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GAISE in Discipline-Specific Courses

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Introduction

While acknowledging the diverse setting, audience, and purpose of introductory courses, existing research assumes that courses offered by different disciplines share the same goals and teaching practices. The purpose of this study is to examine the objectives for student outcomes and pedagogical delivery of introductory statistics courses designed for students in a specific major, providing explicit evidence for this assumption.

The American Statistical Association's *Guidelines for Assessment and Instruction in Statistics Education* (GAISE) are meant to apply to all introductory courses. The College Report's Goals for Students and Recommendations for Teaching are used as a framework for a qualitative study of the way in which introductory courses in various settings deliver instruction.

Research Design

In order to understand the similarities and differences of course objectives and implementation in undergraduate statistics courses across different academic departments, a qualitative investigation of many subtle and inter-related factors is necessary. This project asks questions that need to be answered by findings that compare patterns regardless of instruction (alignment with GAISE) and the influence of individual settings (academic departments).

Data Sources

- Syllabi
- Textbooks
- Assessments
- Observations of class meetings
- Pre- and post-semester interviews with instructors

Participants

Four introductory courses designed for students in a specific major: two social science courses, one required for entrance into business majors, and one for a cluster of STEM majors. All introductory statistics courses offered in Central Virginia were eligible. The only exclusion criterion was a first-time instructor; others were excluded due to logistical matters.

Matrix of Case Descriptions				
	Case A	Case B	Case C	Case D
Class size	200[a]	453[b]	33	68
Pre-requisite	Calculus	Calculus	None	Research Methods
Majors	STEM	Business	Social Science	Social Science
Instructor background	Discipline	Stats	Discipline	Discipline
Instructor experience with the course	~10 years	Twice	~6 years	4 times
Support personnel	3 TAs	8 TAs	1 Tutor	2 TAs
Lab for software use	N	N	Y	Y
Software	Minitab	Excel	SPSS	SPSS
Hours per week	3 - lecture	1 ¼ - lecture 1 ¼ - recitat.	3 - lecture 2 - lab	2 - lecture 2 - lab

Notes: [a] Three sections with approximately 70 student in each. [b] Three sections with approximately 150 students in each.

Data Analysis

Four descriptive case studies are presented through a pattern-matching analysis followed by a cross-case analysis. GAISE provided the initial pattern to frame the case studies. A few other patterns emerged over the course of the project but this presentation focuses on the GAISE goals and recommendations.

Matrix of Goals for Students				
	Case A	Case B	Case C	Case D
First Block: concepts about what information statistical analysis can and cannot provide	uneven	well-aligned	uneven	not evident
Second Block: recognition of appropriate interpretation of results from statistical analysis	potential	aligned	uneven	not evident
Third Block: parts of the process through which statistics works to answer questions	aligned	well-aligned	aligned	aligned
Fourth Block: basic ideas of statistical inference	well-aligned	well-aligned	aligned	well-aligned
Fifth: critical thinking about statistical results	potential	potential	aligned	uneven

Matrix of Recommendations for Teaching				
	Case A	Case B	Case C	Case D
Emphasize statistical literacy and develop statistical thinking	well-aligned	aligned	well-aligned	aligned
Use real data	potential	potential	uneven	potential
Stress conceptual understanding, not merely knowledge of procedures	aligned	aligned	aligned	aligned
Foster active learning in the classroom	uneven	potential	well-aligned	potential
Use technology for developing concepts and analyzing data	potential	well-aligned	aligned	aligned
Use assessments to improve and evaluate student learning	uneven	potential	aligned	potential

Conclusions

All four cases demonstrate many of the goals and teaching strategies recommended by GAISE, even though none of the professors had prior knowledge of the guidelines.

This study supports the GAISE assumption that its goals for students and recommendations for teaching are broad enough to apply to introductory courses in a variety of disciplines.

- Knowing the predispositions of students and strong emphasis on disciplinary relevance.
- Commitment to ensuring that students understand the procedures they carry out, knowing the *why* and the *when* as well as the *what* and the *how*.
- Confidence that *all* of their students have gained useful skepticism as consumers of statistics regardless of their success as producers.

For more details, visit my faculty page at http://bwood-irsc.weebly.com.

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