

Comment: Let's All Write and Teach with e-Books! (Velleman)

"We've gotta have a great show, with a million laughs... and color... and a lot of lights to make it sparkle. And songs - wonderful songs. And after we get the people in that hall, we've gotta start em in laughing right away. Oh, can't you just see it... ?"

— Judy Garland, "Babes In Arms", 1939.

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The “let’s all put on a show” trope central to *Babes in Arms* has been taken up by many subsequent films and plays, most addressing aspects of the fact that it *just aint that easy*. I have the same reaction to these glowing accounts of how we will all be writing and/or teaching with e-books Real Soon Now¹. Hints of the problems peek through these articles and are revealed in how they differ in their views of the coming e-utopia.

First, I offer a “claimer” — the opposite of a disclaimer. In 1997, I released the *ActivStats* e-book that Isaak, Garfield, and Zieffler were kind enough to cite and that Addison-Wesley continues to publish in later editions. I develop the *Data Desk* statistics software, the student version of which is published by Addison-Wesley and used in introductory courses. And I am a co-author of several traditionally published introductory statistics texts. That places me, I think, on all sides of the issues. I believe that electronic materials can enhance statistics education, that students should be exposed to real data and real statistics software, and that there is a valid role for traditional texts.

But I find the enthusiasm and narrow focus in these three articles to be unrealistic for a number of reasons. I don’t think that the authors’ visions are financially realistic, pedagogically sound, or statistically appropriate.

Isaak, Garfield, and Zieffler (hereafter IGZ) quote George Cobb’s remark that one should judge a statistics text by its exercises. They note that modern texts—and especially electronic texts—have many features that warrant evaluation as well. However, I think Cobb’s advice still holds because it speaks to more than the exercises themselves. To write good exercises, a text author must know Statistics at a deeper level than that at which the text is written. He or she must have a well-formed idea of what topics to emphasize and which to omit. Exercises must reflect not only what students need to know, but also what misunderstandings they are likely to have. And, as the GAISE report suggests, exercises and tests should be crafted as learning experiences, not just evaluation tools. A reviewer of a text who thinks about these things can judge how well the authors understand the topic, the students, and the pedagogical challenges. The reviewer can then evaluate how well the authors deal with those challenges.

It is for this reason that I emphatically disagree with West’s commendations for algorithmically generated exercises. Such exercises are rarely about real-world issues and real-world data, so it is difficult for them to reinforce statistical thinking. Algorithmically

¹ <http://www.urbandictionary.com/define.php?term=real%20soon%20now>

generated exercises are excellent tools for drill, and work well in many mathematics courses. But statistics courses should be about understanding the world with data, and that requires, um, data. There are ways that automatically generated exercises can work in this context. For example, they can sample randomly from a large population. But then automatic grading becomes more of a challenge. For example, some samples may include a rare outlier and others may not.

I have similar concerns about the quality of exercises in an open-source text such as that presented by Cetinkaya-Rundel, Diez, and Barr (hereafter C-RDB). It may be easy to modify the body of an open source text, but producing consistent, effective exercises for any modification will require great effort.

The Cost Argument

The one consistent argument for e-texts across these and all other articles on the subject is that they cost so much less than paper and print texts that this alone makes them a good choice and our inevitable future. IGZ cite some price data. C-RDB set a particularly challenging price point (free). And West makes cost a central part of his argument for the inevitability of e-texts. C-RDB argue that the closed nature of published texts is a problem—a view that I don't share and find little support for. They argue that releasing this constraint is sufficient to make a text attractive. By contrast, IGZ and West both discuss ancillary support for modern texts. West also lists some of the support provided by publishers and highlights the challenges of quality, noting that

... publishers have resources to develop quality materials such as videos, applets and algorithmic exercises. While capturing video, for example, may seem to be within the grasp of most tech savvy instructors, the captured product will typically fall short in terms of student expectations of production quality.

I think that these are essential points. I wish the authors had pursued them further. It is worthwhile to consider a typical list of ancillary features²:

- Powerpoint files for each chapter
- A solutions manual that shows the reasoning for exercises and not just the answers
- Videos teaching central concepts
- Statistics software—often a choice of packages
- Instructors' Guides, possibly including media-based tutorials
- Study cards for the text and, sometimes, for individual statistics packages
- Web support, including
 - Algorithmically generated and automatically graded exercises
 - Exam question bank
 - On-line examination administration and grading
 - Course management software (gradebook, announcements, etc.)
 - Homework coaching
 - Statistics software
 - Applets or other software to illustrate concepts and perform simulations

² All of these—along with the *ActivStats* e-book—are provided with the texts I co-author.

- Datasets for exercises in the text formatted for a variety of packages
- And 24/7 support for all of the above.

Beyond this list, commercial texts are expected to be four-color productions designed by professionals and professionally typeset. Texts usually license photographs and other images—an activity that requires professionals to locate images, care in observing copyright rules, and a budget to pay the fees. They employ extensive fact checking and copyediting to remain correct and consistent. As the co-author of several texts, I am often surprised and dismayed by the number of errors that can creep in and survive well into the editing and typesetting process. A text is a long and very complex structure. Beyond the usual challenges of editing a book, a statistics text has formulas, numbers, exercise solutions, and calculations that must all be checked and re-checked.

Books of this complexity with diverse and technical ancillaries require a staff of sales representatives and technical evangelists to show them off and help time-stressed faculty to learn to use them. E-texts are not likely to require any less support.

All of the ancillaries listed are appropriate for e-texts as well. And, as these articles note, e-texts extend this list further by potentially embedding simulations, video, audio, and animated displays, by providing hyperlinks to other parts of the text or to a glossary, and by permitting instructors to re-order topics or add material more easily. But these features require still more professionalism, time, and expense.

Compared with these costs, the expense of printing, binding and shipping paper-based books is not a major component of the total cost of a modern text. So, where are the savings to be found?

You can imagine the graph of list price vs some quantification of the number and quality of features of texts.³ Any discussion of the great savings gained from an e-book needs to decide where on this graph it should sit. It is possible to produce a two-color text with few figures and none of the adjuncts on the list above. But the book won't be adopted widely. I suspect that however attractive open access and easy modification may be and however inexpensive the resulting book, this will be the fate of the text described by C-RDB. Apple seems to think that because they can provide design, typesetting, and distribution with iBooks Author (for a mere 30% slice of the action), they can ease out the publisher entirely and cut the cost of a text to \$15. But such books are in the lower left quadrant of my imagined graph.

Publishers tell us that one reason for the high cost of a textbook is that so many are bought used or re-sold. The attraction to publishers of e-texts is the hope of restricting resale. But other approaches to this challenge already exist. Many publishers offer print versions of texts as “custom” texts. Students purchasing a custom text get a looseleaf bundle of book pages and a binder. Chapters can be re-ordered, those that the instructor intends to skip can be omitted, and additional material from the instructor can be included. In short, many of the advantages of open source publishing are available without sacrificing the other benefits of commercial publication. The purchase price is comparable to the prices seen for e-texts, but students cannot expect to re-sell their book.

³ You'll have to imagine it; the publishers won't release the details.

A realistic examination of the cost of textbooks should include options such as these along with e-books, hybrid combinations of text and technology, and online text options.

The benefits of e-texts cited by these authors are primarily for the student. New benefits for instructors are mostly in the form of the “opportunity” to spend additional time modifying, re-ordering, or adding to the e-text. But most instructors find their time limited. Textbooks, like pharmaceuticals, are selected by experts who are not the ones who pay for them or use them. Many of the ancillaries that come with a modern text are intended to make the life of the instructor easier. If those features are reduced, it might reduce the price of the book, but it will not attract adoptions.

In these early days of e-text fever, it is possible that some publishers are supporting the development costs of a fully-equipped e-text with its associated paper edition. Once the ancillaries have been developed and the book designed and typeset, producing an e-text version costs little in addition. But if publishers were to produce a purely e-text edition, the pricing rules may need adjustment.

In summary, I propose that we take cost off the table as a reason to adopt an e-text. Once the cost of ancillaries is included and alternatives that reduce the price of paper texts are considered, there is not a large difference in price. And if e-texts are no better (or, as we’ll see, possibly worse) than paper, such a fundamental tool for learning is not the best place to find a relatively small amount of savings in an expensive college education.

Videos, Hypertext, and Learning

The *Against All Odds* and *Decisions Through Data* series of videos set a high standard. They also accomplished something not even attempted by most recent video ancillaries. They took the student into the world outside the classroom and showed statistics in use. As a way to introduce a topic in a statistics course, videos of this kind can be very valuable. I also recommend that instructors use current data to create a motivating example to introduce a topic—something that Webster West’s *StatCrunch* system does well.

But many recent videos found with texts just offer a brief lecture on a statistics topic, which may not enhance learning. When mentioning the value of video in e-texts and citing *Against All Odds* and *Decisions Through Data*, it is well to note that newer videos are not likely to have the budget, the quality, or the same role in a statistics lesson as those pioneering productions.

But there may be deeper problems. Nicholas Carr, in his book *The Shallows: What the Internet is doing to our Brains*, and in articles on the subject, (e.g. “The Web Shatters Focus, Rewires Brains”⁴) cites studies that suggest that students learn *less* well when offered videos and hypertext links. Anecdotal evidence suggests that students trying to read a text on a device that can interrupt them with text messages, tweets, and push notifications of Facebook updates, find it harder to focus. (Try that for yourself.)

Where is the Audience?

Judy Garland and Mickey Rooney have high hopes for attracting an audience to their show. So do these authors. But that doesn’t appear to be happening. According to a report

⁴ Accessed at http://www.wired.com/magazine/2010/05/ff_nicholas_carr/all/1

in Publishers Weekly,⁵ a study released by the Book Industry Study Group found that 75% of college students prefer textbooks in printed rather than electronic form. And a parallel survey of college faculty⁶ found that only 12% prefer e-texts to print.

Can we Teach something New and Better?

If cost is not really an issue for comparably supported texts, and evidence suggests that students learn less well with some of the new features offered by e-texts, and neither students nor faculty prefer e-texts to paper, then what reason do we have for advocating for e-texts or asserting that they are the future of textbooks?

The best remaining reason is offered by IGZ, who suggest that with an e-text we could revolutionize our approach to introductory statistics. Their specific proposal is to change the role of the textbook and change the syllabus by making randomization the core concept of the course, integrating simulations and randomization tests directly into an e-text. Their course emphasizes randomization tests in place of traditional methods.

Here too, I must disagree. As the GAISE Report has told us, a modern introductory statistics course should have a solid foot in real world data. It should aim to teach statistical thinking and train students to be able to read, understand, and be skeptical of work that employs statistical analyses. A course based on randomization might be able to teach statistical thinking. But I think we owe it to our students to teach them the inference methods that they will find in general use: Student's t methods for means and regression coefficients, F tests for linear models, and χ^2 methods for contingency tables. I am opposed to substituting randomization tests for three reasons:

1. They are not widely used
2. They are not widely available
3. They are not easier to understand for a beginning student.

We can learn from history. Randomness has been difficult for scientists and social scientists for most of the history of scientific thought. That isn't because the most brilliant minds of their day were limited. It is because the concept is a difficult one for humans. It is unlikely that those students most in need of help with the concepts of sampling distributions and inference will find randomness a more natural path to understanding.

A role for e-texts

I have taught with my e-text, *ActivStats*, as an ancillary to a textbook for about 15 years. The current edition is published and distributed with several texts, including those I co-author. As an addition to a well-taught course with a sound textbook, I think the strengths of an e-text enhance the experience for many students. Simulations can be integrated, videos can present real-world context, and search features may make it easier to locate

⁵"BISG Survey Finds Students Prefer Print" Jan 07, 2011 accessed at <http://www.publishersweekly.com/pw/by-topic/industry-news/publisher-news/article/45699-bisg-survey-finds-students-prefer-print.html>

⁶"College Faculty Continue Their Love Affair with Print Textbooks, Says New BISG Study" Accessed at http://www.bowker.com/en-US/aboutus/press_room/2012/pr_04172012.shtml

definitions and explanations. But I think the combination of paper and electronic features is stronger than either one alone.

I think that the most appropriate role for e-texts is to be partnered with print texts in a hybrid approach to learning materials. I expect to see e-text versions offered for leading statistics texts—if only because publishers have invested so much in the idea. But I expect that most e-texts will be available along with a print version, with students free to move back and forth between the two.

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