The Role of academic committees and collective decision making in improving the teaching and place of statistics in Business schools

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Abstract

Statisticians represent only one among many competing voices in business schools. The author outlines the ways in which changes in technology and pedagogical methods have impacted business statistics curricula. The author responds to the greater time demands these changes have resulted in, by suggesting some changes to the business statistics syllabus. She also suggests that statistics must be emphasized as a research tool across the business curriculum itself. These changes, however, often require a collective decision of the entire business faculty and not merely business statistics professors. They can even require approval by related departments or university-wide joint committees. In order to change the role and place of statistics in the curriculum, then, business statistics faculty must often enlist allies among the different organizational structures both within and even beyond their business school. The paper illustrates these realities with a concrete example: the author's personal experience with curricular revisions as an instructor and member of academic committees.

Keywords: Curricular revisions, business school administration, statistics teaching, business statistics, and statistics education

1. Introduction

Changes in pedagogy and technology and the demands of business and industries have caused business statistics courses to become increasingly demanding. These expectations require curricula to change in terms of added material, and potentially time and resources.

2. Changes and justification for reform

Changes in the last 4 decades in pedagogy, technology and textbooks, as well as the demands of workplace and accreditation agencies resulted in higher expectations of statistics instructors.

2.1 Some of the important changes.

Over the last half a century, a number of changes occurred in statistics education, both at the K-12 level and at the undergraduate level in universities. Some of them are summarized in George Cobb's landmark article, "Teaching Statistics." These include the advent of cheap computing, and changes in statistical practice, and changes at the level of theory. (1) These changes were again heightened by the time of the GAISE report, nearly two decades later. Here we highlight a handful of the changes that have direct impact on business undergraduates. (2)

2.11 Movements in K-12 levels

Business undergraduates, naturally, arrive as an outcome of K-12 education. Two major changes in their preparation over the last quarter century have been the existence of the Quantitative literacy movements (QL) movement and of AP Statistics movement. QL in the seventies and eighties led to the incorporation of statistics into the K-12 math curriculum (3). Mathematics teachers at all levels in schools were trained to meet the new curricular challenge of integrating statistics. Meanwhile, the development of communication skills was encouraged. The author herself directed four teacher enhancement programs in Puerto Rico funded by the National Science Foundation (NSF) and Council of Higher Education (CHE) of Puerto Rico through Eisenhower Grants.

The Advanced Placement Program (APP) is a program run by the College Board and assists in the preparation of high school students for university work. The AP statistics course is part of the APP dynamics in schools. The only academic prerequisite for the course is second year algebra. The curriculum of the AP course has been designed by university professors in conjunction with the College Board. It is meant to be a fully equivalent to an introductory course of undergraduate statistics. (4) "The Partnership for Assessment of Readiness for College and Careers (PARCC) is a consortium of states working together to develop a common set of K-12 assessments in English and math anchored in what it takes to be ready for college and careers." Part of their vision includes creating "Creates high-quality assessments that measure the full range of the Common Core State Standards," (5) which will ultimately have impact on the math curriculum in K-12 education. The standards will "give statistics a larger role in K-12 mathematics education and place more emphasis on statistical problem solving, conceptual understanding, and reasoning," as described in the GAISE Report.

2.12 At the university level.

The project of Guidelines for Assessment and Instruction in Statistics Education (GAISE) created two reports of recommendations for introductory statistics courses (college level) and statistics education in PreK-12 years. (2) The ASA's Curriculum Guidelines for Undergraduate Programs in Statistical Science provides suggestions for the development of curricula for statistics for majors and minors of statistics. (6) ASA recommends a combination of skills that are not exclusively mathematical and be flexible to the institution and must be useful to both students and employers Suggests that skills needed are mathematical, statistical, computational and communicational.

Business statistics textbooks have changed drastically over the last three decades, due to changes in technology as well as the addition of cases and the introduction of additional statistical techniques. The content and organization have changed in many ways. Books published during the 1960's and 1970's made little reference to cases, and certainly not to software packages. The texts were half the size of current textbooks. Many recent textbooks include not only cases but include a CD with datasets for statistical analyses, integrating the usage of at least one statistical software package.

As compared with a half a century ago, the enhanced computer technology and use of statistical software facilitates learning statistical methodology and computations. The personal computer, PC statistical and spreadsheet software, the Internet and the advent of mobile computing radically changed the use of technology in the statistics classroom.

2.2 Impact of changes on the instructors and need for reform.

Three changes have increased the time demands on instructors. The first is the increasing use of statistical software, which can create a need for more classroom time for the teaching of statistical software. A focus on statistics as a research tool can increase professors' workloads because of the addition of research projects to the course requirements. Finally, activity based learning, with its emphasis on statistical thinking, can also take away from traditional course time.

Time is needed for outcomes assessment such as pre-tests and post-tests, many of which are made necessary by the accreditation process, which requires assessment and assurance of learning goals. They often require critical thinking, research, ethics and communication skills to be embedded in the curriculum all through, as well as assessment for assurances of learning. (7) Popularizing and promoting statistics as a research tool across the business curriculum itself means convincing the faculty that use statistics which also needs an effort. All of these require a tremendous effort effort on the part of the instructors.

The challenge lies in the fact that most statistics courses have the same number of contact hours with the students as before. Budget cuts have, in addition, often created a cutback in teaching assistants, "help sessions," etc. In the meantime, valuable as QL and AP have been, their implementation has been far from uniform in all states or even within states. Therefore, it cannot always be said that all students have a significantly greater skill set or knowledge coming into the course.

To make teaching of statistics more effective, therefore, it is necessary either to 1) increase the hours of contact 2) teach less material or 3) increase the previous prerequisite knowledge of the student. Meanwhile, the difficulty of the course for students, and its technological challenges, make additional teaching assistance of particular importance to statistics professors. Greater demands ultimately require more resources of instructor time, teaching assistants, more contact time with students.

3. Curriculum revision in general

The big question is how can an instructor get more time? He cannot do it solo as he is just one of the many competing voices in a business faculty. Reforms and revisions, often, require a collective decision of the statistics instructors and entire business faculty. They may even require approval by related departments or university-wide joint committees as the business statistics courses have pre-requisites and they themselves are a pre-requisite to many business courses.

In order to change the role and place of statistics in the curriculum, the business statistics faculty must often enlist allies among colleagues, faculty committees, and other organizational structures both within and even beyond their business school. Universities have a line of organization for both academics and administration to bring in curricular revisions. The revision may be of a singular course, a few courses, a department's curriculum, or a revision of the entire undergraduate business program.

Changing the syllabus of a single course can be relatively easy if it does not involve its prerequisite courses or if the course is not a service course and is itself a prerequisite to other business courses. In the case of business statistics courses (and depending on how fundamental the re-visioning of statistics is in the overall business program), this reform generally needs to begin at the faculty level, as statistics is a prerequisite to several courses in business curricula.

Martha M. Pointer, associate dean of college of business and technology of East Tennessee University has written regarding her experience in curricular revision, listing a series of considerations with respect to the process, emphasizing "planning, activities, resources and stakeholder considerations and faculty involvement". She also notes the insistence of accreditation agencies on assurance of learning goals and that compromises need to be made as the individual concepts of the ideal program vary among the faculty. (8)

In the University of California, there is a hierarchy of committees, special committees, work groups/academic councils etc and relevant chairs /vicechairs in the academic senate that approve the revision. (9) *Specific* procedures are outlined for how a major curricular reform must progress through the hierarchy. The self study report for the International Assembly for Collegiate Business Education in the Polytechnic University of Puerto Rico School of Management outlines a process for curricular reform: from faculty to a standing curricular committee at the level of the school of management to the Dean, then to a university wide VP for academic affairs, an institution-wide curriculum committee, and if necessary, to the Council of Higher Education, a government organization. (10) A Walton College of Business presentation on large curricular changes illustrates a similar executive process in detail. (11) The University of Hawaii at Hilo provides an excellent diagram of the organizational procedures for curricular reform in a document connected to the accreditation process. (12).

The procedures outlined by these varied universities reveal few differences in the bureaucratic approach to curricular reform. The differences tend to be limited by the respective institutions' organizational structure. The essential procedures for major curricular reforms begin with revision at the departmental or individual faculty level followed by approval at some combination of the levels of campus, academic boards /senate; rector/chancellor, university-wide committees, and finally the regents or the board of the university.

4. Format of Revision in the University of Puerto Rico at Mayagüez

Puerto Rico is a Caribbean island territory of USA with 4 million resident US citizens. The University of Puerto Rico is comprised of eleven campuses. The main campuses are at Río Piedras, and Mayagüez. Curricular revision at the campus level goes finally to the Board of Regents for approval. It must first, however, be approved by the Administrative Board at the campus level. The document detailing these procedures includes eleven articles dealing with titles, legal bases, purpose, application, objectives, definitions, required evaluations, exceptions, and areas of evaluation, transmittal of evaluations of programs, reports of evaluations, norms, interpretation, amendments and approvals. (13) Article 8 is particularly relevant and deals with evaluation of program, due process and reports.

The dean of the relevant faculty or departmental director designates an internal, interdisciplinary committee to evaluate curricular changes. This committee's final report regarding the revision must then be approved by the faculty of the relevant college or academic department. The dean of the individual faculty then submits it to the dean of the academic affairs at the campus level who approves the revision and presents to the Academic Senate, which then appoints subcommittees to study the proposed changes. Assuming a positive recommendation from the subcommittee, the Senate then passes it

on to the chancellor (here called the rector). The campus chancellor then submits this report along with his assessment of the strengths and limitations to the campus' Administrative Board.

The board of the campus sends its recommendations to the larger university system's Vice President dealing with academic affairs for recommendations and review. The president of the University of Puerto Rico system presents his report and assessment to the Board of Regents, who finally approve and formally notify the concerned parties.

It is worth noting that this complex series of steps is part of the "reglamento" or by-laws of the university, and is therefore not optional. The approval comes back to the dean of academic affairs at the campus level which forwards it to the dean of college of business. *All* major curricular reforms must go through this procedure.

5. Authors experience

This paper aspires to show these realities with a concrete example: the author's personal experience with curricular revisions as a faculty member and member of academic committees

5.1 The author's experience and its connection to curricular reform

For the last 25 years, the author has been teaching at the college of business administration in the Mayaguez campus. She has taught courses in business statistics and industrial management both at the graduate and undergraduate levels besides the capstone seminar course in research methods for graduating seniors. The seminar deals with solving a current business problem in an organization. The course has a prerequisite of 2 courses in business statistics of six credits and 12 credits in the students' concentration. It deals with business research methodology, questionnaire design and data analyses and a research report. The statistics courses have prerequisites of mathematics courses.

Early in her career, the author had the opportunity to teach middle and high school mathematics for about three years in a small private school. She experimented integrating statistics in the eighth grade, making research projects part of the assignments. Two of the eight students would ultimately major in statistics at the bachelors level. One of them won the regional science fair for her project in statistics.

The author also worked with students in schools as well as teacher enhancement projects with grants from National Science Foundation (NSF) and Eisenhower Grants sponsored by the Council of Higher Education of Puerto Rico (CHE). Teachers gave workshops to their colleagues and organized statistical fairs in their schools. This experience made the author very committed to statistical education and imparting thinking via research projects.

The author had the opportunity to work in several committees at the College of Business Administration. She was a member of: the consultation committees with mathematics department, committees of the statistics area and industrial management area, the graduate committee, graduate council and the academic committee at the faculty level. As a member of the faculty academic committee she took an active part in the curriculum

revision for the accreditation process for the Association to Advance Collegiate Schools of Business. (AACSB)

5.2 Step by step process of the effort to revise the curriculum

The College of Business Administration's primary strategic objective over the last decade has been AACSB accreditation, which involved a major revision of the entire undergraduate curriculum. The author was the representative for the industrial management area, which includes business statistics courses. This was in itself significant, as it showed that statistics professors were organizationally placed under the department of industrial management, itself one of the six areas of specialization in the College of Business Administration (the other areas are accounting, office administration, human resources, marketing, information systems and finance).

In her experience as a K-12 teacher, and after working with the NSF Teacher Enhancement program and Young Scholars programs, the author became convinced for the positive impact of research projects on students. That is, students gain an appreciation of data and data analysis when they themselves choose a subject, collect data. This gives them an investment in the outcome of their analysis.

Asking undergraduate business statistics students to do research projects, helping formulate a proposal and then discussing the results with them is a very time-taking process. It inevitably means many additional hours of work, outside the classroom. In the introductory course on computers, required of all undergraduate business students, an introduction was offered to Excel, but it did not include instruction on the package's suite of tools for data analysis. Unfortunately, there was very little time available for teaching the use of statistical software even in the introductory statistics course. Students had to learn the packages' use on their own, often with great difficulty. Meanwhile, the analysis of categorical data, though a formal part of the course description, was not emphasized, often only taught at professors' discretion.

During recent years, the author's primary teaching responsibility became the seminar on business research methods. For students in marketing, human resources and industrial management, this is a "capstone" course, meant to integrate their coursework, and a requirement for graduation. The course has a prerequisite of 6 credits of business statistics and 12 credits in the students' concentration. The primary requirement in this course is a research project: students must find a problem from an existing organization and solve it, using the research techniques taught in class.

The bulk of research, particularly in the fields of marketing and human resources, is the design and analysis of questionnaires. Despite the course's prerequisites, students often claimed they had no recollection of statistics and wanted a review. Many professed an unfamiliarity with even the concept of categorical data, what to speak of nonparametric methods. As a result, the professor had to spend valuable class time teaching these methods, even though they are not part of the course's formal description.

The AACSB accrediting process caused the College of Business, as a faculty, to engage in a process of self-study and a total re-evaluation of the curriculum. One of the goals of AACSB is embedding research throughout the curriculum. The AACSB goals and the

prospect of a reform if the entire curriculum itself presented a unique window of opportunity to revise these courses as part. The author pursued two reforms. The first was a revision of the business statistics course: her argument was that the course meet students 4 contact hours a week rather than 3, and that it include a laboratory component in order to provide time for the learning of statistical software packages and guidance in the research process.

For the capstone course, the author proposed that a course purely in research methodology be added as a prerequisite to the seminar where the research process is implemented. About one third of the contents of the textbooks of business research methodology course deals with statistics and applied statistics. The addition of this new course would provide an opportunity for review of statistics, with an emphasis on the methods used in business research in their specialties.

At the college of business, there exist subcommittees for subject areas, an academic committee at the faculty level, a graduate committee, representatives for academic senate and graduate council at the campus level. The steps for the curricular reform at the level of the College of Business precede the steps outlined in section 4. They are as follows:

- Each subdivision of the business faculty reviews its curriculum.
- Committee revises the syllabus and time-frame.
- Committee proposes changes to the Academic Committee of the College of Business.
- Academic Committee submits final revision to the business faculty for approval

The author thus proposed changes in the statistics curriculum first to a committee, which in this case was the committee of professors from in the area of statistics, itself a sub-area in the department of industrial management. Once the professors in this area approved the resolution, however, the proposal went directly to the Academic Committee, which the author was a member of as the sole representative of the field of industrial management. Similarly, as one of the only professors to teach the capstone research methods course over the prior decade, her proposals for the reform of this course also went directly to the Academic Committee. The Academic Committee's effort to revise the overall curriculum took three years. There were no major objections to the proposals in the Academic Committee. The faculty approved the revision, which was then submitted to the Academic Affairs committee for the campus. From there it went to the Academic Senate, Administrative Board, Rector, President, ultimately being approved by the Board of Regents. This approval came despite the added resources required for implementation. The entire process took approximately a decade.

6. Conclusions.

We have established the need for changes in the business statistics curriculum. Statistics must be emphasized as a research tool across the business curriculum itself. It is not only the statistics courses that must change, but also the courses that require and use statistics. These changes, however, often require a collective decision of the entire business faculty and not merely business statistics professors. Alliances need to be made at various levels. Many compromises are needed because all the professors have their own demands and distinctive opinions. As Cobb has noted, "Curriculum reform, like politics, involves an uncertain mix of pragmatism and idealism. To make substantial progress, we need both a vehicle that runs and a distant objective to aim for. We must be realistic in judging how

fast we can change, but at the same time ambitious in our choice of direction and ultimate destination." (14)

To make statistics teaching more effective, alliances needed 1) Between high schools and departments of education at the state level, 2) among all the instructors of business statistics. 3) Between undergraduate business programs and departments that teach pre-requisite courses for business statistics 4) with professors who teach courses for which statistics as a pre- requisite, and 5) administration at all levels.

Actually, the efforts and commitment of senior faculty that teach courses that use statistics and demand reform will be very helpful. Some of the lessons of the author's experience are unique; others can be generalized. Professors with political capital must demonstrate commitment. Credibility, both in terms of one's field and institutional citizenship, counts at the level of department-wide committees and diplomacy matters. Political capital enhances outcomes.

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