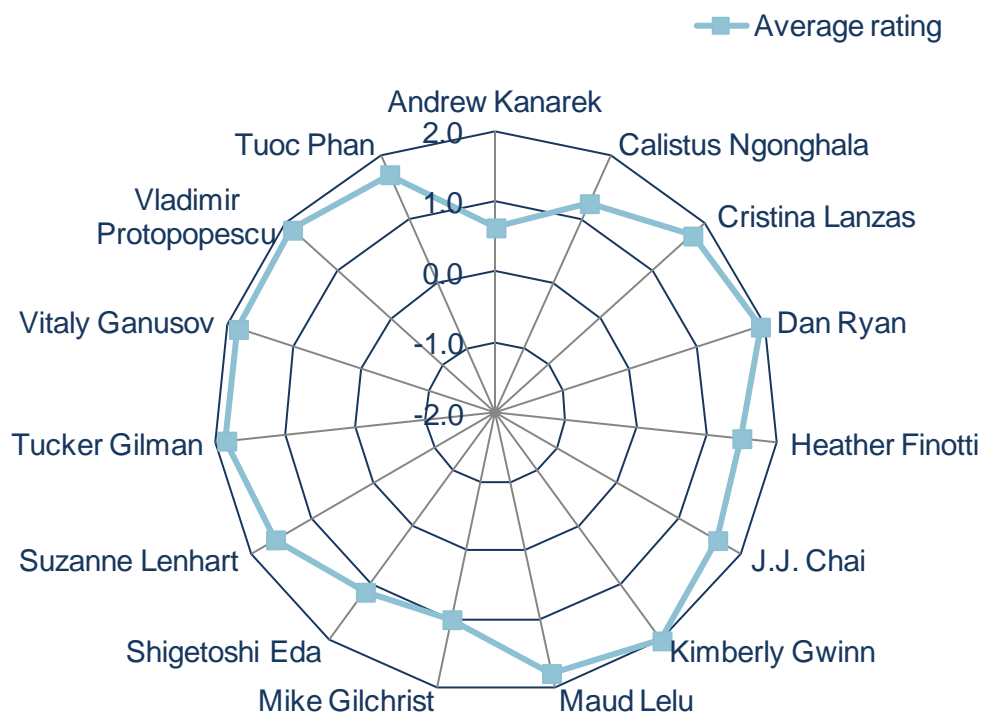
Please use this space for additional comments about your mentors:

The only thing I would've changed was the fact that Cristina Lanzas wasn't able to join our group until a week after the REU started. Once all the mentors were there together everything ran more smoothly.

Tucker Gilman was a great mentor that kept up the excitement for the project the entire time. Heather Finotti is very easy to talk to and knows how to explain complex math to any REU student, regardless of background. Both were a pleasure to work with this summer.

Vitaly was mostly in charge of our group, Calistus came to about half the meetings and helped out mainly with the math involved.

They are awesome!!

I feel like the most constructive part of the mentoring happened in the last week or two of work. The first part we had hardly any work and never really sat down with the mentors to look at the data and figure out the best direction to go in or possible approaches or methods or anything. So we ended up just sort of guessing at things to do and then the last couple weeks when our mentors finally seriously took a look at the data they figured out a lot of things that we could have done and things we should have done differently. So it ended up being really frustrating because there was so much

more we could have done if the project had been taken seriously from the beginning. This is not to imply that I didn't like our mentors - they were awesome - extremely nice, and had great suggestions and insights for us, but I just wish more energy had been put into the project from the beginning so that we could have really taken advantage of their knowledge and ideas.

Communication and Group Dynamics

Figure 9. Did you find the Wiggio was a useful means of communicating within the REU group?
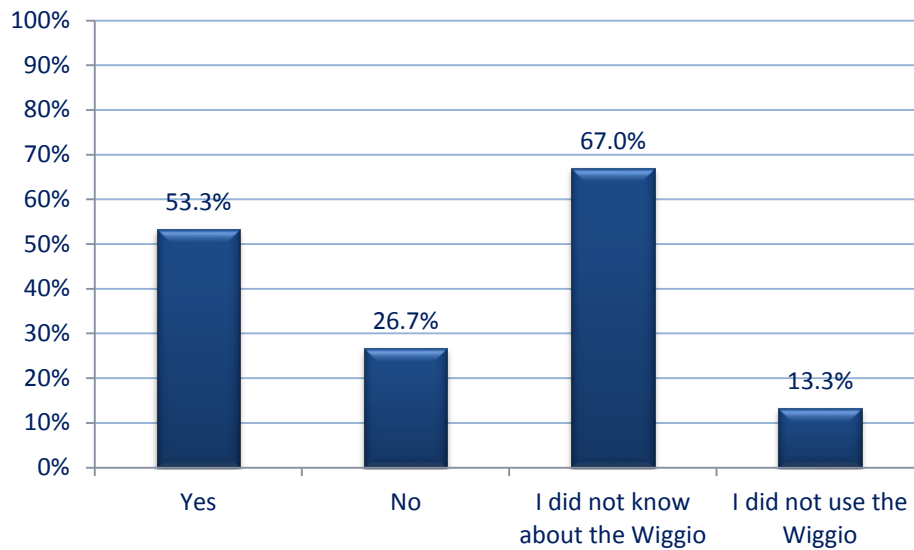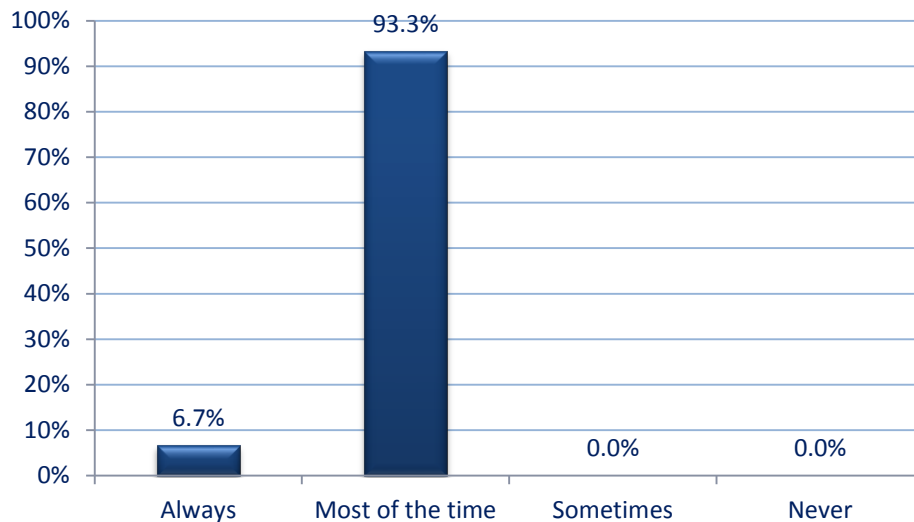

Figure 10. How often did you feel your research group worked well together?

When your group worked well together, what factors do you feel contributed to the group's success?

> When we talked to each other a lot about what each of us were doing. For example, we sometimes would all be working at the same time but unknowingly we were all doing the same thing. We used our time better when we talked and delegated tasks.

> Can make the agreement and every one can do their own job well.

> Our group worked well when each student took responsibility for their part of the project and asked for help when they did not understand something. It also contributed to the group's success when the students' tasks were clear and when help was available from the mentors or other sources when necessary.

> What I saw as interesting is that everyone in the group was concerned. With courage and initiative we were able to do what we did.

> Trusting each other, defining goals at the beginning of the day and dividing up tasks, communicating frequently about our progress.

> Mainly communication with instructor and among us.

> Clear expectations and physically working in the same place.

> People communicating and understanding.

> If we were all on the same page and everyone had done the background work needed for today's work.

> Everyone having finished their portion of the project and understanding others portions.

> If it was clear what we were working on, what the goals were. If we were open to each other. If we communicated well.

> Communications and cooperation.

> Meeting together at the same time.

> Communication.

If/when your group was not functioning well, what were some barriers that prevented your group from working well together? How were these barriers overcome (or how do you feel they could have been overcome)?

> Sometimes didn't understand how to code things in Matlab and had to rely on one person in our group. Wasn't any of our faults but just a lack of knowledge on some of our group members' parts.

> The different cultures, the different ideas. We just talk together and make an agreement.

Our biggest issue was probably that one student group member was being held up by technical errors that they did not understand and waited too long to ask for help.

only focusing on the negatives of different ideas during brainstorming, friction between the fields of math and biology, lack of trust between fields, general negative attitudes toward modeling, misunderstanding of each other's thoughts, ideas, goals, and expectations The general misunderstanding of one another was overcome through open communication and heart to hearts. The other problems could have been bettered through encouragement of respect toward the fields of study in which we were working as well as the fields that we were collaborating with.

Same thing miscommunications were what prevented us from working well all the time.

better communication between us and with our mentors

People not showing up to meetings or not talking to group members when there is a problem. To overcome them people need to show up for meetings and on time.

Personality conflicts took a while. We never really had a chance to get to know one another until the end of the summer.

Better communication when a group member was struggling so that they could keep up. Once someone fell behind in an area they stayed behind

If it was not clear what we were working on, if there were no clear goals. Maybe discussing in beginning what expectations and learning aims were would have been helpful.

If everybody is not in the same phase, it was hard to function. We talked to each other to help, answer questions and etc.

Doing too much completely separately on our own time. Not having much to do and therefore getting lazy with what we did have to do.

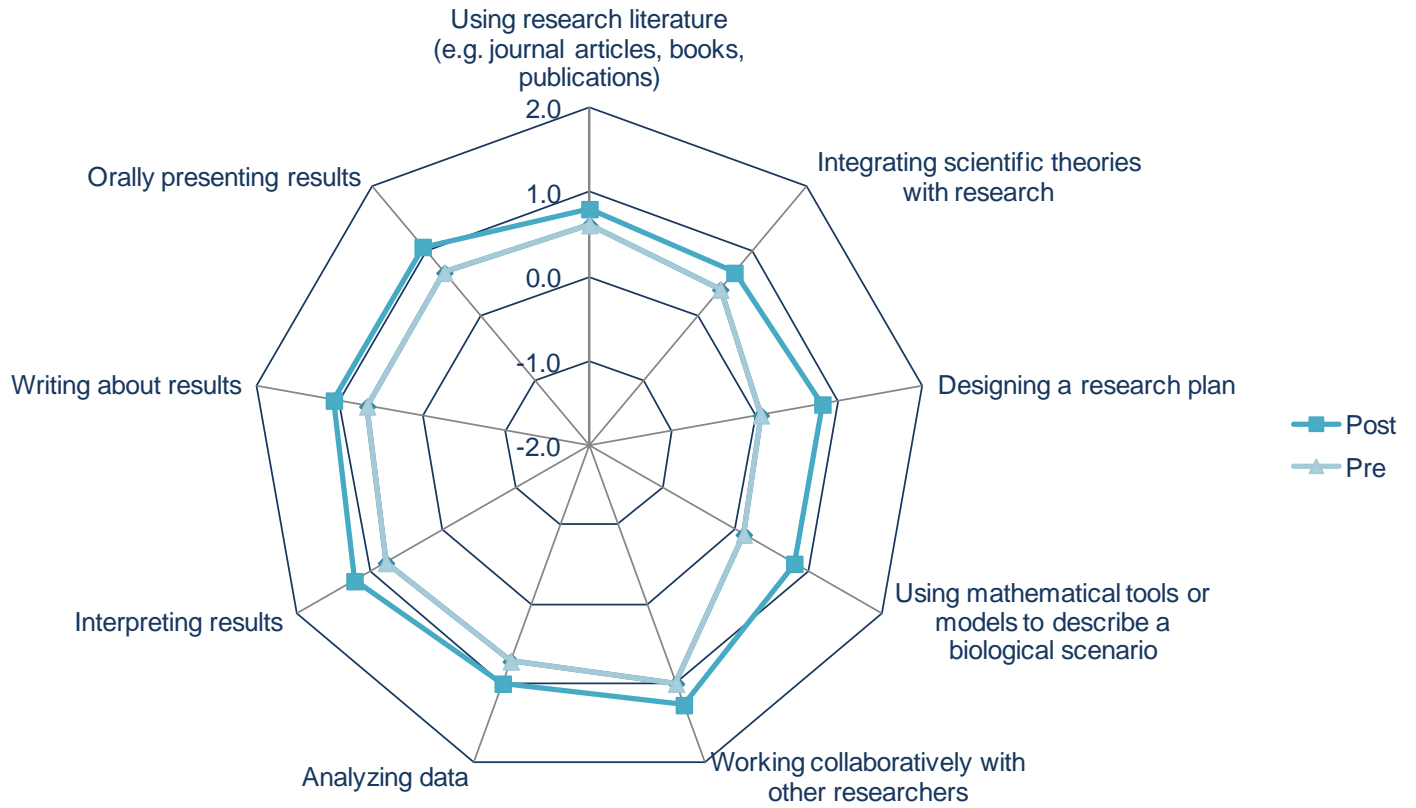*When we weren't communicating or working together, but rather individually.*

Program Impact

Participant Skills

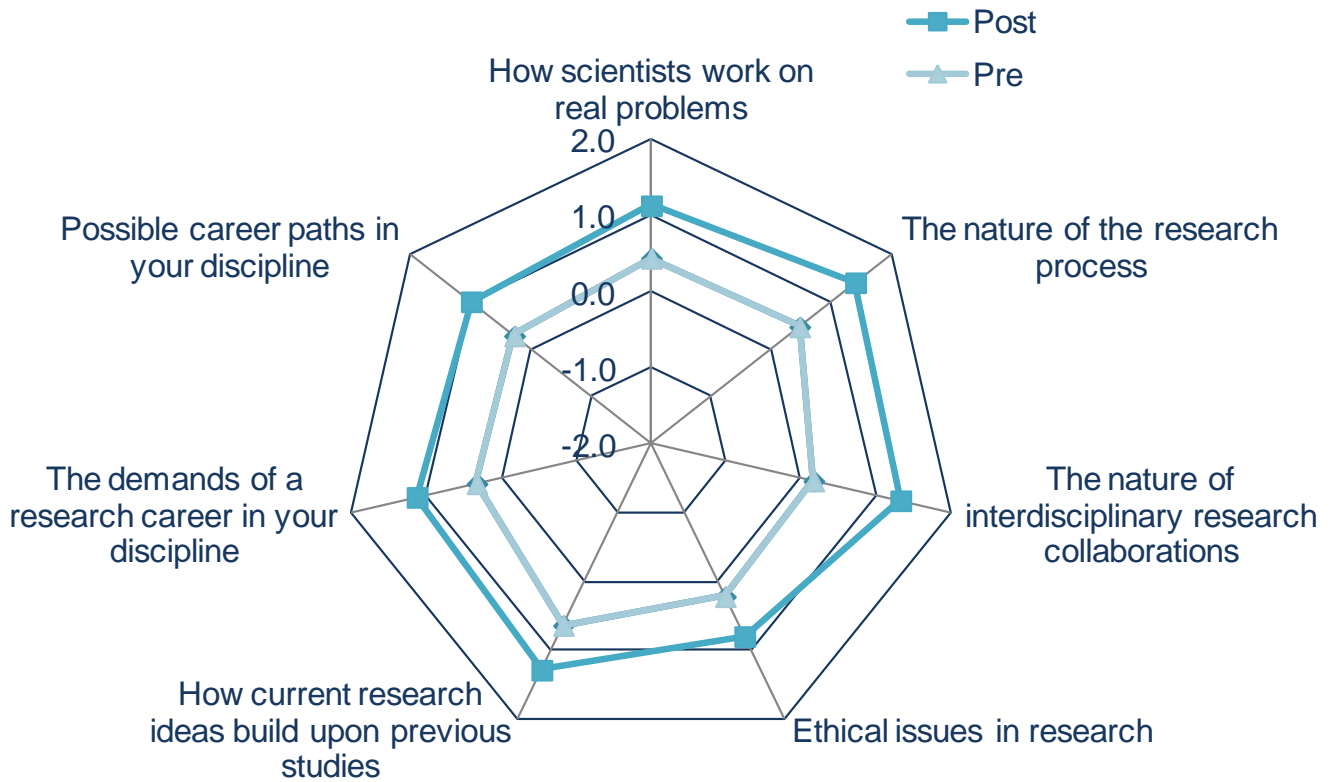Figure 11. Participant pre-and post-program skills

Scale : -2 = Extremely poor at the skill to 2 = Excellent at the skill
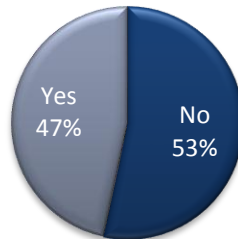
Participant Knowledge

Figure 12. Participant pre- and post-program knowledge

Scale : -2 = Extremely poor understanding to 2 = Excellent understanding

Graduate School Plans

Figure 13. Did this research experience impact your plans to go to graduate school?

Please explain how the research experience impacted your plans for graduate school:

I know now that I definitely want to go to graduate school for mathematics. I enjoyed the research experience. I know I want to go to graduate school but I still don't know what area of the research world I want to pursue.

Can improve my skills for building the math modeling, because my graduate major is about using the math model to solve the social problems.

Well, this research was good and interesting. I did not know how the world of researches feels like. I used to do things without any additional checks or tests. The research helped to think more about how and why I found the results which is interesting. I think that this is the first step I made toward graduate school. I really loved the program and I wish to have more undergraduate research [experience] before I go to grad school. And I wish to have [more] topics as interesting as the one I had [in the NIMBioS REU program]. The other thing I found that people have to be careful about is picking a topic to work on. Whenever you do not like the topic, you are not going to like what you do throughout the program. I am glad I worked on the one I liked and it is the reason why I will go to grad school if i have chance.

I have become more certain that graduate school is in my future, but I am a lot more clueless than I was before in what exactly I will be pursuing in graduate school. I have learned that there are a lot more possibilities out there than I thought, and I am eager to look into them all.

I was not really considering going to graduate school before the REU. I am still not sure that I will go, but I am seriously considering it, and I am doing things to insure that if I want to go, I will be able to.

I know what I want to do for Grad school but I believe I would like to take a year off now.

I realized that I enjoy this form of research but may also want to have some clinical application. In the future, I will look for programs that have both clinical and research based aspects

Table 1. Participant pre- and post-program degree plans

		End of Program		
		Master's	Ph.D.	Total
Start of program	High school diploma	1	0	1
	Bachelor's degree	1	0	1
	Master's	2	0	2
	Ph.D.	0	11	11
	Total	4	11	15

Mentor Evaluation Data

Overall Satisfaction

Figure 14. Overall, how satisfied were you with the NIMBioS REU program?
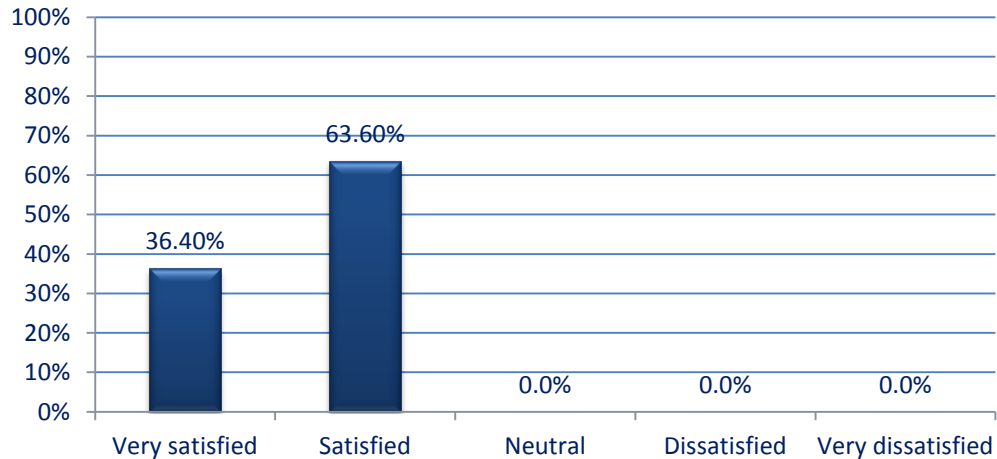
Overall comments about the program:

While I greatly enjoy working with the students, my experience is that the end result is not ultimately useful to the lab due to their lack of understanding good programming practices. I will focus on trying to teach them about this in the future.

I felt that there was too many little write ups students had to do and less time was left for actual research. I wonder if this could be made more flexible.

I think it would be better to provide the students with scientific papers from the research area before they arrive in Knoxville. I will do this in the future.

Woah! I feel a bit lost about how to judge the students according to the criteria presented. I don't know that I can discern their ability levels at the beginning in the areas mentioned, and so it's hard to say how that changed over the course of the project. It may be helpful to give this list of criteria to mentors at the beginning of the project so that we can keep these things in mind. I have many comments I could make about the students, but in the format presented am not sure what to put.

For me, the most challenging aspect of this summer's REU program was getting my students to work independently. My students this summer (and one student in particular) needed a lot more hand-holding than last year's group or than the high school students I have worked with. I believe that research seldom occurs along a nice, neat path. Rather, we try an approach, make (or fail to make)

progress, revise the approach, and try again. The failure to communicate this process of "doing science" to my students is mine. Nonetheless, I would recommend to future REU mentors that they look for a history of successful independent work when evaluating potential students. In some cases, eight weeks may not be enough to train even a talented student to work independently.

Application Process

Figure 15. How satisfied were you that the student applications supplied the necessary information needed to choose qualified participants?
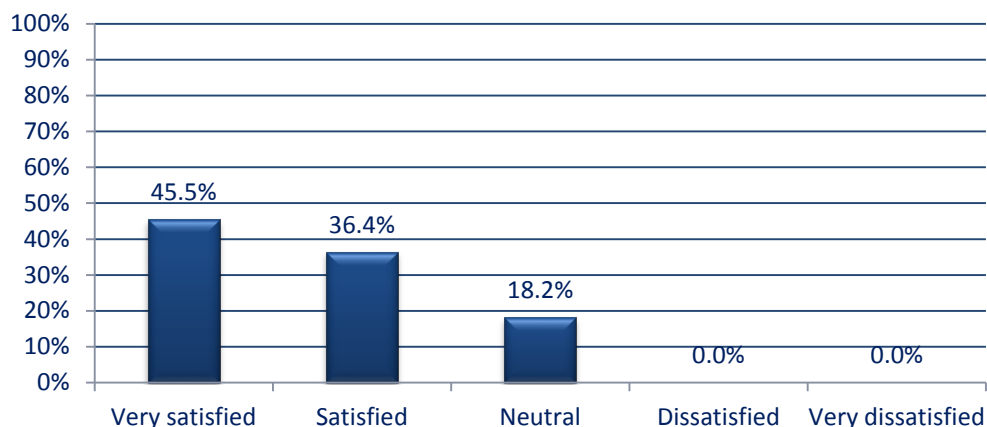

Please provide any suggestions regarding questions or content that might be helpful to include in future applications:

I was a co-mentor with Mike Gilchrist, so I was not involved in choosing students for the project.

Student Training and Supports

Figure 16. How satisfied were you with the training provided by NIMBioS to your students (lectures in R, MatLab, modeling, etc.)?
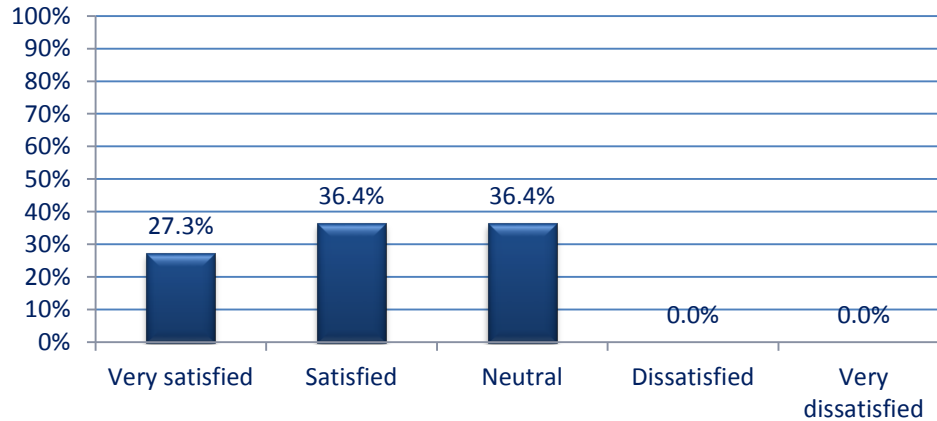
Please let us know if there are any additional training that you feel would have benefitted your students:

> *It would be very helpful to have a 'best practices in programming' workshop or tutorial.*

> *These training sessions are useful but they cannot provide the sufficient level of expertise so students start using the results in their research. We should put more emphasis on experience of students at using various programs and previous modeling experience. Maybe we should make a scale for several different skills that are needed for different types of research so that students can rank themselves in those areas in the application process.*

> *I felt that this year's students did not have the NIMBioS back-up that they have had in years past. The personality of one of the students may have been a factor.*

> *I didn't actually attend any of these trainings, but the students seemed to have the tools they needed and seemed satisfied with what was given.*

> *NIMBioS has trainings in MathLab and modeling, but I don't think there is training in R. And our project used R specifically, it'll be nice to include some R training in the future, especially for students who don't have R experience at all.*

Figure 17. How satisfied were you with the other supports provided by NIMBioS to your students (computer resources, social activities, etc.)?
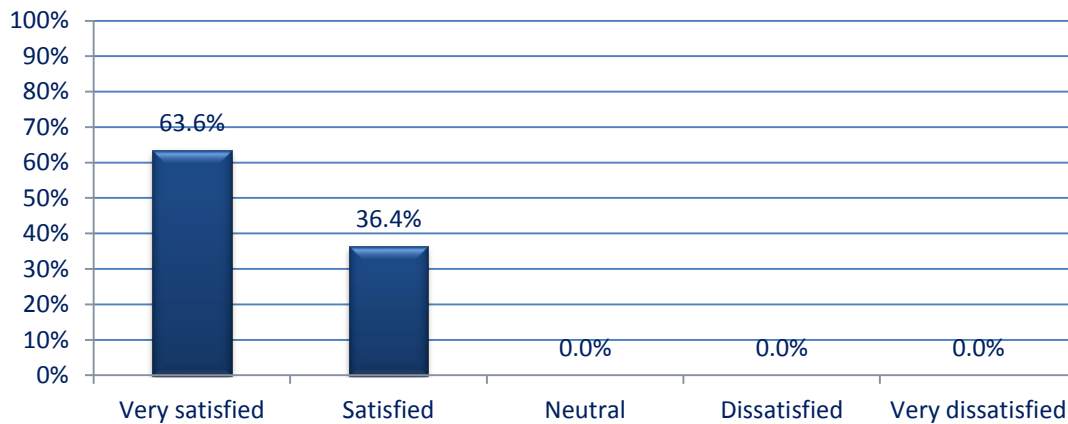
Please let us know if there are any additional supports that you feel would have benefitted your students:

> *General "living in Knoxville" support may be helpful. Various options for finding groceries (some of them were very happy for example to learn about the farmer's markets), options for entertainment, etc.*

Figure 18. Did your students attend all research group meetings?
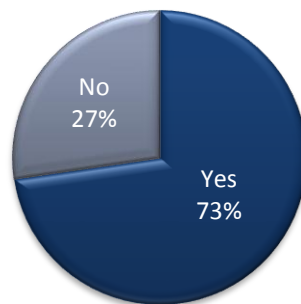
If you answered "No" above, what were the reasons for not attending provided by your students?

> *Since they were programming in R, I did not think it useful for them to learn about Matlab.*

> *One student did not attend all meetings due to illness.*

One of my students was invited to and attended a Google programming camp for one week during the REU. This came as a surprise to me, and also to Kelly and Suzanne. In the future, it may be useful to clearly state that students are expected to be present for the full REU. (In my opinion, this shouldn't need to be explained, but apparently it does.)

Group Communications

Figure 19. How satisfied were you with the Wiggio for communicating with others in the program?
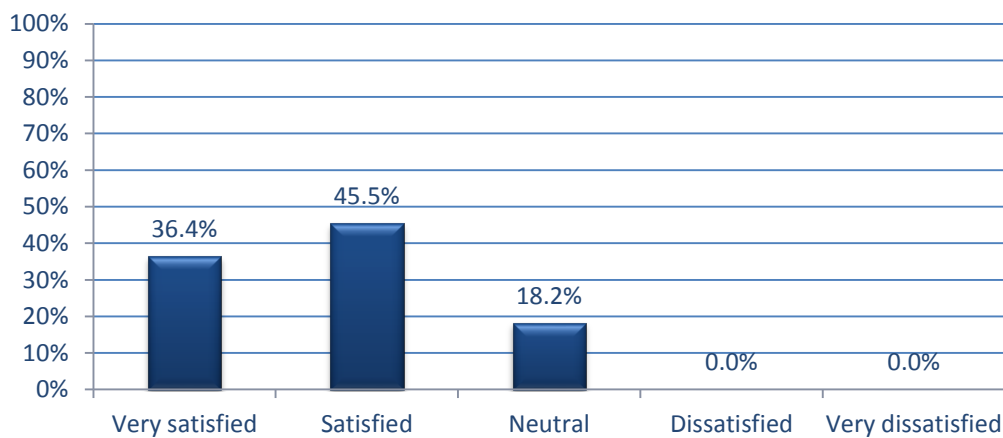
Comments about the Wiggio and/or communications within the program in general:

Seemed to be fewer announcements than usual

I really didn't use this, so I can't evaluate it.

Mentor Training

Figure 20. Please indicate if you agree with the following statements:

Number of mentors who agreed
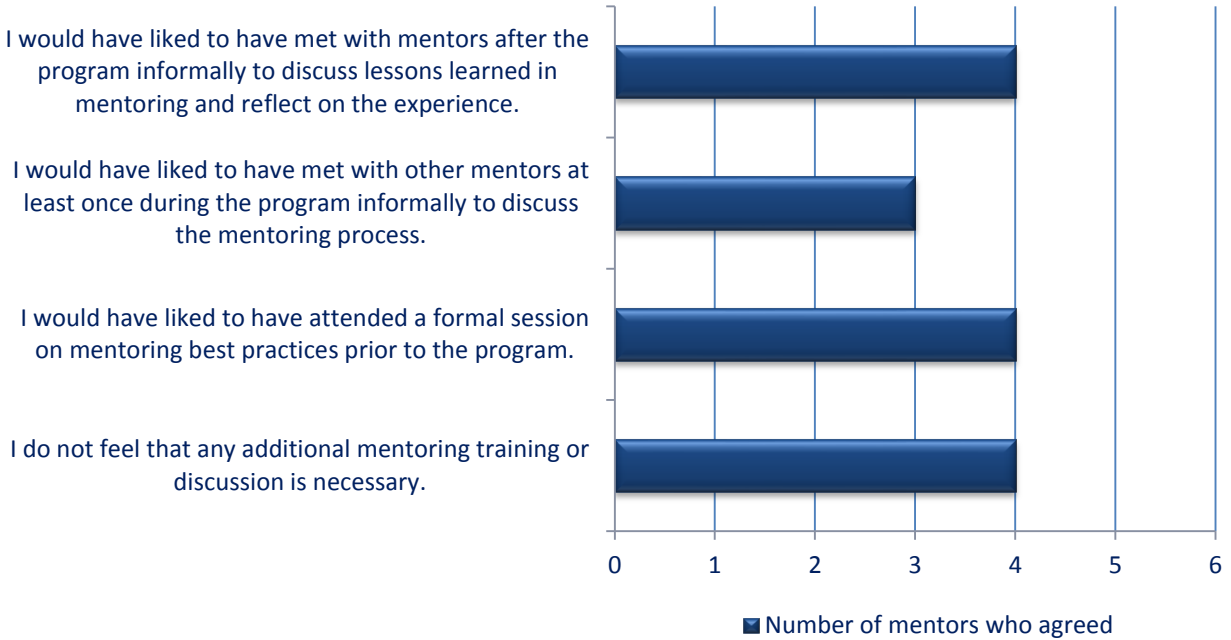
Comments or suggestions about mentor training:

No comments.

Figure 21. How satisfied were you with your interaction with the other mentor(s) on your project?
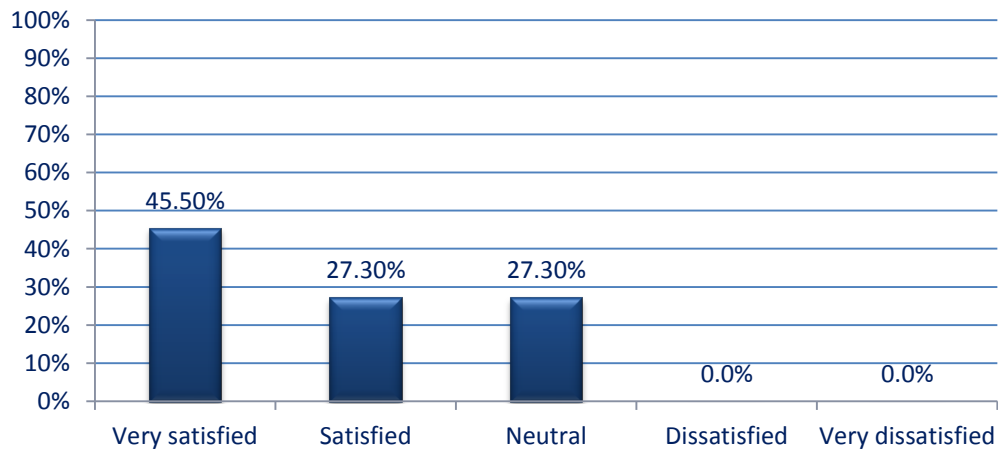
Comments or suggestions about interaction with other mentors:

I did not interact with other mentors.

I believe that we had too many times that one or more of us were not available. NIMBioS needs to set a standard for how long a mentor should be on travel. Two consecutive weeks was too long.

In general, I was very satisfied, but near the end felt a bit left out of the loop as i don't have a NIMBioS office and am not generally on campus unless i know i need to be, it seemed that these factors meant that the students tended to lean on the other mentor more heavily.

Appendix A

List of Participants

Participants

Last	First	Institution
Bogen	Sarah	Capital Univ.
Collier	Sarah	Univ. of Dayton
Crosley	Elena	Bowdoin College
Dillon	James	Univ. of Scranton
Hall	Frances	Earlham College
Hennessey	Kelly	St. Olaf College
Lasebikan	Olatomiwa	Fisk Univ.
Li	Weijie	Luther College
Liu	Yanjie	Univ. of Tennessee, Knoxville
Mutambuka	Vedaste	Univ. of Arkansas, Little Rock
Nivens	Arielle	Maryville College
Perez	Andre	Univ. of Texas, El Paso
Rhoads	Anthony	McKendree Univ.
Robins	Jessica	Univ. of Tennessee, Knoxville
Rubin	Ilan	Cornell Univ.
Welch	Jessica	Univ. of Tennessee, Knoxville
Westhoek	Annet	Univ. of Wisconsin
Woodard	Dawn	Appalachian State Univ.

Appendix B

REU Pre and Post-surveys

Research Experiences for Undergraduate Students

Pre-survey

Thank you for taking a moment to fill out this survey. Your results will be used to enhance your experience at the University of Tennessee this summer, to improve the REU programs for future cohorts, and to track your progress during the program. Congratulations on your acceptance into the program. We hope you have an interesting and exciting experience.

How did you learn about this program?

What do you hope to gain through participation in this program?

What is the highest level of education you have completed to date?
 High school diploma
 Associate's degree
 Bachelor's degree
 Master's degree
 Doctoral degree
Other degree, specify:

Are you currently enrolled in a degree-granting program?
 Yes
 No

What type of degree are you currently pursuing?
 Associate's degree
 Bachelor's degree
 Master's degree
 Doctoral degree
Other degree, specify:

What is the highest level of education you hope to complete?
 High school diploma
 Associate's degree
 Bachelor's degree
 Master's degree
 Doctoral degree
Other degree planned, specify:

The questions on this page will be used to track your progress as a researcher during the program. It's okay if you don't feel as though you have strong skills in all areas.

How would you rate your ability regarding the following research skills?
{Extremely poor, Below average, Average, Above average, Excellent}

Using research literature (e.g. journal articles, books, publications)
Integrating scientific theories with research
Designing a research plan
Using mathematical tools or models to describe a biological scenario
Working collaboratively with other researchers
Analyzing data
Interpreting results
Writing about results
Orally presenting results

The questions on this page will be used to track your progress as a researcher during the program. It's okay if you don't feel as though you have a good understanding of all the subjects listed.

How would you rate your level of understanding in the following areas?
{Extremely poor, Below average, Average, Above average, Excellent}

How scientists work on real problems
The nature of the research process
The nature of interdisciplinary research collaborations
Ethical issues in research
How current research ideas build upon previous studies
The demands of a research career in your discipline
Possible career paths in your discipline

Please give any suggestions for activities you would like for us to do as a group (social and/or research related):

Please use this space for any additional comments:

Research Experiences for Undergraduate Students

Post-survey

Thank you for taking a moment to fill out this survey. Your results will be used to improve the REU programs for future cohorts, and to track your progress during the program. We hope you had an interesting and exciting experience!

Overall Evaluation
Overall, how satisfied were you with your research experience?
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

To what extent did this research experience meet your expectations?
No expectations met
Some expectations met
Don't know
Most expectations met
All expectations met or exceeded

How did you feel about your workload overall?
Way too little
Too little
Just about right
Too much
Way too much

How often did you feel your research group worked well together?
Always
Most of the time
Sometimes
Never

When your group worked well together, what factors do you feel contributed to the group's success?

If/when your group was not functioning well, what were some barriers that prevented your group from working well together? How were these barriers overcome (or how do you feel they could have been overcome)?

Did this research experience impact your plans to go to graduate school?

Yes →Please explain how the research experience impacted your plans for graduate school:
No

What is the highest level of education you hope to complete?
High school diploma
Associate's degree
Bachelor's degree
Master's degree
Doctoral degree
Other degree planned, specify:

Please indicate how useful you found the following lectures or sessions:
{Very useful, Somewhat useful, Not Useful, Did not attend}
Introduction to UT Library Services
MATLAB Introduction by Joe Hughes
MATLAB Intermediate by Xavier Thibert-Plante
Modeling Lectures by Suzanne Lenhart
Introduction to R by Tom Ingersoll
Graduate Student Panel
Introduction to Networking
A Political Guide to Team Personalities by Kelly Sturner
Team Dynamics Mid-Evaluation by Kelly Sturner
UT STEM REU Symposium
Society for Mathematical Biology Annual Meeting

Please list any other sessions or lectures you found valuable:

Comments about lectures or sessions:

The questions on this page will be compared with your pre-survey answers to track your progress as a researcher during the program.

How would you rate your ability regarding the following research skills?
{Extremely poor, Below average, Average, Above average, Excellent}

Using research literature (e.g. journal articles, books, publications)
Integrating scientific theories with research
Designing a research plan
Using mathematical tools or models to describe a biological scenario
Working collaboratively with other researchers
Analyzing data
Interpreting results
Writing about results
Orally presenting results

The questions on this page will be compared to your pre-survey answers to track your progress as a researcher during the program.

How would you rate your level of understanding in the following areas?
{Extremely poor, Below average, Average, Above average, Excellent}

How scientists work on real problems
The nature of the research process
The nature of interdisciplinary research collaborations
Ethical issues in research
How current research ideas build upon previous studies
The demands of a research career in your discipline
Possible career paths in your discipline

Would you recommend the NIMBioS REU program to others?
 Yes
 No→ Please explain why you would not recommend the NIMBioS REU to others:

Accommodations Evaluation

Please indicate your level of satisfaction with the following accommodations provided to you during your research experience:
{Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied, Not applicable}

Computing resources
Housing
Mail service (postal)
Extracurricular activities

Did you find the Wiggio was a useful means of communicating within the REU group?
 Yes
 No
 I did not use the Wiggio
 I did not know about the Wiggio

Please describe any accommodations/supports you needed that were not supplied (if any):

Mentor Evaluation

Your responses to the following questions will be kept confidential. Your name will not be associated with any of your responses regarding your mentors during reporting. Please select the name of one of your mentors: (NOTE: This question was repeated multiple times, allowing participants to rate all of their mentors)

{All participant names listed}

My mentor:
{Strongly agree, Agree, Neutral, Disagree, Strongly disagree}

Was accessible
Was interested in enhancing my research experience
Communicated on an appropriate level
Encouraged independence
Offered constructive ideas for improvement
Was organized
Had the necessary skills to mentor
Positively impacted my research experience

Please use this space for additional comments about your mentors:

Please use this space for any additional comments about your research experience overall:

Research Experiences for Undergraduates

Mentor Feedback Survey

Thank you for taking a moment to complete this survey. Your responses will be used to evaluate and improve the REU programs hosted by the National Institute for Mathematical and Biological Synthesis. Your responses will be used to evaluate and improve the program, and will be kept confidential to NIMBioS staff. Information you supply about your program participants will not be shared with them.

How satisfied were you that the student applications supplied the necessary information needed to choose qualified participants?
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

Please provide any suggestions regarding questions or content that might be helpful to include in future applications:

Did your students attend all research group meetings?
Yes
No

If you answered "No" above, what were the reasons for not attending provided by your students?

How satisfied were you with the training provided by NIMBioS to your students (lectures in R, MatLab, modeling, etc.)?
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

Please let us know if there are any additional training that you feel would have benefitted your students:

How satisfied were you with the other supports provided by NIMBioS to your students (computer resources, social activities, etc.)?

Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

Please let us know if there are any additional supports that you feel would have benefitted your students:

How satisfied were you with the Wiggio for communicating with others in the program?
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

Comments about the Wiggio and/or communications within the program in general:

NIMBioS would like your input about providing opportunities to help our REU mentors increase their undergraduate mentoring skills next year. Please check the box next to each statement below that applies to you regarding your mentoring experience:
I do not feel that any additional mentoring training or discussion is necessary.
I would have liked to have attended a formal session on mentoring best practices prior to the program.
I would have liked to have met with other mentors at least once during the program informally to discuss the mentoring process.
I would have liked to have met with mentors after the program informally to discuss lessons learned in mentoring and reflect on the experience.

Comments or suggestions about mentor training:

How satisfied were you with your interaction with the other mentor(s) on your project?
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

If you were not satisfied with your interactions with the other mentor(s), please explain: (NOTE: your response will be kept confidential to NIMBioS staff)

The next few pages contain questions about the changes in knowledge and skills that you saw in your program participants from the beginning to the end of the program. You will have to

opportunity to rate each of your participants separately. Please begin by selecting your project from the list below:

{Programs Listed Here}

Mentors were asked, for each of the participants in their programs, to rate them on the following research skills at BEGINNING of program and again at the END of program on a scale of 0-4 as follows: 0 = I don't know 1 = Extremely poor 2 = Below average 3 = Above Average 4 = Excellent

(Participant's Name) Research Skills:
Using research literature (e.g. journal articles, books, publications)
Integrating scientific theories with research
Designing a research plan
Using mathematical tools or models to describe a biological scenario
Working collaboratively with other researchers
Analyzing data
Interpreting results
Writing about results
Orally presenting results

Mentors were asked, for each of the participants in their programs, to rate them on the following levels of understanding at BEGINNING of program and again at the END of program on a scale of 0-5 as follows: 0 = I don't know 1 = Extremely poor 2 = Below average 3 = Average 4 = Above Average 5 = Excellent

(Participant's Name) Level of Understanding of:
How scientists work on real problems
The nature of the research process
The nature of interdisciplinary research collaborations
Ethical issues in research
How current research ideas build upon previous studies
The demands of a research career in your discipline
Possible career paths in your discipline

Overall, how satisfied were you with the NIMBioS REU program?
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied

Please use this space for any additional comments or suggestions for improving the program next year: