



Emphasizing Communication Skills in an Actuarial Curriculum

Edward W. (Jed) Frees

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Outline



- 1 Communication Skills Throughout an Actuarial Curriculum
- 2 Report Writing
 - Tables
 - Graphs
- 3 Using Video Capture to Leverage Learning
- 4 Appendix - Online Learning Tools



Communication Skills Throughout an Actuarial Curriculum



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- At UW - Madison, the actuarial program is hosted by a business school
 - This means the communications are more important than if it were in a science unit.
 - It also means more resources are available, e.g., a professional communications course that all business majors take.
- By “actuarial curriculum,” I mean not only coursework but also faculty mentoring opportunities, actuarial student club, and industry partnerships.



Actuarial Curriculum Activities that Promote Communication



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- faculty mentoring
 - online exam review, report writing for projects (medical malpractice, building insurance)
- actuarial student club
 - networking, leadership, mentorship
- industry partnerships
 - case study competitions, ethics, leadership
- coursework
 - active learning, teamwork, presentation skills



Actuarial Coursework Activities that Promote Communication



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- We have a regression course and comparable course in health analytics where we use a hybrid active learning model.
 - About 60% of each class period is spent on hands-on activities (using R to analyze data) where students team with one another
 - These classes require a written project
 - In some classes, students also present their projects. In other classes, students present regression/health applications.



Actuarial Coursework Activities that Promote Communication



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 - About 60% of each class period is spent on hands-on activities (using R to analyze data) where students team with one another
 - These classes require a written project
 - In some classes, students also present their projects. In other classes, students present regression/health applications.
- We have two exam tutorial classes (1 credit hour) for probability and interest theory that utilize active learning
 - 4 - 6 students per table working collaboratively on problems
 - Each table has a student who leads the table through the problem
 - Student leaders stand and use whiteboards to document problem solution - this develops presentation and communication skills
 - Faculty member provides guidance as necessary



Report Writing: Communicating Data Analysis Results



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- Outline

- Title and Abstract
- Introduction
- Data Characteristics
- Model Selection and Interpretation
- Summary and Concluding Remarks
- References and Appendix

- Idea

- The Title, Abstract and Introduction sections serve as the preparatory material, designed to orient the reader.
- The Data Characteristics and Model Selection sections form the main body of the report
- The Summary, References and Appendices sections are parts of the ending.



Preparatory Material



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- Title and Abstract

- The title should be concise and to the point.
- For the abstract, be sure to respond to such questions as:
 - What problem was studied?
 - How was it studied?
 - What were the findings?
- Overall, describe source of data and techniques used to solve the problem.

- Introduction

- As with the general report, the introduction should be partitioned into three sections:
 - orientation material,
 - key aspects of the report
 - and a plan of the paper.



Data Characteristics



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- Use *basic statistics* to appeal to a larger audience than had you restricted your considerations to a specific statistical model.
 - Constructing statistics that are immediately connected to specific models leaves you open to the criticism that your model selection is incorrect.
- Details
 - Identify the source and nature of data. (longitudinal versus cross-sectional, observational versus experimental, et cetera).
 - Use scatter plots to indicate primary relationships in cross-sectional data or time series plots to indicate most important trends in longitudinal data.
 - Carefully choose the statistics and graphical summaries that you present in this section.
 - Do not overwhelm the reader at this point with a plethora of numbers.
 - *Foreshadow the subsequent model selection.*
 - Other salient features may appear in the Appendix.



Model Selection and Interpretation



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- Provide:
 - an outline of the section
 - a statement of the recommended model
 - an interpretation of the model, parameter estimates and any broad implications of the model
 - the basic justifications of the model
 - an outline of a thought process that would lead up to this model
 - a discussion of alternative models



Ending Material



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- Summary and Concluding Remarks
 - Rehash the results of the report in a concise fashion, in different words than the executive summary.
 - Include ideas that you have about future investigations
- References and Appendix
 - The appendix may contain many auxiliary figures and analyses.
 - The reader will not give the appendix the same level of attention as the main body of the report.
 - Each portion of the appendix be clearly identified, especially with respect to its relation to the main body of the report.



Sources



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- This guide on report writing is from my book entitled *Regression Modeling with Actuarial and Financial Applications*
 - Certainly not unique - originally developed as a guide for the Society of Actuaries Course 121 on **Applied Statistical Models**.
- The next two subsections on summarizing data through tables and graphs are more germane to actuarial applications. They also both appear in the book.
- The graph advice was originally published as "Designing Effective Graphs" by myself and Bob Miller, 1990, in the *North American Actuarial Journal*.



Tips for Making Tables



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- For titles and other headers, STRINGS OF CAPITALS ARE DIFFICULT TO READ, keep these to a minimum.
- Reduce the physical size of a table so that the eye does not have to travel as far as it might otherwise; use single spacing and **reduce the type size.**
- Use columns for figures to be compared rather than rows; columns are easier to compare, although this makes documents longer.
- Use row and column averages and totals to provide focus.
- When possible, order rows and/or columns by size in order to facilitate comparisons.
- Use combinations of spacing and horizontal and vertical rules to facilitate comparisons.
 - Horizontal rules are useful for separating major categories;
 - vertical rules should be used sparingly.
 - White space between columns serve to separate categories; closely spaced pairs of columns encourage comparison.



Principles of Reading and Writing Graphs



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- These principles are important to actuaries who deal extensively with quantitative information
- Graphs are more complex than text - they are vulnerable to many sources of abuse
- The paper presents examples to illustrate how to “lie” with data.
- The examples illustrate that graphic design choice makes a difference
 - We have not included gross misrepresentations, such as you might find in Tufte’s *The Visual Display of Quantitative Information* or Wainer’s *Visual Revelations*
 - We seek to show more subtle differences that could result from genuine misinterpretation of data.



Examples



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- Including Zero to Compress Data
- Perception of Correlation
- Transforming to Logarithmic Scale
- Double Y-Axes
- Aspect Ratio



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Tips for Making Graphs



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- Avoid chartjunk
- Use small multiples to promote comparisons and assess change
- Use complex graphs to portray complex patterns
- Relate graph size to information content
- Use graphical forms that promote comparisons
- Integrate graphs and text
- Demonstrate an important message
- Know your audience



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Empirical Foundations For Guidelines



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- How do we process information?
- How do viewers perceive graphs?
- Cognitive psychology - the science of perception
- Pie charts are horrendous!



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Report Writing Conclusions



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- Just as actuaries need to be taught writing, they need to learn to communicate complex numerical information graphically.
- This starts with our journals, seeps into the classroom and spreads throughout practice.
- With modern-day computing available, it is all too easy to become passive consumers of the defaults programmed by software developers.
- Actuaries need to become effective creators and critical consumers of graphical displays!



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Using Video Capture to Leverage Learning



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- Just as with earlier generations, our students are better equipped to work as actuaries with tools to communicate with colleagues and in written fashion to others
 - This is certainly true of actuaries in academia. I argue that it is at least as important for those in industry.
- What is new is the opportunity to communicate via video capture.
 - This is no longer solely within the purview of professional communications folks; for example, there are many good tools available at low or minimal cost.
 - As we see in academia, it is a media for reaching a broader audience.



Video Capture in an Actuarial Curriculum



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Selected examples where I have used video capture in my role as an actuarial educator.

- Hybrid/flipped classes
 - The use of hybrid teaching methods reduces lecture time. Lecture time can be augmented via video capture.
 - Video capture is great when I need to travel!
- Supplement to textbooks
 - When writing textbooks, it is traditional to offer teaching supplements such as solutions, overheads, and the like. Video capture is another such resource. See my regression book videos at <https://www.ssc.wisc.edu/~jffrees/regression/>
- PhD class
 - In my last PhD class, I required the students to make a video of a homework problem. Great success.
- New adaptive learning platform
 - I am using the Datacamp learning platform to develop a regression module. This requires extensive use of video capture.
- Undergraduate
 - Our undergraduates have produce an exam review website that contains over 450 videos.



Summary



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In this presentation, I

- 1 highlighted methods of encouraging students to communicate with their peers in the context of classroom activities including student presentations, teamwork/interactive learning, and so forth,
- 2 discussed communication in the context of written reports, focussing on communicating numerical concepts in the context of graphs and tables, and
- 3 described efforts for enhancing communication skills in terms of videos, a medium that combines elements of report writing and interactive peer-to-peer communication.



The End



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Thanks for Attending!





Society of Actuaries Learning Grant



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- This is a three-year project funded by the Society of Actuaries - we were eligible to compete for this as a Center of Actuarial Excellence
- Grant ended in 2013



Society of Actuaries Learning Grant



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- This is a three-year project funded by the Society of Actuaries - we were eligible to compete for this as a Center of Actuarial Excellence
- Grant ended in 2013
- Purpose: To develop technology enhanced learning (TEL) tools to provide new ways for students to master classroom material.
- Tools are available anytime and anywhere a learner chooses.
- This is learning enhancement (supplement to the classroom), not distance education.
- These tools are freely available for the public, e.g., **your** students.



Online Actuarial Exam Videos



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- The Wisconsin Technology Enhanced Learning (TEL) site is best known for exam preparation videos
 - Site has over 450 student-produced videos on the preliminary actuarial exams (P through C)
 - Since we went live in 2013, about 120 thousand visitors from 150 countries
 - Last year, over 30 thousand (unique) visitors
- More than just exam prep! We have information on Excel, R-Commander, making graphs, and so forth...
- <http://instruction.bus.wisc.edu/jfrees/UWCAELearn/default.aspx>



Wisconsin TEL Visitors



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Wisconsin TEL Visitors



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Country	Users	% Users
1. United States	30,167	58.61%
2. Canada	5,278	10.25%
3. China	1,530	2.97%
4. Hong Kong	1,219	2.37%
5. Taiwan	1,052	2.04%
6. Malaysia	1,033	2.01%
7. South Korea	868	1.69%
8. United Kingdom	830	1.61%
9. India	765	1.49%
10. Philippines	655	1.27%