

## Statistical Consulting Center Work Report

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### **Overview**

The Florida State University Statistical Consulting Center provides free service to FSU faculty and graduate students who come to seek statistical assistance on their questions, which may arise from their thesis, dissertation, research projects and work. Even though we do not provide actual analysis, we do provide all-around statistical guidance from formulating a research problem to identifying statistical hypotheses to interpreting statistical results. In addition to suggesting statistical methods to clients, we also explain statistical ideas, confirming or suggesting modifications to their own analyses and reassuring them about the whole statistical procedure.

### **Services Provided**

In the past two years, I have scheduled three two-hour intervals each week to meet clients. However, my actual schedule is quite adaptive to the clients' needs. Some of them may have emergencies requiring an over-the-weekend meeting. Some of them may need to come more than once so that I make later appointments with them at other times. Many consulting cases require additional time devoted to reading and some research.

There were a total of about 150 clients in the 2000-01 and 2001-02 academic years. The clients came from various backgrounds, including both the physical and social sciences. A partial list is as follows:

- Anthropology
- Art Education
- Biology
- Business
- Biomedical Research Facility
- Chemistry
- Chemical Engineering
- Civil Engineering
- College of Communication
- College of Business, Management Department
- Curriculum and Instruction
- Dedman School of Hospitality
- Education
- Education Leadership
- Electrical and Computer Engineering
- Geography
- Math Education

- Music
- Nursing
- Nutrition
- Oceanography
- Physical Education
- Psychology
- Social work
- Sport Administration
- Textiles and Consumer Sciences
- FSU-FAMU College of Engineering
- School of Information Studies

There are also clients from other organizations, such as,

- ACS State Healthcare
- FSU Center for Intensive English Studies
- FSU Dean of Students Department
- FSU Student Counseling Center
- Florida A&M University
- Florida Department of Environment Education
- Florida Natural Areas Inventory
- Supreme Court of Florida

Most of the clients are graduate students who use statistics in their thesis, dissertation, or other research project. Some need help designing a survey or sampling scheme, including issues of reliability and sample size. Some have already collected their data and are more concerned with the choice of statistical procedure or interpreting and expressing statistical results. Others need help on statistical software, e.g., SAS, SPSS and MINITAB.

The statistical tools and concepts on which we give advice include experimental design (ANOVA, factorial), descriptive statistics (summary, graphical), modeling [linear, GLM (logit, multi-logit, log-linear), repeated measures], multivariate analysis (factor analysis, principal component, MANOVA, cluster analysis, discriminant analysis), nonparametric tests (binomial, Wilcoxon-Rank Sum, Friedman). There are other cases in which a very specific statistical tool needs to be used. For example, a social science student may need meta-analysis, content analysis or SEM (structure equation modeling).

Many clients' questions entail the use of some specific computer programs that are not found on common statistical software like SAS and SPSS. To address these questions, I have collected from the Internet a number of programs that can perform various tasks like meta-analysis, content analysis, power analysis, etc. The clients are very happy to have a reference to these programs.

In addition, I put a "resource" web page on the SCC website. That page includes links to a statistics dictionary, an electronic statistics textbook, an online statistics calculator, the FSU survey research laboratory that also provides some statistics assistance, a tutor list from our department and the statistics science web that contains everything about statistics. I have also located many tutorials and guidance on specific statistical tools. These resources complement what is provided at the SCC and are useful to some clients.

### **The Contribution of the Statistical Consulting Center**

The role the Statistical Consulting Center (SCC) plays in supporting the research of graduate students and faculty is significant and indispensable. A distinct characteristic of current scientific research is that statistical methods are used in almost every field where quantitative analysis is possible. Especially in the social science area, it has become a norm to support research hypotheses or social observations with some sort of data analysis. Unfortunately, a majority of the social science students are not sufficiently specialized in statistics and need help or guidance in their research. The SCC is often their first choice in seeking statistical advice since it is well-known (via their major professors or word of mouth), easily found (through Internet search) and conveniently accessible (make appointments through phone or email or Internet are easy and the center is flexible to adapt all kinds of needs).

Most clients use this resource by coming to the center in person through appointment. A few clients may use the center by phone or email to save time. Many clients who have been met before may also use phone or email to ask more questions or ask for confirmation of their statistical results. We accommodate all these cases in the hope that this consulting resource is most helpful.

Many past clients of the center have found the consulting services worthwhile and very helpful. Generally, most of them come to the SCC under a deadline that requires a solution to a research problem quickly or a quick review of their statistical work. In response, we provide timely statistical assistance, whether it be in the form of statistical advice or guidance on software use or assurance of the validity of their statistical methods. Our help not only satisfies the clients' statistical needs, but also reduces their stress coming from dissertation defense or journal publication deadlines.

### **Typical Cases**

A typical example where a client solicited help from the SCC is as follows. On Sept. 24, 2002, we received an email:

"Hello,

I am a doctoral student at the University of South Carolina and I have recently completed an internship at Florida State Hospital. I am in the process of analyzing my dissertation data, but am in DESPERATE NEED of professional assistance. Can you please help me?? I would love an appointment. I will fax the Request for Assistance and Consent forms to you tomorrow at 850-644-5271."

As she wished, we set up an appointment with her to meet on Sept. 26, even though I originally had no schedule to meet client on that day and even though she was a doctoral student at the University of South Carolina. After the meeting, she left happily, with all her statistical questions answered.

In the following I list a sample of cases to give the reader a flavor of the consulting requests we receive at SCC.

- Two clients from the Florida Natural Areas Inventory wanted to design a statistically valid method for evaluating the relative value of sites proposed for conservation acquisition based on the natural resources the sites contain.
- A faculty member from the School of Information Study wanted to look at organizational development interventions. He had three randomly assigned groups: High Involvement, Teams, High Involvement+Teams. He had two moderators (skill level and task-relationship orientation) and measurements on pre-intervention and post-intervention. He asked for help on using ANCOVA and its SPSS implementation.
- A professor from the Department of Civil Engineering wanted to determine the possibility of substituting some common ingredients in concrete mixes, without changing major properties. His data includes air content, slump and compressive, strength of concrete. He asked for help on the experiment design and on interpreting/reporting results.
- A graduate student from the Biology Department wanted to determine if mutation has effect on viability and/or fertility in his research on gene cloning in *Drosophila*. He had the data of (20 individual) pair matings in each of 6 genetic backgrounds. He needed to choose an appropriate statistical method.
- A graduate student from the College of Business wanted to determine the effects of social skill and influence tactics on certain HR outcomes. He "need just a bit of help with analyzing extreme values and running moderated regression via SPSS."

### **Personal Reflections**

I have been working in the SCC for two years. It has been a great time for me and I enjoyed being a statistical consultant. Why is this such a rewarding experience for me?

Firstly, I like to meet people and help them with their statistical questions. Helping, in whatever form, is always rewarding, especially when you help a client who is pressured by a deadline and see her leaving with a smile on her face.

Secondly, by talking to clients face-in-face, I get an immediate experience of how statistics is helping other scientific research. You can't get that sense of achievement in classroom. I feel I am a small part of a big human inquiring enterprise doing my bit of contributing to the advancement of science. This is thrilling.

Thirdly, I learned the significance of statistical methods in all walks of science. You never know the true power of statistics until you are applying it to analyze real-world data, which can arise from such diverse areas as from astronomy to zoology.

Fourthly, consulting practice reinforced what I learned in books. In addition, I learned other precious skills like communication skills, human skills, etc.

Finally, being trained as a statistician, it's interesting to observe how people from different backgrounds perceive statistics; ultimately, my challenge is to convey the kernel idea and technical terms in simple and transparent form to the clients. I enjoy the consultant's work not only for the constant push it gives to improve my communication skills, but also for the great opportunity it provides to learn more special and diverse knowledge to meet the clients' needs and increase the efficiency of collaboration.

Two years of consulting seems to be a very short time in the sense that consulting is never tiring: I am always meeting new people and solving new problems. But it is indeed a time long enough for me to grow from an inexperienced consultant to an experienced one. Looking back on when I was a fresh consultant, with knowledge learned only from textbooks and classroom, I realize what a challenge it was to consult someone who was from a different discipline and who might have a different understanding of statistics! Miscommunication happened from time to time. I learned from each lesson, trying to do better next time. Thanks for the Statistical Consulting course opened by Dr. Doug Zahn, I learned precious consulting skills and got great advice from him. Gradually, I became more effective and efficient in consulting.

### **Acknowledgment**

I would like to thank Dr. Zahn for his encouragement and advice on how to be a better consultant. His class on consulting is also very helpful. I would also like to thank a number of other professors in our department, especially Dr. Duane Meeter and Dr. Xufeng Niu, for assistance with some hard cases.