Using Journal Articles in Intro Stats
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Abstract: There are certain benefits to using actual journal articles in class, even in introductory statistics. The articles give credence to the material covered in class, but, moreover, they show the role that statistics plays in research. In this article, I give some guidelines to using journal articles in class.

Introduction: For some years, the standard in statistics education is to use real, as opposed to made up, data. This movement is good, but it is even better when accompanied by actual journal articles. The problems in many texts are often so compressed that they have lost most, if not all, of their context. The student tends to see the data in terms of its form – one variable or two, count or measure, raw data or summary statistics. How the data and its analysis fits into the problem at hand is often lost. This is made worse when the problem area is so arcane that the student has no feel whatsoever for the problem being addressed.

Using actual journal articles enhances the learning process in a number of ways. The most important of these is how the data fits into the scientific problem at hand. This addresses an issue that is very difficult to approach using highly condensed problems. Doing this greatly enhances the role of statistics as a skill of the "educated citizen".

Level: Actual journal articles can be used at almost any level, although they play different roles in different courses. In introductory courses, it may be enough to interpret p-values or locate values of N. At a slightly higher level, you can convert the statements of the article to hypotheses (if appropriate) and discuss whether H0 was rejected and what that meant. At higher levels, you can have the students confirm the calculations. This works, for instance, when the means and standard deviations for several groups are given and ANOVA has been computed. In higher level courses, the students might look for flaws in the reasoning. Some articles use analyses that are not covered in a standard course and the student might have to learn about these methods independently and report to the class.

Time commitment: The amount of time can vary from 10 minutes up to the entire semester. At the minimum level, you can show the relevant portions of the article in class and show how the statistics fits into the scientific problem. At a slightly higher level, short articles can be copied and distributed to the students for them to read. This works well with abstracts from JAMA. These tend to be about one page long and often contain enough statistics (at least p-values) for the student to make use of them.

At the high end, I have run one semester courses which consisted entirely of analyzing journal articles. The students choose and read different articles. They then present their summary to the rest of the class, along with their critique of the article. The class then asks questions, based on the presentation. With discipline, you can cover 3 articles in a one-hour (50 minute) class.

In both scenarios, it is possible to include this material on tests. This will require a careful summary of the article (or made-up article). The result must not be so long to be a time-issue, but must contain enough information so the student can get a proper appreciation for the article. A good question might be "Compare and contrast the benefits of significance testing and confidence intervals in this problem."

Example: "Moxibustion for Correction of Breech Presentation", by Dr. Cardini, Dr Weixin, JAMA, 280:1580-1584. This article deals with the traditional Chinese remedy called "moxibustion". This consists of burning a bundle of herbs, sometimes described as a cigar. In this case, the "cigar" was burned near the woman's big toe. (The article does not specify if the woman is sitting, standing or prone during the procedure.)

This article illustrates many of the common issues in using journal articles in class. Students are generally aware of pregnant women. Many might not know what "breech" means and might not be familiar with the

term "presentation" in medical jargon. But after these are explained, the students can "get their arms around" the problem.

The abstract for this article contains quite a bit of information. The basic design is presented, as are the sample sizes. P-values are given for the two main tests, although standard deviations are missing for the number of fetal movements. The abstract says that 75% of the treatment group were cephalic at birth, compared to 62% of the control group and P=0.02. The student should then conclude that moxibustion works!

This article also gives confidence intervals for Relative Risk, which is not often covered in introductory statistics. If the student thinks about it for a bit, he/she can figure out what this means and how it fits into the context of the problem.

Sources: An excellent source of articles can be found at www.freemedicaljournals.com. Among other things, it provides a link whereby students can view articles from the New England Journal of Medicine, provided the article is 6 months old. These are the complete articles in PDF format. This eliminates the need for photocopying articles or having the students spend hours in the library.

There are also good statistics in some legal and education journals. Special education seems to have particularly good examples. Newspapers and magazines are notoriously bad sources. They rarely have anything like raw data and often give so little information about the scientific problem that it is impossible to make good use of the articles.

Choosing articles: Obviously, it is best if the article uses methods covered in the course. There will always be issues with the subject matter, but you want one that the students will understand and, it is hoped, find interesting. Medical journals often cover subjects that the students can follow, after a little introduction. Length is also an issue. A long article is costly to photocopy and takes a lot of the student's time.

Using the article: It is important that the student understand the intent of the article. Plan to spend some time explaining terms and the context of the problem, if necessary. Once the problem is understood, then the statistics can be viewed in the context of the problem. "The article says that P=0.02. Does this mean that the treatment worked or that it didn't work?"

Beware: You and your students should expect problems when reading journal articles. Some (statistically) important information may be buried somewhere else in the report. Sample sizes are particularly prone to migrating to odd places in the article. Information may be missing. Sometimes, this is the sample size, but more often, it is the standard deviation. Be on the lookout for tables that list values in parentheses, but do not make it clear if these are standard deviations or standard errors. Sometimes, this can be puzzled out by calculating the t statistic and comparing it to what is given. Hypotheses can be fuzzy or wrong. Do not hesitate to cut out sections of the article that are missing too much information or that would confuse the student.

Be prepared to learn, yourself: When I began using journal articles, I was appalled at the quality. I know how hard it is to catch typos, but typos in data tables cannot be fixed by referring to the context. Expect to see authors confuse failing to reject H0 with accepting H0. It is common to see hypothesis testing when confidence intervals would be more informative. The process of explaining to your students (and to yourself) how statistics is used in scientific research can lead you to new insights about the role of statistics.