Evaluation Report

R Seminar

February 2-March 2, 2009

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Table of Contents

R Seminar Evaluation

Introduction

The R Seminar for statistical computing was conducted on the University of Tennessee campus and sponsored jointly by NIMBioS and the Department of Ecology and Evolutionary Biology. The purpose of the seminar was to help students learn to use the R statistics package in biological research. The format of the seminar was one hour a week for six weeks, beginning on February 2, 2009. The seminar was limited to 20 participants who were selected from an applicant pool. Due to participant attrition during the six week duration, a total of 15 participants remained at the end of the seminar.

Evaluation Design

A participant survey was distributed online to seminar participants during the last meeting on March 9, 2009. A total of 15 participants responded to the survey, for a 100% response rate. The following report summarizes their responses.

Findings

Overall satisfaction

Participants responded favorably to overall questions about the seminar, including satisfaction level, level at which content was presented, and knowledge of the instructor. All but one of the respondents agreed they would recommend the seminar to others (Figure 1, Table 1).

Figure 1. Overall participant satisfaction

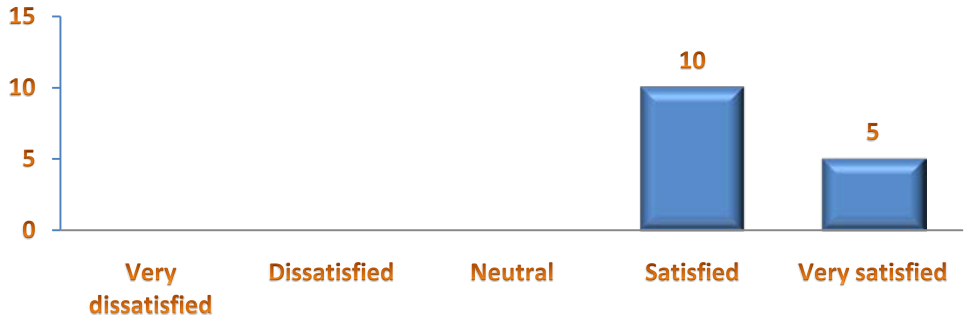


Table 1. *Number of responses to general rating questions, by response category*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
The seminar was appropriate to my level of expertise.			2	5	8
The instructor seemed very knowledgeable about the topic.			1	3	11
I would recommend this seminar to others.			1	4	10

Seminar Content and Format

Participants answered several questions about the seminar content and format. Most participants felt the amount of content offered was just right, and the majority of participants felt the format was effective (Figures 2 & 3).

Figure 2. Amount of content offered during seminar

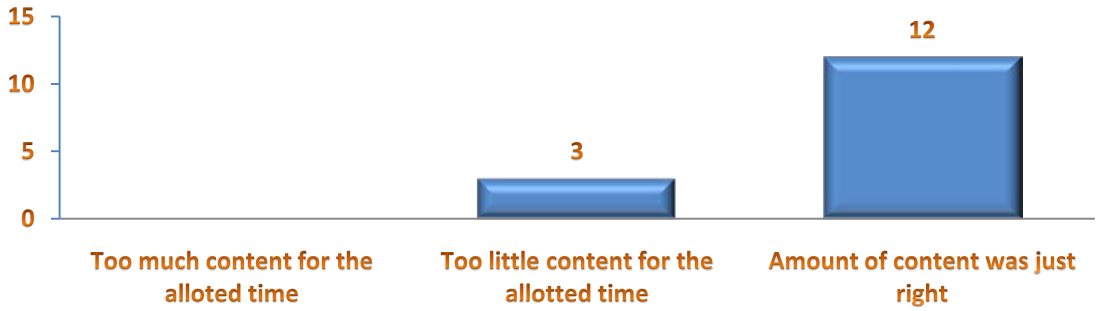
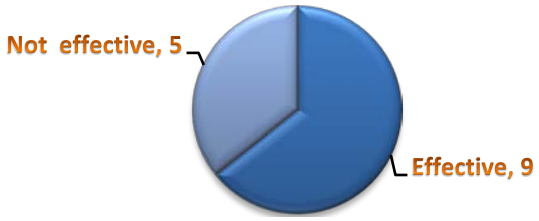


Figure 3. Effectiveness of seminar format



All participants indicating the format was not effective said they would have liked for the seminar to last longer. One participant's comment about how to make the seminar more effective (See Appendix B for a full listing of responses):

"More time each week. One hour is not long enough. I feel like I have learned a bit, but maybe not enough to be an independent R learner. This class needs to be thought over a longer period of time, and more time devoted to it each week."

In response to a question regarding the most useful aspect of the seminar, the majority of participants (n = 12) responded that the exercises that forced them to figure things out on their own were extremely useful learning tools (See Appendix B for a full listing of responses):

"Being told what we wanted to accomplish with a data set and having to look up and implement the commands."

"How to use R resources. Because the class is so short, it is very important that we learn how to get the information we need by our own means. So everything about searching R for formula, finding and uploading packages, etc, was very useful."

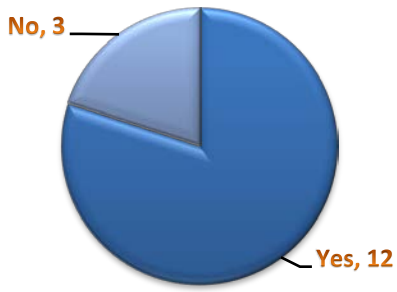
"Learning how to upload packages and doing an entire exercise by myself."

In response to a question about the least useful aspect of the seminar, 5 of the 10 respondents indicated they thought everything was useful. Other responses indicated that the handouts about data and hypotheses, having to look everything up rather than being provided the code, and the time devoted to teaching stats rather than how to use R were the least useful aspects. One participant suggested that introductory level and follow-up seminars would be useful:

"The least useful thing is that the seminar was only 6 classes, I think with the turn over of participants and the interest we really need a follow up, and an introductory class of R for new students."

When asked if attending the seminar would enable them to use R in their research, the majority of participants answered "yes" (Figure 4).

Figure 4. Ability to use R in research as a result of attending the seminar



Of the three participants indicating they did not feel they could use R after the seminar, one two felt that a longer course would allow them to learn enough content to be able to effectively use R, while one indicated he/she needed more statistical background courses. Some participant comments (See Appendix B for a full listing of responses):

> *"It just needs to be thought for a longer period of time so that we can get to a point where we can do more than a T-test and a Regression. I want to use R to for Monte-Carlo simulations and design my own null models. I am not saying that we should be taught how to do this on R, but I feel that I would need a full semester of learning about R to get to a point where I can learn how to do permutation tests by myself."*

> *"More info, perhaps a semester long course would be helpful."*

Suggestions for Future Seminars

The overwhelming consensus by survey respondents was that the best way to improve the R seminar would be to make it longer. Participants found the content of the seminar very useful, but felt as thought they did not have enough time to learn everything they were interested in knowing. Some participant comments (See Appendix B for a full listing of responses):

> *"If a complete semester (or even 2) were used. I feel like the course was much too short to actually cover enough. Again, what we did cover was a fantastic base for me to go ahead and get into R. I just wish it was much longer."*

> *"More time each week. One hour is not long enough. I feel like I have learned a bit, but maybe not enough to be an independent R learner. This class needs to be thought over a longer period of time, and more time devoted to it each week."*

Respondents indicated a number of topics they would to have covered if given more time, including how to make graphs and how to perform specific statistical functions such as ANOVAs, t-tests, and logistic regression. Additionally, respondents indicated they would be interested in attending seminars on other topics, including Bayesian modeling for biology and math ecology for "non-math people" (See Appendix B for full listing of comments):

> *"A much more detailed R seminar (perhaps even a class). But also, perhaps more general math ecology for graduate students that have a strong ecology background but little math especially as it relates to ecology. As it is now, anything that has to do with math ecology seems to assume an extremely high knowledge of math and less ecology. I think things that for people coming from the ecology side, it is much harder to get into the math ecology than for students coming from the math side."*

Respondents had a few suggestions for making the written seminar materials more useful for someone learning how to use R in a biological context as well. Two respondents indicated it would be useful to

have a book or manual to follow while learning the content, while another suggested including the command in the problems on the handouts:

> *"We could follow a book like the Gotelli and Ellison stats book, and go from chapter to chapter and learn how to do the basic tests in each chapter using R."*

> *"I think that it would be nice to have kind of a manual instead of having copies of a book for the exercise."*

Conclusion and Recommendations

Overall, the seminar was well-received by the participants and appears to be a useful activity for students interested in using R in biological research. The recommendations (if feasible) from analysis of the survey data are as follows:

- Continue to offer the R seminar, but change the format so that participants have more time. A full semester course meeting several times a week would be ideal.
- Consider a written text to use with the course that students can use as a reference
- Continue and expand the current inquiry-based format for learning to use R
- Offer a seminar in math ecology for students with a limited math background

Appendix A

R Seminar Participant Survey

Please check the appropriate box to indicate your level of agreement with the following statements about this seminar:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No Answer
The seminar was appropriate to my level of expertise.	❍	❍	❍	❍	❍	❍
The instructor seemed very knowledgeable about the topic.	❍	❍	❍	❍	❍	❍
I would recommend this seminar to others.	❍	❍	❍	❍	❍	❍

How do you feel about the amount of content offered during the seminar?

❍ Too little content for the allotted time
❍ Too much content for the allotted time
❍ Amount of content was just right
❍ No Answer

What topics would you have liked to have covered in this seminar if given more time?

How do you feel about the format of the workshop (one hour a week for six weeks)?

❍ This was a very effective format for learning the material
❍ This was not a very effective format for learning the material
❍ No Answer

The seminar format would have been more effective if:

What was the single most useful activity/concept offered during the seminar?

What was the single least useful activity/concept offered during the seminar?

Do you feel this seminar will enable you to use R in your research?

❍ Yes
❍ No
❍ No Answer

Please indicate any suggestions you have for making the written seminar materials you received more useful to someone learning how to use R in a biological context:

Indicate your overall level of satisfaction with the seminar:

❍ Very dissatisfied
❍ Dissatisfied
❍ Neutral
❍ Satisfied
❍ Very satisfied
❍ No Answer

What topics (besides R) would you like to see covered at future NIMBioS/EEB seminars?

Additional comments:

Demographic Information

Your participation in answering the following questions is completely voluntary. Answer only those questions with which you feel comfortable.

I am a(n):
Undergraduate student
Graduate student **(14)**

Gender
Male **(8)**
Female **(7)**

Are you Hispanic or Latino?
Yes **(4)**
No **(10)**

What is your racial background?
American Indian or Alaska Native
Native Hawaiian or other Pacific Islander
Asian **(4)**
Black or African-American
White **(11)**

Appendix B

Open-ended Responses

What topics would you have liked to have covered in this seminar if given more time? (n=11)

Miscellaneous (6)

Writing and executing programs in R

I think we need to try more project-like missions.

I would like to have a little bit of more emphasis on data manipulation. , The content on statistics was covered fine. , I don't know if it would be possible but little bit of exposure on repetitive (I mean looping) activity would have been very good!

I would have liked to have gone in more detailed analysis and learned better how to read help manuals.

More time to practice the given problems. It was great to learn the basics and to learn how to work with r.

A more detailed instruction on how to work with data in R. Naturally, this course was too short to also cover general programming, but a bit of info on how to create your own functions and the like would be nice if we had more time. , For the amount of time we had, I am pleased with the topics we did cover.

Regression (4)

Logistic regression, more about ANOVAs (block, factorial)

More on graphing, more linear examples... multiple regression selection, more types of ANOVA

How to make the most common forms of graphs used to present results. How to run stepwise regressions., Pairwise T-Test

Topics for the next seminar, because I would like to have a follow up; how to make graphs, logistic regression, multivariate stats

Graphs (3)

Making graphs, more statistical tests

How to make the most common forms of graphs used to present results. How to run stepwise regressions., Pairwise T-Test

Topics for the next seminar, because I would like to have a follow up; how to make graphs, logistic regression, multivariate stats

ANOVA (2)

Logistic regression, more about ANOVAs (block, factorial)

More on graphing, more linear examples... multiple regression selection, more types of ANOVA

The seminar format would have been more effective if: (n=5)

More time (5)

More classes through out the semester

We met twice a week for three weeks

Three times in a week and about four weeks, like general classes.

If a complete semester (or even 2) were used. I feel like the course was much too short to actually cover enough. Again, what we did cover was a fantastic base for me to go ahead and get into R. I just wish it was much longer.

More time each week. One hour is not long enough. I feel like I have learned a bit, but maybe not enough to be an independent R learner. This class needs to be thought over a longer period of time, and more time devoted to it each week.

What was the single most useful activity/concept offered during the seminar? (n=15)

Learning how to figure things out on our own (12)

Teaching us how to ask questions from the program

Look up how to do thing on our own.

Being told what we wanted to accomplish with a data set and having to look up and implement the commands ourselves

working on our own-- being given an activity and being let loose to figure things out on our own., It might be useful to send out the code commands we're using that day before hand-- that way we can try it on our own and use class time for troubleshooting, asking questions about our own datasets, etc.

How to do search things in R was really good. But there were other useful things too!

Just myself soaked in the R tool was good enough...and instructor was very helpful on directing us to right places for further help

Learning the code for basic operations

Learning how to do full tests. Like ANOVAs

Finding help in R. RSiteSearch("") and ? function

How to use R resources. Because the class is so short, it is very important that we learn how to get the information we need by our own means. So everything about searching R for formula, finding and uploading packages, etc, was very useful.

The two last classes in which we only get the data and we need to figure out how to analyzed data, trying to find the answers and comments for our own.

Learning how to upload packages and doing an entire exercise by myself.

Miscellaneous (4)

Method and example to use R program

Just myself soaked in the R tool was good enough...and instructor was very helpful on directing us to right places for further help

Step by step how to do the analysis

I learn some of the R commands which enlarge my horizons so that it is very helpful for my future research.

What was the single least useful activity/concept offered during the seminar? (n=10)

Everything was useful (5)

None

I can't find anything that was lest useful

None

None.

I have never used R, either SAS so everything in this seminar was useful for me

Miscellaneous (5)

Handouts about data and hypotheses

Looking up how to do everything.. just provide the code

I can't think of anything that was not useful. The least useful thing was probably attaching data (but only because I always used $ instead, it will likely be useful in the future).

Most of us have a basic knowledge of statistics, so I felt there was too much time devoted to teaching stats concepts that we already knew. The emphasis should be on how to use R, not how to do stats.

The least useful thing is that the seminar was only 6 classes, I think with the turn over of participants and the interest we really need a follow up, and an introductory class of R for new students

Please indicate any suggestions you have for making the written seminar materials you received more useful to someone learning how to use R in a biological context: (n=10)

Use a book or manual (2)

We could follow a book like the Gotelli and Ellison stats book, and go from chapter to chapter and learn how to do the basic tests in each chapter using R.

I think that it would be nice to have kind of a manual instead of having copies of a book for the exercise

Include handouts with codes (3)

Handouts about code and their input arguments

Being given written code before class would have been helpful

I will give handouts with the basics of R (i.e. the code for an ANOVAs, or how to enter data) that will help people to use it after they forgot the details of the course (i.e. 6 months after the course)

Miscellaneous (2)

None

I don't think they could have been. Pretty clear and straightforward handouts.

What topics (besides R) would you like to see covered at future NIMBioS/EEB seminars? (n=11)

Bayesian modeling

Understanding what parameter values can be accurately extracted from a data set

Systems biology markup language (SBML)

Working with Genomic datas

SAS

Permutation-based tests.

Multivariate stat using R

Math ecology (3)

Basics of math ecology. Or modeling for people that are not math people.

A much more detailed R seminar (perhaps even a class). But also, perhaps more general math ecology for graduate students that have a strong ecology background but little math especially as it relates to ecology. As it is now, anything that has to do with math ecology seems to assume an extremely high knowledge of math and less ecology. I think things that for people coming from the ecology side, it is much harder to get into the math ecology than for students coming from the math side.

I would also like to take a seminar about SAS and Math Ecology

More about R (2)

More on R, Basic modeling for biology

A much more detailed R seminar (perhaps even a class). But also, perhaps more general math ecology for graduate students that have a strong ecology background but little math especially as it relates to ecology. As it is now, anything that has to do with math ecology seems to assume an extremely high knowledge of math and less ecology. I think things that for people coming from the ecology side, it is much harder to get into the math ecology than for students coming from the math side.

Additional comments: (n=4)

The instructor made a great job teaching this seminar

None

Great stuff. I learned a lot, and think this R seminar should be expanded on in the future.

Good job Marco!

Appendix C

List of Participants

Last name	First name	Department	Institution
Austin	Emily	Ecology and Evolutionary Biology	University of Tennessee
Barrios	Noelia	Ecology and Evolutionary Biology	University of Tennessee
Barun	Arijana	Ecology and Evolutionary Biology	University of Tennessee
Buckley	Nicholas	Ecology and Evolutionary Biology	University of Tennessee
Dimarco	Romina	Ecology and Evolutionary Biology	University of Tennessee
Felker-Quinn	Emmi	Ecology and Evolutionary Biology	University of Tennessee
Goswami	Sumit	Biochemistry Molecular Biology	University of Tennessee
Hudson	Patrik	Ecology and Evolutionary Biology	University of Tennessee
Hunkapiller	Tim	Ecology and Evolutionary Biology	University of Tennessee
Kwon	Hae-Ryong	Genome Science & Technology	University of Tennessee
Lessard	JP	Ecology and Evolutionary Biology	University of Tennessee
Matheny	Brandon	Ecology and Evolutionary Biology	University of Tennessee
Neilan	Rachael	Math	University of Tennessee
Nunez	Martin	Ecology and Evolutionary Biology	University of Tennessee
Rodriguez-Cabal	Mariano	Ecology and Evolutionary Biology	University of Tennessee
Shakya	Mijun	Genome Science & Technology	University of Tennessee
Stuble	Katie	Ecology and Evolutionary Biology	University of Tennessee
Todd-Thompson	Megan	Ecology and Evolutionary Biology	University of Tennessee
Vaughn	Justin	Biochemistry Molecular Biology	University of Tennessee
Xing	Fei	Math	University of Tennessee