

THE JOURNAL OF STATISTICS EDUCATION:
THE CHALLENGES AND OPPORTUNITIES OF THE ELECTRONIC MEDIUM

E. Jacquelin Dietz, North Carolina State University, USA.

The Journal of Statistics Education was the first electronic journal in statistics. Publishing electronically saves paper and printing costs and reduces the time lag associated with paper publication. More importantly, the electronic medium makes it possible to publish materials that could not appear in a paper journal. For instance, JSE articles have included downloadable datasets and software, hyperlinked teaching materials, animations, and dynamic graphics. In addition, the entire journal archive can be searched. However, the electronic medium also poses numerous challenges related to funding, archiving, and accessibility.

The *Journal of Statistics Education (JSE)* is a refereed electronic journal on post-secondary teaching of statistics. The journal is available free on the World Wide Web. In addition, a plain ASCII text version is available by e-mail or gopher for readers without access to the World Wide Web. Our readership includes teachers of statistics from departments of statistics, mathematics, psychology, sociology, business, and education from universities and colleges around the world.

JSE publishes high-quality articles on a variety of topics related to the teaching of statistics, for instance, results of controlled experiments on pedagogical methods, case studies, review and opinion articles, interviews with experienced educators, and of new technologies and new methods of assessment on statistics education. We have published articles on curricular reform in statistics, the use of cooperative learning and projects, assessment of students' understanding of probability and statistics and their attitudes and beliefs about statistics, ideas for teaching hypothesis testing, and the use of computers in teaching. Articles have included datasets, software, and other teaching materials that can be easily downloaded to a reader's computer. We have taken advantage of the electronic medium by incorporating color graphics, hyperlinks, and even animation in articles.

Real datasets are critical in teaching applied statistics; they increase students' motivation and interest and enable them to acquire analytic skills in a realistic context. However, the time required to find suitable datasets can seem prohibitive for instructors. And once a dataset is found, it must be keyed into a computer for analysis. Our "Datasets and Stories" department not only identifies interesting datasets and describes their useful

pedagogical features, but enables instructors to download the datasets to their own computers for further analysis or dissemination to students.

Another regular feature of *JSE* is “Teaching Bits: A Resource for Teachers of Statistics,” which briefly summarizes pertinent items published elsewhere. The first section of Teaching Bits, “From the Literature on Teaching and Learning Statistics,” informs readers about articles of interest they might otherwise miss, for instance, articles in the education literature not read by most statistics instructors. The second section, “Topics for Discussion from Current Newspapers and Journals,” summarizes articles from the popular press and elsewhere that form the basis for interesting class examples.

A typical issue of *JSE* contains approximately four feature articles, one or more Datasets and Stories articles, and the Teaching Bits column. *JSE* is published three times a year, in March, July, and November; the March 1998 issue was the thirteenth.

Over our five years of publication, our subscriber count and rate of submissions have grown steadily, and the technological capabilities of the journal have increased rapidly. The first issue of *JSE* contained only plain ASCII text articles accessible to readers by electronic mail or gopher. The second issue contained the first graphic. By the third issue, *JSE* was available via the World Wide Web (WWW). That issue contained many graphics and two pieces of downloadable instructional software, suitable for classroom demonstrations or for hands-on use in a computing lab. An article in the fourth issue presented data gathered by Galileo, with an animation demonstrating Galileo’s experiment.

An ASCII text version of *JSE*, accessible to anyone with electronic mail, is available to readers without access to the WWW. The WWW version of the journal, however, offers capabilities not available in the ASCII version, including full-text searching and hyperlinks among journal materials. A variety of fonts and type sizes are available, and color graphics appear at appropriate places in articles.

The *JSE* is a part of the *JSE* Information Service, a collection of information of interest to teachers of statistics that is available via electronic mail, gopher, or the WWW. The *JSE* includes, in addition to the *JSE* itself, the archives of EdStat-L, an electronic discussion list on statistics education, and several other e-mail lists; free software; datasets for use in class; and information about the International Association for Statistical Education.

The day-to-day operation of *JSE* is much like that of any refereed journal, except that almost all communication among authors, editors, and referees is carried out electronically. Articles are submitted by e-mail, usually in LaTeX or plain text format, to the Editor. Those articles that pass an initial screening are sent to three referees, at least of the *JSE* Editorial Board. Before manuscripts are sent to referees, they are processed using LaTeX to produce a consistent format and to number paragraphs, so reviewers can refer to particular sections of a paper. Referees are asked to provide reports within four weeks.

After an article is accepted for publication, the Editorial Assistant carefully proofreads and edits the manuscript for punctuation, grammar, and style. We then prepare two versions of each article — a plain ASCII text version and the WWW version. Accepted articles appear in the next journal issue; there is no backlog of accepted articles. Thus our turnaround time is quite short compared to most paper journals.

The *JSE* has been innovative in ways other than its use of the electronic medium. Many of our policies and procedures were developed with the goal of encouraging the participation of a broad audience in the operation of the journal. In 1993, I issued a call to our subscribers for volunteer referees. The response was quite remarkable; 88 subscribers immediately volunteered to review articles. We have continued to encourage readers to volunteer to review papers. Each volunteer fills out a survey describing his or her interests within statistics education; this survey information is used to match papers to referees. Most volunteer referees have written timely reviews of high quality.

JSE was one of the first statistics journals to carry out double-blind refereeing. The American Statistical Association has since followed our lead, and has implemented double-blind refereeing for its journals.

We have adopted another practice that is unusual among statistics journals, with the goal of improving the quality of referees' reports. After a decision has been reached about a paper and communicated to the author, I send anonymous copies of my letter to the author and all of the referees' reports to each referee. Referees have responded very positively to this practice; they find it both interesting and educational to see how other reviewers have evaluated the same paper.

JSE was the first electronic journal to be indexed in the Current Index to Statistics (CIS), the primary index of the statistics literature. We worked with the CIS Editors to

define a format for indexing an electronic journal. For instance, our entries include a file name and a count of kilobytes, but no page numbers!

Publishing a free electronic journal has not always gone smoothly. One of our continuing challenges is to balance two conflicting goals: We want *JSE* to be accessible to as wide a readership as possible, and we want to take advantage of new technologies that enrich the information we make available. We have considered it important to continue the ASCII version of *JSE* for readers without access to the WWW. However, many *JSE* articles contain equations and other mathematical material that is difficult to communicate in ASCII text. We have published two articles (and have others in review) that contain hyperlinked teaching materials that can only be presented on the WWW. Even in the WWW version of *JSE* it is not easy to present mathematical material. We eagerly await new versions of HTML (Hypertext Markup Language) that support Greek letters and mathematical notation.

As journal submissions have increased, and as journal issues have become more complex, producing the two versions of *JSE* has become an increasingly time-consuming job. For several years, a Managing Editor was responsible for technical aspects of the journal, including handling the software, graphics, and datasets included with many journal articles. That individual left the university, and the Editor and Editorial Assistant have assumed his responsibilities. The Editorial Assistant marks up articles in HTML creates and edits graphics files, handles conversions from one file format to another, and performs other technical tasks. One of the challenges of running an electronic journal is that rapidly changing technology requires us to continually learn new skills; just staying current is time-consuming. The Editorial Assistant is the only paid staff person; the journal depends heavily on unpaid volunteers.

The *Journal of Statistics Education* is only published electronically; we do not produce a paper version of the journal. We are still struggling with the challenge of how best to archive *JSE* to insure its immutability and permanency.

Another challenge has been to find ways to fund the journal without imposing subscription fees. A three-year grant from the U.S. Department of Education and financial support from the Department of Statistics at North Carolina State University enabled us to establish the infrastructure required by *JSE*. The necessary hardware and software are in place, and a large network of volunteers has been assembled to carry out the refereeing and editing functions of the journal. The costs of running *JSE* are small

compared to those of print publications. The most pressing financial need of the journal is salary for the half-time Editorial Assistant. The Exxon Education Foundation has supported our Editorial Assistant, a Ph.D. student in statistics, for the 1997-1998 academic year. We must soon identify a dependable and ongoing source of funding for the journal.

A survey carried out in 1996 showed that many *JSE* readers were willing to pay a subscription fee. However, we hope to avoid mandatory fees that might discourage some segments of our readership. Voluntary subscription fees (à la shareware fees) might be a source of some revenue; advertising or corporate sponsorship by textbook publishers and software companies seem more promising. In fact, several publishers have contacted us and expressed interest in having some involvement with the journal. Rather than try to negotiate these sources of funding ourselves, we would like to have a professional organization take on the journal as an official society publication. The society could then lend its expertise and reputation to help raise the required operating funds.

We have had many discussions with both the American Statistical Association and the International Statistical Institute over the past few years. Both have expressed considerable interest in *JSE*, but arrangements for sponsorship have proved elusive. The special features of *JSE* — its electronic medium, its international readership, and its appeal to teachers of statistics from many disciplines — should make *JSE* attractive to a professional society. It is my hope that by the time our Exxon funding ends, one of these societies will have taken on *JSE* as an official publication.

Over a period of six years, we have seen the *JSE* grow from a daring idea to a well-regarded resource for teachers of statistics. It is gratifying how often the name of the journal turns up in unexpected places. We have broad support from the statistics community, which has grown to depend on *JSE* as a source of information and inspiration on teaching statistics, as well as datasets and other teaching materials.

Starting and nurturing the *JSE* has been an exciting and rewarding experience for everyone involved with the project. We will continue our efforts to improve *JSE*, with the ultimate goals of improving the teaching of statistics and the professional development of statistics teachers. *JSE* has filled a need and is making a difference in the teaching of statistics. The following anonymous quotes from *JSE* readers demonstrate the importance of the journal to many teachers of statistics.

“I think *JSE* is terrific. The articles are high quality and interesting. I find myself often going back to reference articles or re-read articles or columns, and am reassured to know they are always available on the web site.”

“The *JSE* has had considerable influence on what I do in the classroom.”

“I look to *JSE* for new ideas and good examples.”

“I depend on *JSE* for much of my new teaching material and ideas.”

“I have really enjoyed the *JSE*. It has helped me do my job better.”

“This is the future here today — keep up the work.”