

## REQUIRED FORMAT

### REPORT FOLLOWING SABBATICAL

*Directions are in Italics*

Name: [REDACTED] Campus/Department: [REDACTED] Mathematics

Period of Sabbatical: Spring 2011

Attach the Statement of Purpose as approved by the Sabbatical Review Committee.

**A. Narrative on Activity and Findings**

*(Describe your activity in detail and attach supporting documents of outcomes—e.g. transcript, manuscript outline and/or chapter course proposal, and research/project report, survey responses. Be certain to directly address and report upon the activities outlined in your sabbatical proposal.)*

During this sabbatical, I wrote six chapters of an introductory statistics text, to follow four chapters, which were completed prior to the start of the Sabbatical Period (SP). The first four chapters introduce statistics using a linguistic and conceptual approach. The six following chapters, written during the SP approach the material in more mathematical and theoretical detail. In these chapters, a careful step-by-step pedagogy is used throughout. Using a lively and conversational style, a broad range of real examples illustrate central concepts and methods. While ideal for a first course or a self-teaching guide, the emphasis on statistical literacy—both in reading and writing—should serve the reader through graduate school, making this treatment ideal for a service course.

**B. Professional Benefit to Applicant**

*(Discuss how the activity made you a better teacher or other professional or scholar.)*

One of the greatest rewards that accompany writing a textbook comes while class testing the material. I had the opportunity to class test several of the chapters at the Eastern campus during the first summer session. I had numerous discussions with said class about writing these chapters during my sabbatical. As always, I asked them for any feedback about the chapters; and I emphasized that I particularly needed negative feedback. What really struck me was—at the risk of tooting my own horn—how good the multiple-choice and true-false questions were at stimulating and assessing critical reasoning. These questions arose from years of teaching this subject with an eye toward facilitating deep understanding, rather than rote memorization of procedures. It has struck me as ironic that I have had my greatest success toward this end with multiple-choice questions highlighting the *classroom* pedagogy. (Admittedly, I also rely on high-stakes group projects as synthesis tasks, but not until after sensitizing the students with said multiple-choice questions.)

“...So when you reject the null hypothesis it’s a Type I Error. Right?” Asked a student during my early teaching years.

“No,” I said. “It could be a Type I Error, but it could also be a correct decision.

“But what about the exam...you write ‘Type I Error’ right?”

“Well that’s a good question. I guess I’ll have to come up with some multiple-choice questions that tests whether the student understands the distinction between a Type I Error being possible and definite.

...and think about it this way...suppose you knew for sure you were committing a Type I Error: What would be the intelligent thing to do?” I asked

“um...not reject the null in the first place?”

“You will do fine on the test!” I exclaimed.

Then upon attending confused expressions on some of the other students I instinctively put progenitors of the following sorts of questions on the blackboard.

A researcher wishes to test whether two nominal variables with three and four respective categories are statistically independent. She observes a chi square value from Pearson's chi square test of independence of 7.1062.

I. At the 5% significance level the appropriate decision could be a Type II Error.

II. At the 5% significance level the appropriate decision is a Type II Error.

a. I is true and II is true.

c. I is false and II is true.

b. I is true and II is false.

d. I is false and II is false.

e. None of the above

Solution: Since the appropriate decision is to fail to reject the null hypothesis, the appropriate decision could be a Type II Error but could also be a correct decision. Accordingly, the truth value of Proposition II is indeterminate making the correct choice *e*.

A researcher wishes to test whether two nominal variables with three and four respective categories are statistically independent. She observes a chi square value from Pearson's chi square test of independence of 13.5016.

I. At the 5% significance level the appropriate decision could be a Type II Error.

II. At the 5% significance level the appropriate decision is a Type II Error.

a. I is true and II is true.

c. I is false and II is true.

b. I is true and II is false.

d. I is false and II is false.

e. None of the above

Solution: Since a Type II Error is impossible to commit when the appropriate decision is to reject the null hypotheses, both propositions are false. Answer: *d*.

It has been rewarding to experience the level of critical reasoning that is stimulated by questions like these.

Additionally, this Sabbatical gave me the opportunity to present material, which is often dry and boring in a real world context, providing me as a teacher with an easy way to nudge my students into buying into the practicality of learning statistics. The following is an example:

## 6.1 Contingency tables

### 6.1.1 Smallpox in Sheffield

In 1902, a landmark paper was published examining whether vaccination reduced the chance of dying from Smallpox. The paper used the data presented in Table 6. 1 and a then relatively new statistical method called Pearson's chi square test of independence. That simple statistical method is still in use today and is the primary focus of this chapter. Table 6. 1 is an example of a **cross-classification frequency table** (also called a contingency table). The term frequency is just a fancy term for a count, often of the number of individuals with a particular characteristic, or as we say in statistical parlance, a particular attribute. In Table 6. 1 we have two attributes:

1. whether or not the study subject was vaccinated and
2. whether or not the study subject died.

Table 6. 1: Frequency of deaths in Sheffield 1887-1888 due to Smallpox cross-classified by vaccination status

<b>Vaccinated</b>	<b>Died</b>		<b>Total</b>
	<b>Yes</b>	<b>No</b>	
Yes	200	3951	4151
No	274	278	552
Total	474	4229	4703

Source: Macdonell, W. R. (1902) On the Influence of Previous Vaccination in Cases of Smallpox. *Biometrika*, Vol. 1, No. 3, pp. 375-383.

The purpose of setting up the data in a table like this is to make it easy for the researcher to determine whether the two attributes (being vaccinated and dying) are statistically "linked." Obviously, it is hoped that any vaccine significantly reduces the chance of succumbing to its targeted disease. And since our world is one where chance and variability are central characters, we must use the laws of probability in drawing any conclusion or inference<sup>1</sup>.

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<sup>1</sup> See Chapter 1 for a detailed discussion about the difference between an inference and a deduction and how conclusions are drawn in science and mathematics.

This Sabbatical also gave me the opportunity to incorporate my original high-stakes group projects and my novel peer assessment instrument into the textbook. I would like to add that I am currently revising the following paper: *Are individual grades really needed for perceived fairness among college students engaged in high-stakes group projects?* This paper shows that the method of peer assessment contained in my manuscript is attended with student satisfaction scores, which are no worse than those associated with a much more time consuming and labor intensive peer assessment method. This time consuming and labor intensive peer assessment method has stimulated research for over ten years in the journal, *Assessment and Evaluation in Higher Education*. Although the data for my paper were collected prior to the SP, much of results and discussion sections were written during the SP, as I reflected upon writing these six chapters and my years of experience teaching mathematics.

In short, this Sabbatical has enhanced my ability to teach, not only in the day-to-day sense, but also as an educator who contributes to the field of education.

**C. Benefit to the College**

*(Discuss the impact your sabbatical activity will have on carrying out your professional responsibilities e.g. to teaching; to student learning; to programs, courses or curriculum development; to retraining, or to an institution specific project.)*

**Mission of a two-year college.** Many college statistics instructors teach introductory statistics like it's still 1975! Their exercises and examination questions often focus on number crunching and rote mechanical manipulation. Unfortunately, most students who take a non-calculus based statistics course will not become mathematics majors, and this traditional teaching approach often stops these students dead in their tracks, resulting in high failure and low retention rates. Applying the pedagogy in this evolving text, I have observed students to be much more engaged relative to when I had used other, more traditional texts<sup>1</sup>. Moreover, I have also observed that fewer students drop the class and there are—at least on average—happier faces using this approach. Accordingly, my modern approach to statistics instruction will enhance the efforts of colleges (particularly community colleges like SCCC) to give their students a competitive and realistic advantage in our current global and information-based economy. If this book becomes recognized on a national level, this effort will join many other efforts to give SCCC even more national recognition as a leader in the use of innovative pedagogy.

**Perception of a scholarly environment.** In one of the many follow-ups to Chickering and Gamson's (1987) landmark paper, Kuh, Pace, and Vesper (1997) report results, which suggest that student perception of being in a scholarly environment is positively associated with value added achievement. I have personally observed students to take on a more serious attitude toward my statistics classes after learning that the assigned Internet readings are, in fact, part of my effort to write a book. The more developed the manuscript has become, the greater the student's perception of my scholarship seems to become. Ultimately I aspire to join the ranks of other SCCC professors whose scholarship has manifested to the degree sufficient for publication, adding my part to enhance the perception of being in a scholarly environment.

**Faculty Development.** Upon returning from my sabbatical, I plan to give a departmental presentation highlighting the aforementioned pedagogical techniques and directions. I believe the momentum and professional growth resulting from this proposed sabbatical will help others as

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<sup>1</sup> Based upon informal reflection not IRB approved retention studies.

well. I am certain that through a process of collaborative brainstorming we can synergistically enhance our value as educators.

## References

Chickering, A. W. & Gamson, Z. F. (1987). Seven Principles for Good Practice in Undergraduate Education. *The Wingspread Journal*, 9(2)

Kuh, Pace, and Vesper (1997). The Development of Process Indicators to Estimate Student Gains Associated with Good Practices in Undergraduate Education, *Research in Higher Education*, 38:4.

### D. **Describe the Current Status of the Project** (*Indicate when the project will be completed.*)

#### *Post-Sabbatical Chapter Completion Plan*

**Chapter 11.** I anticipate Chapter 11 to take an entire semester or more, post-sabbatical since said chapter will be highly graphics intensive. Again, this chapter will require interesting and edgy examples. I propose to write this Chapter concurrently with Chapter 15.

**Chapter 12 and Chapter 13.** I have lots of preexisting material for these chapters. Together, I anticipate completion in a semester or half of a summer.

**Chapter 14.** My approach for this chapter is based on hypothesis test inversion, rather than the more traditional probabilistic approach. I intend to cover left-, right-, and two-sided confidence intervals, so as to be consistent with traditional hypothesis testing. I have tested this approach in the past and have had reasonable success at imparting these concepts. This novel approach may be one of the selling points of the text. I anticipate an entire semester to finish this chapter. Even though I have preexisting material this will be one of the highlights of the text.

**Chapter 15.** While most texts presents descriptive statistics and data visualizations in a single chapter, I propose to present the two-sample (and multi-sample) versions of these methods directly before the associated hypothesis tests. After all, this is how the methodology is implemented in practice! This also, will serve as a pedagogical springboard into Chapter 16. To the best of my knowledge, this approach is novel. Many of the examples in this chapter may be capable of being formatted during that for Chapter 11. Accordingly, this could actually be quick chapter to write and may only take a month or two. At least that's my hope—a hope based on good momentum from an inspiring sabbatical!

**Chapter 16.** I already have lots of matter for this chapter from when I taught Statistics II. This may be quick and smooth.

**Chapter 17 and 18.** Part of the selling point of this text is that these chapters will focus more on the use of technology than by-hand number crunching. This makes it easy for the students to comprehend and apply and easier for me to write, than if I had to format all of the sophisticated mathematics into Microsoft Word. I have some preexisting material from when I taught Statistics II. By the time students finish this material, they should be able to read statistical results from most peer reviewed journals, design a variety of studies, implement analyses using hand and technology-based methodology, and be able to communicate results using oral and written modalities. I hope I can be assigned Statistics II again, as the momentum in inspiration from teaching this material could propel me to finish these chapters quickly.

### *Associated Research*

I have already published the following, which relates to the methodology I have explored relating to my use of high-stakes group projects.

Neus (2009). Peer assessment accounting for student agreement. *Assessment and Evaluation in Higher Education*. Vol. 36, No. 3, May 2011.

I am currently revising the following:

*Are individual grades really needed for perceived fairness among college students engaged in high-stakes group projects?*

This paper is to be submitted to the same journal.

### **Notes:**

**The report should be submitted to the Sabbatical Review Committee (c/o Vice President for Academic Affairs) within eight weeks of your return.** Your report will be reviewed by the Sabbatical Review Committee to make certain that you completed the work proposed in your sabbatical application. You should be aware that your report may be subject to public inspection and may be shared with the Board of Trustees and your colleagues. Upon review and acceptance by the Sabbatical Review Committee and your dean, the report will be forwarded to the President.

A faculty member is expected to complete his/her sabbatical as awarded, or as modified or waived with committee approval. A faculty member granted and accepting a sabbatical who fails to complete the sabbatical as awarded, or modified or waived with committee approval, shall be required to reimburse the College for all monies paid under this provision to the faculty member during the period of said leave.

Upon return from sabbatical leave, the faculty member agrees to remain in a full-time faculty position for a minimum of one (1) year. Prior to the commencement of a sabbatical leave, a faculty member shall be required to execute documentation to assure repayment to the College of all costs related to the sabbatical leave in the event the faculty member does not return to the employ of the College. At the conclusion of

one year of full-time service following sabbatical leave, the documentation will be returned to the faculty member.