Software Review...

An Electronic Companion to Statistics

George W. Cobb and Jeffrey A. Witmer, Jonathan D. Cryer
New York: Cogito Learning Media, Inc. 1-800-93-THINK 1997; $29.95
ISBN: CD-ROM 1-888902-40-X and Workbook 1-888902-42-6

System requirements:

IBM-PC - Windows 3.1 or higher with a 486 processor or higher and 8 or more MB of RAM.

Macintosh - LC 475 or other model with a 040 processor or higher running System 7.1 or later with 8 or more MB of RAM.

With video excerpts from the "Against All Odds" series, concept maps that highlight the structure and connections in statistics, an adorable "Data Dog" leashed to a fire hydrant to illustrate statistical inference, and scores of exercises for self-testing, the CD-ROM *Electronic Companion to Statistics* leads students on an entertaining tour through introductory statistics.

The CD-ROM is divided into 13 topics, spanning data summary and exploration through probability distributions, inference, and concluding with an introduction to nonparametric methods. Intended for use as a supplement to virtually any introductory statistics course, the *Companion* seems to be generic enough to match up well with most textbooks that are currently on the market.

Would an individual student benefit by purchasing a personal copy of this reasonably priced product? Certainly, but perhaps a more practical use for the *Electronic Companion to Statistics* would be to install it on a computer in a classroom, a math resource center, or a library where many students in an introductory course could review the material in turn.

In the *Electronic Companion to Statistics*, the user is invited to peer into the mind of George Cobb, one of the leaders of the statistics education reform movement. Cobb's vision of the introductory course includes very little probability. Some instructors and authors may disagree with Cobb's remark "Fortunately, you only need a small amount of probability for a first course in statistics."

Cobb's maintains an open mind on the spectrum from computation to interpretation in introductory statistics course. I uncovered my favorite reform-flavored quote from the Companion while taking the test in the "Describing Distributions" topic:

"Many statisticians now consider learning notation and formulas to be a poor use of time in a beginning course. If your course doesn't use formulas, skip this problem."

Cobb's concept maps help to link the material contained in any introductory statistics course. The consistent and organized structure of the maps provide a stable bed of intellectual soil from which a student's own understanding can sprout and blossom.

As I bounced around in the CD-ROM, I found that notation was not always clearly defined. For example, in the cute "Logic of Inference" animation starring "Data Dog," the term "se" is used without any explanation that it means "standard error." The entry page for the inference animation does warn that the user should investigate the topics on Probability Distributions and Sampling Distributions first, and "se" is explained in the "Sampling Distributions" topic. Despite this warning, I thought that it would be appropriate for the narrator of the animation to use the phrase "standard error" at least once in place of "se."

Although the test questions on the CD-ROM are interesting and challenging, the limited pool of questions for each individual topic is drained every time a test on that topic is requested. Although the workbook supplements with a larger number of questions, the CD-ROM itself does not even introduce minor variations of the questions to keep students on their toes.

Although the *Electronic Companion to Statistics* really is generic enough to be used as a supplement for many statistics textbooks, it does include some material that is not commonly found in other books. Cobb's explanation of "Box Models" in the "Probability Distributions" topic skirts the frontiers of resampling methods. His construction of a least squares regression line using a "balloon summary" and "midpoints of vertical slices" is fascinating but would be new to many statistics instructors (myself included), I fear.

The CD-ROM includes helpful options that allow the user to see a path through previous pages visited, to search the *Companion*, to store bookmarks at important or frequently visited pages, and to access the Notepad program.

The CD-ROM is accompanied by a workbook that contains many more self-test questions. The workbook questions include "simple drills for basic skills," "skills in context," simple drills on basic concepts," and "concepts in context." Each self-test question in the workbook is immediately followed by the answer. I believe that the workbook questions would be more valuable for student self-review if the answers were separated to the back of the workbook, but I cannot deny that the resource contains plenty of problems to read and review.

The *Electronic Companion to Statistics* is a comprehensive supplement for students of statistics. It should be in the electronic resource collection of every library; it would be a valuable tool for review and self-testing in classrooms and math resource centers; and, it can keep those students who purchase personal copies engaged and statistically entertained for hours as they review and explore George Cobb's vision of the virtual world of statistics.

Reviewed by Tom Short
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Book Review...

Statistics Handbook for the TI-83
by Larry Morgan
Texas Instruments, 1997
ISBN 1-886309-07-8
165 pages, Paperback, $19.95

The TI-83 graphics calculator is being used in many statistics courses, both AP and at the college level. The graphics calculator provides an inexpensive tool that is accessible to students both at home and at school. For this reason the TI-83 will make an impact on the way statistics is taught. The Guidebook that accompanies the calculator provides two chapters (12 and 13) on the statistics functionality of the calculator as well as part of chapter 2 dealing with the probability features. Each chapter has a "Getting Started" problem, that allows the user to work through several features by following instructions in the manual. The remainder of each chapter is devoted to instructions on all the functions of the calculator. These are outside the context of a problem situation. Larry Morgan's *Statistics Handbook for the TI-83* demonstrates, using problem situations, how to use the TI-83 to explore ideas and solve problems encountered in an introductory statistics course.

This is not a statistics textbook. It is assumed the reader will have a textbook that explains the concepts that are dealt with in the handbook. This handbook, by examples, demonstrates how to use the statistical features of the TI-83 to solve problems and clarify concepts typically encountered in a beginning statistics course. The handbook consists of 59 topics. These topics are divided into 13 activities. Each activity begins with an introduction that covers the topics in the activity.

The topics are presented by way of problems similar to those found in most textbooks. The range of topics covers everything in most introductory level statistics courses. Procedures are presented that the reader can use to solve problems from their text. Five topics involve simulation that will help the reader understand the meaning and results of the procedure being explained. Most topics use the built-in features of the TI-83, but the book also covers three advanced topics: multiple regression, two-way analysis of variance and a time series decomposition. These use programs that are listed in the back of the book. The programs can also be downloaded from the Texas Instruments web site, or obtained from TI on disk. In both cases the user must have a TI-GRAPHLINK.

In addition to the information found in the guidebook on univariate data, Morgan's handbook provides some information helpful for producing stem and leaf plots, dot plots, and percentile scores. The author gives a comparison of the various methods used in fitting curves to bivariate data. Unique ways of handling categorical data not found in the guidebook are also given.

Activity six covers probability, simulations, and probability distributions. Several simulations are discussed that help the reader understand the probability distribution under discussion. If the reader has not used the calculator for simulations, this is a good jumping off point. Simulations are again used to help the reader understand confidence intervals and hypothesis testing. Here the reader is also exposed to the use of the equation solver in finding critical values. The TI-83 has a built in inverse normal function, but does not have a dedicated inverse function for the t, Chi-square, or F distributions. This process can be accomplished by using the EQUATION SOLVER from the MATH menu. This should prove very helpful for the student or instructor as they move towards using the calculator as a replacement for the tables found in statistics books.

Activity nine topics deal with the Chi-square tests. Since the goodness-of-fit test is not built into the calculator, a simple procedure using lists is given. Two way tables are built into the calculator and explained fully. The tenth set of activities deals with Analysis of Variance, using the TI-83 built-in ANOVA test for randomized design and a program by the author for randomized block design and two-factor designs. Activity eleven introduces multiple regression, again by using a program by the author. All programs are clear and can be understood by following the examples in the handbook. The final activity addresses the possible uses of the TI-83 in non-parametric statistics.

Often, the reader will want to go to the topic of interest rather than read the book cover to cover. Several topics depend of a knowledge of earlier topics. The introduction to each activity has been clearly marked to pics that need to be covered before others in the section. Topics instructions also refer the reader to necessary information from previous sections. In addition, topics that relate to later or previous topics are also noted with the second topic number in parentheses. Calculator screens are shown throughout the book and numbered so the reader can be sure they are getting desired results. Simulations, a powerful tool in the understanding of statistics, are presented several times. On occasion, the reader will need the TI-83 Guidebook to make sure what the steps listed in the handbook are doing. The author provides a cross reference by textbook section to two popular texts: *The Basic Practice of Statistics* (David S. Moore, Freeman Publishing Co.) and *Elementary Statistics*, Sixth Edition (Mario F. Triola, Addison Wesley Publishing Co.).

In summary, this handbook has a wide breadth of topics, from one-variable statistics to advanced topics like multiple regression and ANOVA. An emphasis is placed on using every statistics capability that the TI-83 has.

The reader is guided through each feature with step by step instructions for the calculator. The organization of the handbook parallels the organization of topics in a standard statistics textbook. I believe this book provides students and instructors a quick, easy resource to using the TI-83 in their classes.

Reviewed by Mike Koehler
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ICOTS 1998...

The fifth International Conference on Teaching Statistics, will be held in Singapore, June 21-26, 1998. The announcement can be obtained from the ICOTS-5 Secretariat at ctmapk@singnet.com.sg or fax +65 299 8983. Information can also be found at:

http://www.nie.ac.sg:8000/~wwwmath/icots.html

Book Review...

A Casebook for a First Course in Statistics and Data Analysis

Samprit Chatterjee, Mark S. Handcock, and Jeffrey S. Simonoff
Wiley, 1995, ISBN 0-471-12255-6

I began searching for a book of case studies to use in teaching statistics a few years ago in an effort to enhance the use of real data in context in my courses. I have always been a supporter of 1) using real data, 2) analyzing data in context, 3) exposing students to a diverse set of applications, 4) providing opportunities for students to write-up results, and 5) linking statistical analyses to meaningful recommendations. The larger issue for me has been how to accomplish all of these objectives without sacrificing statistical content, and yet continue to motivate and excite my students about statistics. The *Casebook* by Chatterjee, et al. provides a structured approach to accomplishing these objectives and is useful for instructors who are in need of a variety of good data sets with associated real statistical questions.

This book is most suitable for use as a supplement to a good applied introductory statistics textbook. The *Casebook* contains approximately 60 case studies and 36 different data sets from a diverse set of disciplines, such as business (The Return on Stocks in the New York Stock Exchange), economics (Estimating a Demand Function), social policy (Condom Use and the Prevention of AIDS), general interest (The Flight of the Space Shuttle Challenger), and even athletics (The Effectiveness of National Basketball Association Guards). The data sets are provided in ASCII files on a diskette and descriptions of the variables in each file appear at the end of the book. Most of the data files are easily formatted for use with popular statistical software packages (e.g., Minitab).

The cases are separated into four general topics: "Data Analysis," "Applied Probability," "Statistical Inference," and "Analysis Involving Regression." More importantly, however, each case is indexed by key words which state the specific statistical concepts and techniques covered in the case. This indexing by statistical topic is extremely helpful in integrating these cases with the main text of the course and makes it fairly easy to locate a specific case associated with a topical segment of a course. Most of the statistical techniques are standard

for an introductory statistics course and include basic graphics (e.g., boxplots, histograms, and scatterplots); basic statistical concepts (e.g., conditional probability, central limit theorem, sampling distributions, and statistical independence); and major statistical topics (e.g., confidence intervals, hypothesis testing, and simple linear regression). In addition, many of the cases contain techniques and concepts appropriate for more advanced courses (e.g., multicollinearity, partial regression, autoregressive modeling, and nonparametric tests). An obvious advantage of these additional topics is that this *Casebook* can also be used in a second course in the statistics sequence. However, for the second course, you will most likely find that there is a lack of case on some key advanced topics (i.e., there are no cases for factor analysis, logistic regression or analysis of variance).

In addition to being grouped by topic, the cases are also labeled by stage of completion: cases labeled "F" are fully analyzed; cases labeled "G" are partially analyzed - requiring some amount of further analysis; and cases labeled "O" require a full analysis to be completed by the students. As suggested by the authors, the cases which are fully analyzed provide an opportunity for the students to see a paradigm for an effective methodological approach, to check their own computer output with the book's output, and to focus on conceptual explanations, rather than computations. After the students gain confidence in their ability to analyze real data, the partially analyzed cases provide an opportunity for individual or group work, which can be written up as a student project, a report to a client, or even a case study of their own.

I have been using cases in my introductory statistics courses for two years now and have received both verbal and written feedback from the students on the effectiveness of cases. My interpretations of the student responses are that (1) cases are effective at helping students understand statistical concepts, (2) cases are strongly recommended by my students for future statistics courses, and (3) the fully analyzed cases were helpful in teaching the students statistical methodology. From an instructor's perspective, I have found the cases from the *Casebook* to be instrumental in creating lively class discussions, providing opportunities for thought-provoking questions, exposing students to a wide range of applications, and most importantly, making statistics interesting.

The main disadvantage of the *Casebook* is its lack of structured questions for the students. For the fully analyzed cases, I have found that a series of case discussion questions provided by the instructor are useful to guide the students in their preparation for class discussion. Many of the partially or unanalyzed cases are useful in a laboratory setting with an associated set of written lab exercises, again provided by the instructor, since the cases were not originally conceived as labs. Even the unanalyzed cases that I have let the students use for less structured group projects, required some specific directions regarding project requirements and evaluation criteria. A possible second disadvantage to the *Casebook* is its volume. Students purchase a book containing about 60 cases when realistically only about a dozen cases can be covered in one semester. Thus, students (and even instructors) may feel that the book is not a good investment. From a different perspective, however, the volume of cases allows for a choice of data sets, depending on individual or collective student interest.

In conclusion, I would recommend the *Casebook* to any statistics instructor who is in need of good data sets with real empirical problems. I believe that cases, in general, provide an opportunity for students to see real applications in context and motivate creative and critical thinking about statistical methodology.

Reviewed by Norean Radke Sharpe
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Book Review... ═══════════════

TI-83 Enhanced Statistics

by Ray Barton & John Diehl
Venture Publishing
(508) -896-9486
ISBN 1-886018-10-3 $25

To build a good course, all teachers need a story to tell and the tools to tell it with. One strategy for teaching statistics is to allow technology to simultaneously remove some of the drudgery of mechanical operations and aid in focusing on higher level concepts. Aligned with recent learning theory, the NCTM and The College Board suggest that statistics courses should tell their story by teaching methods that allow students to construct their own knowledge. Computers and graphing calculators play a large role in allowing students to learn by

exploration. Many secondary school mathematics programs use graphing calculators. Of these calculators, the TI-83 has one of the most comprehensive set of routines for statistics.

Light and lively, *TI-83 Enhanced Statistics* is a valuable liaison between the TI-83 and many of the concepts found in a first course in statistics. Authors Ray Barton and John Diehl find just the right balance in their 35 activities. Always being careful not to go too far, they provide a conceptual overview while guiding the reader through the statistics routines of the TI-83. Their pragmatic activities flow naturally. While not formally grouped into chapters, the activities lead the reader through:
* Descriptive Statistics
* Regression, Correlation, and Coefficient of Determination
* Distributions and Simulations
* Confidence Intervals
* Hypothesis Tests for Means, Proportions, and Linear Regression
* Chi-Square
* ANOVA
* Sinusoidal Regression and Logistic Curve Fits

Each activity follows a similar format. A narrative describing the statistical concept is integrated with examples which the reader enters into the TI-83. Each activity ends with a short but interesting and appropriate set of exercises. Many of the examples and activities contain realistic data. All exercises have carefully worked solutions located near the end of the book.

TI-83 Enhanced Statistics can be used in different ways. At first I turned to it when I was about to prepare to teach a topic which I had not taught before. Each activity helped me develop an overview and provided a few good examples of a particular concept. In some cases I even modeled an in-class worksheet on a particular activity.

Then I began to realize that there was a story being told and told well. I realized that working on an isolated activity missed the succinct but well organized flow of this book. The flow can be gleaned from the activity titles. For instance, near the center of the book, activities such as Binomial Distribution, Simulation, Normal Approximations to Binomial Distributions, Normal Distribution, Assessing Normality, and Random Sampling & The Central Limit Theorem suggest that this book is much more than a list of how to push the TI-83's buttons.

The Narratives

The narrative section of each activity introduces material and reviews major points without side-tracking the reader with excessive details which are more appropriately found in text books. Usually, formulae are presented without derivation. The reader is asked to let the calculator apply specific statistics to illuminating examples. The narratives are experiential. They suggest that the reader enter data and complete computations. They also ask for predictions and suggest questions which help the reader confirm understanding.

Yet needed details are given when appropriate. For example, the method which the TI-83 uses for computing outliers from a five-number summary is explained. Also, a complete but succinct presentation of how to determine a median-median line by hand is provided (footnote1). This is appropriate since this relatively new topic is often not described in text books.

Another example of appropriate detail is found in an exercise for visualizing "signed area" which leads nicely to a first understanding of the correlation coefficient. In addition, the authors are very careful to demonstrate that the outputted r for log, exponential, and power regressions is "actually measuring the linearity of the transformed data." This is a point that first time teachers are often not aware of. The authors have left the reader with the desire to make sure that he or she clarified this concept.

Even as a very experienced TI-83 user, *TI-83 Enhanced Statistics* reminded me of features that had slipped my mind. For example, somehow I had forgotten that the last of the six "Stat Plot" options was a normal-quantile plot. I was reminded of this feature as I prepared this review! Ironically, my students used Minitab to create these plots last year. In addition, I learned that the coordinates of the three summary points for a median-median line are available in the VARS menu and that there is an optional parameter in Sinusoidal Regression which estimates the period.

There are some areas of the narratives which could be improved. Occasionally, the organization and narrative style left me hanging. Within a particular activity, there were times when I was not sure if I was about to start a new concept or if I was finishing up the last. To some degree this is a function of the authors' goal of not overdoing the book's structure or details. As often happens with good experiential material, the trick with *TI-83 Enhanced Statistics* is to continue reading and to continue doing the examples.

Unfortunately, the most confusing presentation is in the first activity: Data and Lists. The TI-83's ability to store an enormous number of named lists makes the initial entry of data confusing to many first time users. The authors tried to cover two different approaches to entering data into lists plus the idea of relative lists in the first activity. As a result the reader's attention is split between too many concepts. It might have been better to choose one approach for the first activity and then insert an additional activity to introduce the second approach and relative lists. In addition, a more complete explanation of the use of the "SetUpEditor" command would ease confusion later on. This command determines which lists are displayed in the Stat List Editor.

There are also times when more information would be helpful. For example, while a solid activity on the Poisson Distribution is included, the reader is not sure when the Poisson Distribution should be used (footnote 2). In a similar fashion, there is a strong activity on how to handle a Goodness-of-Fit test for a one-way table and even a program to compute the appropriate Chi-Square statistic. However, the reader is not informed that the TI-83 lacks a function to perform this operation. In addition, there is a wonderful example of using data extracted off the Internet from the Data and Story Library (http://lib.stat.cmu.edu/DASL) to do a test of homogeneity. Yet there is no mention of how this test relates to the previous example which is a traditional test of independence for two-way tables.

One interesting choice the authors make is to use a matrix approach to determining the Least Squares Regression line. Those readers hoping to find more insight into what is squared and what is minimized will only be more confused after reading this discussion. On the other hand, the authors continue to build an interesting story by extending this matrix process in explaining polynomial regression a few activities later. Perhaps both the traditional approach to minimizing the squared residuals and a matrix approach could be included in future editions.

The Exercises

Activities usually end with between two and six exercises. Most are basic but illuminating. Often they contain one or two very good examples that could be used in class, in a worksheet, or on a test. There are little gems scattered throughout the exercises. For example, the following questions are found at the end of an

activity on Normal Distributions (footnote 3).

The expression Y1 = normalcdf(-4,X,0,1) was inserted in the Y= Menu to produce the graph shown in Figure 1: *To Create Figure 1 Enter on the TI-83: Y1 = normalcdf(-4,X,0,1) and set window to -4,4,1,-0.2,1,2,0,1*
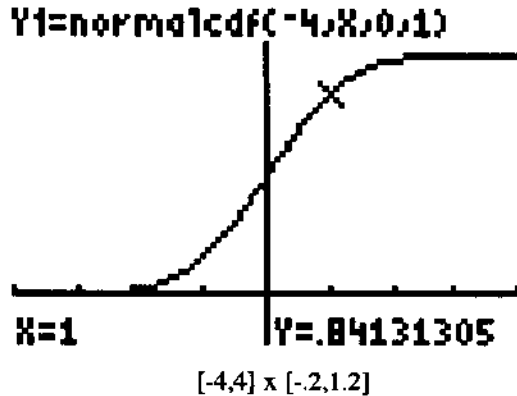

[-4,4] x [-.2,1.2]

Figure 1

A. What do the X and Y coordinates displayed on the graph tell you about the normal curve with mean 0 and standard deviation 1?

B. This graph appears to have a horizontal asymptote of Y=1. Explain why.

In a phone conversation, the publisher, George Best, mentioned that the authors are considering adding additional exercises.

Conclusion

TI-83 Enhanced Statistics is a valuable resource. It tells the story of much of a first year statistics course and concurrently explains how to use the TI-83 statistics routines. It uses an experiential style that does not bog down the reader with excessive detail. It contains easily missed or forgotten technological details. Valuable teaching ideas are found in many of its activities. It has realistic data sets and some unique exercises.

TI-83 Enhanced Statistics would be a valuable review for teachers who are about to teach statistics for the first time. It would pull together concepts for students who need an overview or more exploration. It would be a valuable reference for each of us who teaches introductory statistics using the TI-83.

Footnotes:

1. For a fuller explanation, see *Contemporary Precalculus through Applications.* Gloria Barrett et al. Janson. 1991.
2. For a description and examples of the use of the Poisson Distribution, see *A Data-Based Approach to Statistics.* Ronald L. Iman. Duxbury. 1994.
3. Reproduced with the permission of the Publisher: George Best, Venture Publishing.

Reviewed by Al Coons
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Call for Statistics Workshop Sites—Summer 1998 ...

Is your school district wanting to upgrade its knowledge of hands-on probability and statistics? In case you are not aware, the NCTM/ASA Joint Committee on Curriculum in Probability and Statistics has developed several programs that could definitely help you. The overall name of the series of programs is Quantitative Literacy, which consists of three programs designed for elementary K-5, middle grades 6-8, and high school 9-12. In addition, SEAQL, Science Education and Quantitative Literacy, is for high school science teachers. Data Driven Mathematics consists of a dozen modules that motivate topics in algebra, geometry and advanced mathematics from a data point of view.

If your school is wanting to host a workshop on any of these programs, or on Advanced Placement Statistics, for summer 1998, then ASA's Center for Statistical Education (CSE) is more than willing to advise you on how to organize and conduct your workshop and on how to fund it. The Center will provide a team of highly qualified, experienced Master teachers as instructors; a team consists of a school teacher and a statistician. An ideal institution would be able to guarantee 20 local teachers as participants.

The cost of putting on a workshop depends on what you want to provide your participants. For example, minimally, funding should include $7,500 to cover two instructors' remuneration and expenses, materials and lunch for the participants. Additional costs could include items such as travel expenses, stipends, lodging, and meals for the participants, and local administrative costs. CSE may have a charge depending on the extent of its aid.

One way to generate the funding to cover your total costs is to charge a registration fee (somewhere between $350 and $450 per participant). Participants are often able to use their school's Eisenhower funds to cover the fee. To cover all or partial costs, writing a grant to a local foundation is another possibility; ASA should be helpful in this regard. Local indus-

tries may be a possible source of funding. A nearby ASA Chapter could be of help as well.

If you wish more information on any of these very exciting and useful programs, or to talk about putting on a workshop for summer 1998, contact Sue Kulesher by E-mail at the ASA-CSE site sue@amstat.org or by phone at 703-684-1221x150; Clancy Potratz, CSE resource statistician, at cpotratz@uidaho.edu; or the STN editor Jerry Moreno. We are wanting to help teachers understand the NCTM curriculum standards in probability and statistics, and to implement prob and stats into your classes. Please do not hesitate to call.

Call for Papers...

The CO-WY ASA Chapter is sponsoring The Western Statistical Teacher's Conference (WeSTCo) in Colorado Springs March 27-28, 1998. The purpose of the conference is to promote excellence in teaching statistics. Send abstracts for 15 minute presentations on the teaching of statistics to: Jim Rutledge, HQ USAFA/DFMS, 2354 Fairchild Drive - Suite 6D2A, USAF Academy, CO 80840-6252. For further information contact Jim at rutledgejh.dfms@usafa.af.mil or Brad Warner at warnerba.dfms@usafa.af.mil. The conference website is http://www.concentric.net/~jimstat for fees, accommodations, and registration forms.

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