Taking the Fear Out of Data Analysis: Case for History Lessons in Statistics Courses

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1. Introduction

When striving for effective ways to improve quantitative literacy of students, one of the most important challenges instructors face is taking the fear out of data analysis. This paper focuses on one approach that proved very effective, namely the inclusion of history lessons into statistics courses. Possibilities of doing that are numerous and range from simple exercises (e.g. assigning a face to a name or discussing examples of famous past statistical achievements and blunders) to well-rounded lectures (e.g. on socio-economic context of past developments in statistics and methodology, or role of women in statistics).

In the paper, the advantages and disadvantages of the approach are discussed in detail along with several sources that can aid instructors in their endeavours to give statistics a more human face in the eyes of their students.

2. Practical Attempts to Take Fear Out of Data Analysis

The negative attitude of students towards statistics is often reported (Gordon, 1995; Francis, 2002; Martin, 2003; Ograjenšek and Bavdaž Kveder, 2003) and has been repeatedly experienced by the author of this paper in case of the courses on economic statistics and business statistics taught at the University of Ljubljana's Faculty of Economics to undergraduate students in the second year. Many of these students already get acquainted with statistics in high school, others in the first year of their undergraduate studies. The nature of their past experiences possibly influences their interest in statistics as well as their attitude towards economic and business statistics. In any case, the instructor's job is not an easy one – to break down a negative attitude (usually stemming from fear of data analysis), to gain the students' interest and/or to retain it.

Generally, practical attempts to take fear out of data analysis can be crudely classified into the „honest" and „less honest" ones. „Honest" attempts include:

- Development of handbooks for instructors, e.g. Gelman and Nolan's *Teaching Statistics – A Bag of Tricks* (2003).
- Preparation of reference books for instructors and students, e.g. Salkind's well written and nicely illustrated *Statistics for People Who (Think They) Hate Statistics* (2004).
- Incorporation of modern IT tools in lectures and tutorials (in various forms ranging from analytical software packages and simulation software packages to webpages with directories of useful resources such as *The World Wide Web Virtual Library: Statistics* or *The University of Michigan's Statistical Resources on the Web*, complete stand-alone on-line courses such as the *Course on European Economic Statistics*[1] or even complex web-based learning platforms for a multitude of statistics courses).

The „less honest" attempts include endeavours to change the names of statistics courses into something which should be perceived as „easier", „more acceptable" and „more fun" by students, e.g. *Business Decision and Information Analysis* or *Evidence-Based Management*. At the 2004 conference of the *European Network for Business and Industrial Statistics* in Copenhagen, one of

the speakers seriously argued for necessity to change the existing statistical terminology in order to make it less complicated and easier to grasp for students of business. While it is easy – at least to a certain degree – to empathise with him (teaching statistics to students of business can at times indeed be **very** frustrating), it needs to be pointed out that hypothesis testing or analysis of variance would certainly not gain in appeal if called any other way. In words of immortal Shakespeare[2]:

„ … What's in a name? that which we call a rose
By any other name would smell as sweet; … "

Instead of putting up unnecessary smokescreens, thereby adding to an already overwhelmingly huge terminological barrier between businesspeople and science graduates, instructors should be focused on constantly improving ways of gaining and retaining students' interest in statistics.

3. Gaining and Retaining Students' Interest in Statistics: Case for Use of History Lessons

Easier said than done, both gaining and retaining students' interest in statistics can actually be achieved with relatively little effort, by adhering to three golden rules.

Rule number one, regardless of the students' chosen field of expertise (yet too often forgotten by statistics instructors), is the following: each session should be structured as a theatrical performance. Sessions without a logical flow (an introduction, a peak, a conclusion) and a clearly summarised key message(s) will produce frustrated students and, ultimately, frustrated instructors.

Rule number two is even simpler: whenever possible, conduct sample calculations using datasets of interest to students – predict soccer game outcomes, calculate trends in *Formula 1* pilot's earnings, compare the efficiency of medical treatment in the *ER* vs. *Chicago Hope*[3], etc.

Rule number three is about giving statistics a more human face by including shorter or loger history lessons wherever appropriate. These lessons can be classified into the following groups:

- **Assign a face to a name:** discuss biographies of famous statisticians, preferably in form of short anecdotes, many of which can be found in Salsburg's masterpiece from 2001 with the title *The Lady Tasting Tea – How Statistics Revolutionised Science in the Twentieth Century*. A systematic overview of celebrated statisticians and their work accross centuries is given in Heyde and Seneta's *Statisticians of the Centuries* (2001). More advanced learners will be interested in David and Edwards's *Annotated Readings in the History of Statistics* (2001). Useful information can also be obtained on-line from *The History of Statistics* webpage.

- **Discuss famous statistical blunders:** many are described and nicely illustrated in Huff's classic *How to Lie with Statistics* (originally published in 1954 and still of great interest). Hooke's *How to Tell the Liars from the Statisticians* from 1983 basically covers the same material, though slightly less efficiently. For speakers of German, Krämer produced a similar text in 1997 (*So lügt man mit Statistik*).

- **Present developments up-to-date in ... :** for example in data collection techniques (starting with references to history of population censuses, making students aware of the existence of the *Domesday Book*), in data analysis, in data visualisation, in quality management, etc.

- **Discuss the socio-economic context of important statistical findings:** e.g. emphasise close historical ties between agriculture and statistics, discuss the role of women in statistics (starting with the original meaning of the word „calculator"), etc.

Additionally, apply knowledge gained in history lessons in present by involving students in competitions and projects such as search for statistical blunder of the month in press; evaluation of reports on completely opposite effects of chocolate or coffee or vitamin C or eating habits in general on one's health; assessment of the use of statistics in companies' annual reports; analysis of population trends, and so on.

4. Discussion

Unobtrusive inclusion of history lessons into curriculum (no matter how crowded) has in author's experience proved to be much appreciated by students, resulting in their more positive attitude towards statistics in general. Although no formal attitude survey has been carried out yet, discussions with students, their comments („I never thought statistics could be so much fun") and, ultimately, results of course evaluation, show that this is a path worth pursuing.

Those who feel that talking about famous statistical blunders might diminish the value of statistics as a scientific discipline in the eyes of students should be reminded of the fact that each blunder represents a perfect learning opportunity.

The only real disadvantage of history lessons is the fact that bits and pieces of information as well as pictorial records usually need to be gathered from a multitude of sources. Often the search alone can be very time-consuming, not to mention the preparation of teaching notes, slides, and handouts. However, this technical „disadvantage" is usually more than offset by lively discussions immediatelly following a history lesson and increased student interest in practical applications of the statistical toolbox.

NOTES

(1) A stand-alone on-line *Course on European Economic Statistics* was developed at the University of Ljubljana's Faculty of Economics in 1999 (Bregar et al., 2000) and is currently up for major reevaluation and harmonisation with the latest developments in the field of official statistics.

(2) Quote from Shakespeare's *Romeo and Juliet* – Scene II: Capulet's orchard. [URL: http://www-tech.mit.edu/Shakespeare/romeo_juliet/romeo_juliet.2.2.html].

(3) An assignment featuring *ER* and *Chicago Hope* can be found in Albright et al. (1999).

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The World Wide Web Virtual Library: Statistics [URL: http://www.stat.ufl.edu/vlib/statistics.html].

RÉSUMÉ

Diminuer la peur de l'analyse des données: le cas d'introduction de leçons d'histoire dans les cours de statistiques

Lorsqu'on cherche à améliorer le niveau d'instruction quantitative des étudiants, l'un des défis rencontrés par les enseignants est celui de faire disparaître la peur de l'analyse des données. L'article est axé sur une approche qui s'est déjà révélé efficace dans le domaine: introduire des leçons d'histoire dans les cours de statistiques. Il existe de nombreuses possibilités pour le faire, allant de simples exercices (par exemple mettre un visage sur les noms, discuter de réussites ou d'échecs statistiques dans le passé) à des cours plus structurés (par exemple, basé sur le contexte socio-economique historique des progrès dans le domaine des statistiques et de la méthodologie, ou sur le rôle des femmes dans les statistiques). Dans l'article, seront discutés en détail les avantages et les inconvénients de cette approche et présentés différentes sources pouvant aider les enseignants dans leurs efforts de présenter aux étudiants les statistiques sous un aspect plus humain.