

Introductory Statistics in a Business Anthropology Program

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Abstract

Introductory statistics courses in bachelor's degree programs in higher education are often challenging to both teachers and learners. In 2012 our institution launched a bachelor's degree program in Market and Management Anthropology (MMA), a field of study in which qualitative research plays a vital role. Quantitative methods are regarded as a supplement to the armada of anthropological tools such as participant observation or informal and structured interviews. This makes the design and conduct of an introductory course in statistics even more challenging. In this paper I discuss the curriculum, the lecturing, the exercises and software used, and the assessment form for this new target group of students.

Despite the qualitative nature of the bachelor's degree program in MMA, a basic understanding of what statistics can (and cannot) do is essential. The curriculum turned out to be almost the same as that for any other introductory course in statistics, say, one for economics students. However, a stronger focus on nonparametric techniques is meaningful.

Keywords: Curriculum; Teaching; Assessment; Higher education; Business anthropology

Introduction

During the first half of the twentieth century anthropology, the study of our understanding of humanity, was occasionally focused on business applications. The publication of *The Anthropologist in Business and Industry* [1] opened the way for the use of the term business anthropology [2], and since 1980 it has become more popular and widely used in the literature. Business anthropology is now recognized as a subfield of applied anthropology. It is not only taught in graduate anthropology programs as a subfield of applied anthropology, but also included in the curricula of MSc programs in Business Administration at a number of American universities [3]. The dedicated bachelor's degree program Market and Management Anthropology (MMA) was launched at our institution in 2012. As anthropologists' research is typically of a qualitative nature and done by means of participant observation or informal and structured interviews (among other techniques, but generally implying small sample sizes), quantitative methods are not the first choice in the anthropologists' toolkit.

Qualitative and quantitative research are often considered as complementary terms which relate to words and numbers, respectively; however, they may as well interact since certain types of qualitative data are analyzed by quantitative means [4]. Correspondingly, they target the questions of 'how' versus 'how many' [5]. Both kinds of research set out with a set of research questions, require gathering data in the second step in order to finally analyze the data and answer these questions. Reversing the order of the first two steps, meaning collecting data first and generating hypotheses based on the data, is only of exploratory value and any finding needs to be

confirmed by a consecutive, independent trial [6]. Data-driven results are necessarily overly optimistic (since you headed for the strongest signal in your data in the first place), unconfirmed, and potentially misleading. Technically speaking, you can take the positivity of your results to the extremes by being open to data manipulation or advantageous choice of study subpopulations [7,8]. The famous statistical quotation 'I only believe in statistics that I doctored myself', which supposedly tracks back to Winston Churchill [9], bears witness to those fraudulent possibilities which, though, are not limited to quantitative research, but do apply to qualitative research as well. Statistics is about common sense and good design [10].

This paper begins with a brief description of our BSc program, which is followed by a more detailed explanation of its introductory course in statistics. First, the curriculum of the course is shown. Second, the teaching approach is characterized and some examples of interactive lecturing are given. Third, considerations regarding exercises and the use of computer software are presented. Fourth, the form of assessment and the way of giving feedback (when and how) are described. Fifth, opportunities of consecutive master programs for the students are named. Concluding remarks close the paper.

The BSc Program

Our BSc MMA program is offered in English only, and in its first three years it attracted 92, 97, and 110 first-semester students, respectively. Since 2015, the admission is limited to 80 students. The students learn 'how markets arise and change, along with people's values and daily needs, in the interweaving of local culture with global flows and structures. The student's understanding of culture and economy and her/his skills in research methodology and project management are to make her/him able to create value for corporations and public organizations, as they enter, operate on and innovate for the

global markets of the future' [11]. The studies comprise four pillars (Table 1):

- Anthropological disciplines
- Business with an anthropological perspective
- Business and economics

- Politics and law

The introductory statistics course is placed in the second semester within the pillar 'Business and economics'. It probably represents the most quantitative part of the whole BSc MMA program. The requirement for enrolment in the program is mathematics B-level.

	Anthropological disciplines	Business with an anthropological perspective	Business and economics	Politics and law
6 th semester	Bachelor project 20 ECTS		Project management in global markets 10 ECTS	
5 th semester	Anthropological field work 10 ECTS	Elective courses 20 ECTS		
4 th semester	Anthropological fieldwork methods 10 ECTS	Global consumer cultures 5 ECTS	Business anthropology 5 ECTS	Perspectives on law and society 10 ECTS
3 rd semester	Philosophy of science 5 ECTS	Principles of management 10 ECTS	Budget and management accounting 5 ECTS	Corporate finance 5 ECTS
2 nd semester	Economic anthropology 5 ECTS	Marketing and strategic communication 10 ECTS	Social and economic statistics 5 ECTS	
1 st semester	Introduction to social anthropology 10 ECTS	Introduction to globalization 5 ECTS	Principles of micro-economics 5 ECTS	Principles of macro-economics 5 ECTS
				Globalization and the transformation of the state 5 ECTS
				Perspectives on development 10 ECTS
				Global organizations 5 ECTS

Table 1: Overview of the courses offered and skills taught in the BSc Market and Management Anthropology program (valid from September 1, 2016)

Curriculum

The course consists of one two-hour teaching session and one two-hour exercise per week and runs for 15 weeks (equivalent to 5 ECTS). The students are supposed to learn basic statistical methodology in order to become capable of gleaning information from statistical charts, performing simple calculations, and summarizing and communicating statistical analysis results to others. Basically, the aim of the course is helping the students to statistical literacy, which is one of sixth key recommendation of the Guidelines for Assessment and Instruction in Statistics Education (GAISE) college report [12,13].

The areas of the study are as follows:

- Data types and data sources
- Population, samples, and random sampling
- Descriptive statistics and graphical presentation of data
- Probability
- Discrete and continuous random variables and their distributions:
 1. Binomial, Poisson
 2. Uniform, Normal
- Sampling distributions
- Confidence intervals
- Hypothesis testing:

1. Parametric methods (one-, two-sample t test, one-way analysis of variance)

2. Nonparametric methods (sign test, Wilcoxon's rank sum test, Wilcoxon's signed rank test, Kruskal-Wallis test)

- Association and correlation:
 1. Chi-square test
 2. Bravais-Pearson and Spearman's rank correlation coefficient
- Linear regression models

It should be mentioned that Garfield and Ahlgren [14] reckoned that ideas of statistical inference can be developed without the basic axioms of probability that discuss intersections, unions, and conditional probability and that these often form an unnecessary stumbling point for students. Redesigning a large introductory course in statistics to incorporate the GAISE college report, Woodard and McGowan [15] removed the basic axioms of probability completely from their course. So, this topic may be dispensable in this course, too.

In order to account for typically smaller sample sizes in anthropological field experiments, a strong focus is put on nonparametric hypothesis testing. The textbook used for the course is *Business Statistics in Practice* by Bowerman et al. [16]. The textbook by Corder and Foreman [17] provides an extensive elaboration of nonparametric statistics for non-statisticians, including

implementations in *SPSS, which may be considered as supplementary material.

Didactical Methods

Another key recommendation of the GAISE college report [12] is to use real data. Immediately before the first teaching session, the students are requested to fill out

- A brief questionnaire in an *Excel sheet with information on gender, age, eye color, body mass index, allergies, playing musical instruments, housing (dormitory, rented flat, own house, own flat), level of mathematics in school (A, B, C), knowledge of programming languages and/or statistics software (e.g. C, C++, Mathematica, Matlab, R, S+, SAS, SPSS, SQL, Stata), preference of examination form (20 min oral vs. 4-hour written), money spent on textbooks this semester, and number of hours slept the night before.
- The 36-Item version of the Survey of Attitudes Towards Statistics (SATS-36) [18,19] which items are grouped into six attitude components:
 1. Affect – student's feelings concerning statistics;
 2. Cognitive competence – student's attitudes about their intellectual knowledge and skills when applied to statistics;
 3. Value – students' attitudes about the usefulness, relevance, and worth of statistics in personal and professional life;
 4. Difficulty – students' attitudes about the difficulty of statistics as a subject;
 5. Interest – students' level of individual interest in statistics;
 6. Effort – amount of work the student expends to learn statistics.

Data from both questionnaires, which the students are very familiar with, are used throughout the course, for instance, when discussing different types of data; population, samples, and random sampling; descriptive statistics and graphical presentation of data; sampling distributions; and exploratory hypothesis testing.

The traditional two times 45-minutes classroom lecture (or 90-minute monologue with a 15-minute break in between) has been criticized for being a relatively poor instructional approach for maintaining student attention [20], and student concentration during lectures begins to decline after 10 to 15 minutes [21]. Interactive lectures supposedly produce educational outcomes superior to those resulting from traditional single-speech lectures as student involvement is remarkably increased [22]. One model for successful learning comprises five overlapping processes [23].

- Wanting to learn – motivation, interest, enthusiasm;
- Needing to learn – seeing the reason for putting in some hard work, gaining a sense of ownership of the intended learning outcomes;
- Learning by doing – practicing, trial and error, learning from mistakes;
- Getting feedback on how the learning is going – other people's reactions, comments, seeing tangible evidence for one's achievements by using what has been learned;
- Making sense of what has been learned – 'digesting' it, getting one's head round it.

Teaching units of 15 to 20 minutes (showing *PowerPoint slides, providing examples on the blackboard or overhead slides) alternate with smaller (group) exercises for the immediate application of terms and methods, for instance:

- Putting data types to variables like gender, height, the use of *Facebook (never, once a day, twice daily and so on);
- Generating sequences of random numbers in a spreadsheet program and making bar charts and/or displaying the distribution of a summary measure in order to visualize the Central Limit Theorem;
- Calculating probabilities with respect to the birthday paradox using the students' own calendar data from *Facebook [24].

Also, live 'experiments' can be done in order to separate the teaching units from each other:

- The students generate random sequences of zeros and ones both by using a spreadsheet program and 'manually'. Two of these are displayed on the blackboard, and the instructor is asked to point out the pure random sequence and the fake random sequence (by counting the longest sequences and judging the likelihood of real versus fake randomness) [25].
- The students show by hand sign how many siblings they have, and an average number of children is calculated (which will be biased and overestimated because only families with at least one child, the respective students, will be involved) and the result compared with Statistics Denmark's [26] register data [25].
- Two students compete against each other shooting baskets (e.g. into a wastepaper basket), and their proportions of success are compared and discussed so that 95% confidence intervals for the difference of two proportions can be motivated [25].

Another valuable source of inspiration for classroom demonstrations and activities emphasizing active learning and critical thinking is *A Guide to Teaching Statistics* by Hulsizer and Woolf [27].

When appropriately placed, it also makes for a nice change to show three-to-five-minute-long videos, for instance:

- 'Stats song - To the left': on the calculation of the area under the standard normal distribution curve [28].
- 'Biologist talks to statistician': power and sample size considerations [29].
- 'It had to be U - the SVD song': though not part of this curriculum, this one is definitely worth mentioning [30].

Exercises and Software

Following the usual practice, this course also includes exercise sessions in which a teaching assistant presents examples of calculations and explains solutions to exercises. The textbook for this course [16] provides a wealth of worked-out examples, and each chapter contains an appendix with detailed instructions on how to use *Excel. However, using a real statistical software package like *Stata is preferable and more appropriate with respect to the GAISE college report [12]. One out of six key recommendations concerns the use of technology for developing a conceptual understanding and analyzing data [15]. The use of *Stata requires at least one dedicated teaching session on the package at the onset of the course, supplementary notes on its use during the course, and time set aside in teaching sessions for discussing the application of it, highlighting both merits and pitfalls (as, for instance, coding and labelling of variables or the use of wide

versus long data format). This will, apparently, also contribute to the variation of teaching techniques, making teaching sessions both more hands-on and versatile. An appropriate textbook on *Stata is, for example, Acock's A Gentle Introduction to Stata [31].

Assessment and Feedback

The exam for this course consists of two parts: a mid-term 2-hour written test and an end-of-term 2-hour written test. Only one mark is given, with the two parts contributing equally to the final mark. Detailed solutions to all questions on both parts are placed online on e-Learn/Blackboard within 24 hours after each test, and the scores (not the marks) are given additionally for the mid-term test, which allows the students to see where they would stand were this test the only basis for their final mark. The purpose of this is to give immediate feedback to the student [23], which is especially useful as the students receive an evaluation while the course is still in progress. The use of assessment to improve and evaluate student learning is also one GAISE key recommendation [12,15]. Figure 1 shows an example of a course schedule and where the exams and feedback are placed.

September 2015		October 2015		November 2015		December 2015	
T 1	Teaching	T 1	Exercises	S 1		T 1	Teaching
W 2		F 2		M 2		W 2	
T 3	Exercises	S 3		T 3	Teaching	T 3	Exercises
F 4		S 4		W 4		F 4	
S 5		M 5		T 5	Exercises	S 5	
S 6		T 6	Teaching	F 6		S 6	
M 7		W 7		S 7		M 7	
T 8	Teaching	T 8	Exercises	S 8		T 8	Teaching
W 9		F 9		M 9		W 9	
T 10	Exercises	S 10		T 10	Teaching	T 10	Exercises
F 11		S 11		W 11		F 11	
S 12		M 12		T 12	Exercises	S 12	
S 13		T 13	Autumn holiday	F 13		S 13	
M 14		W 14		S 14		M 14	End-of-term evaluation
T 15	Teaching	T 15		S 15		T 15	Online feedback
W 16		F 16		M 16		W 16	
T 17	Exercises	S 17		T 17	Teaching	T 17	
F 18		S 18		W 18		F 18	
S 19		M 19		T 19	Exercises	S 19	
S 20		T 20	Teaching	F 20		S 20	
M 21		W 21		S 21		M 21	
T 22	Teaching	T 22	Exercises	S 22		T 22	
W 23		F 23		M 23		W 23	
T 24	Exercises	S 24		T 24	Teaching	T 24	
F 25		S 25		W 25		F 25	
S 26		M 26		T 26	Exercises	S 26	
S 27		T 27	Mid-term evaluation	F 27		S 27	
M 28		W 28	Online feedback	S 28		M 28	
T 29	Teaching	T 29		S 29		T 29	
W 30		F 30		M 30		W 30	
		S 31				T 31	

Figure 1: Example of a course schedule for the fall semester. Teaching sessions (2 h) and exercise sessions (2 h) alternate over a period of 15 weeks, and the mid-term evaluation is placed in week 8 the end-of-term evaluation in week 15.

Future Perspectives

With a complete bachelor degree in Market and Management Anthropology, the student has direct access to the MSc degree program in cultural sociology, MSc in International Security and Law, MA in Journalism as well as to the MSc degree program in MMA at

the University of Southern Denmark. The latter is, though, pending on current accreditation.

Regarding the MSc degree program in MMA, a reasonable and commensurate possibility for further statistical education in this field would be an advanced, elective statistics course on survey sampling and multivariate statistics (including conjoint analysis, e.g. [32]).

Conclusion

Despite the qualitative nature of our BSc degree program in MMA, a basic understanding of what statistics can (and cannot) do is essential. The curriculum of an introductory course in statistics for students in the business anthropology program is almost the same as that for any other introductory statistics course, say, one for economics students. However, a stronger focus on nonparametric techniques is meaningful.

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