Restructuring an Elementary Statistics Course for the General Education Audience

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Indiana University Purdue University Fort Wayne
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Outline:

• Context
• Current Course
• Challenges
• Steps to address challenges
Context: Institution

• Commuter campus
  • ≈13,600 undergraduates, 700 graduate students
• Serve northeastern Indiana and surrounding area
• High Access; High percentage of first-generation-in-college students
• Education ranks behind jobs, family

<table>
<thead>
<tr>
<th></th>
<th>2009 NSSE</th>
<th>Freshmen</th>
<th>Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work for pay off campus</td>
<td>IPFW</td>
<td>63%</td>
<td>73%</td>
</tr>
<tr>
<td></td>
<td>national</td>
<td>34%</td>
<td>58%</td>
</tr>
<tr>
<td>Provide care for dependents</td>
<td>IPFW</td>
<td>53%</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>national</td>
<td>31%</td>
<td>42%</td>
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</tbody>
</table>
Area I: Foundational Skills

• To be familiar with the important modes of human thought that are the foundations of science, philosophy, art and social behavior.

• To possess effective foundation skills:
  – Read, write, and speak with comprehension, clarity, and precision.
  – Identify substantive knowledge and disciplinary methods.
  – Develop information literacy skills.
  – *Reason quantitatively (as means of gaining and creating knowledge and drawing reliable conclusions)*

• To demonstrate the ability to think critically and to solve problems using the foundation skills:
  – Evaluate their ideas and the ideas of others based upon disciplined reasoning.
  – Understand the traditions that have formed one’s own and other cultures.
  – Be able to articulate their ideas in appropriate media.
Current Course

STAT 125 Communicating with Statistics

• Audience:
  – Non-math oriented majors (history, dental hygiene, theater, communication, etc.)
  – Prerequisite: equivalent to high school algebra
  – 35 students per section, ≈12 sections per semester
Current Course

• Desired Goals:
  – Quantitative reasoning, critical thinking skills
  – Role of using data to make arguments (evidence-based)
  – Communicating findings to a general audience
  – Relevance: appreciation of field

• In Reality: Cover the Content!
Current Course

Content:
• *Essentials of Statistics*, Triola (Chap. 1 – 8)

Technology:
• Require TI-83 or TI-84 graphing calculator
Current Course

• Pedagogy:
  – Interactive lecture
  – Small groups work on exercises (skill-and-drill)

• Assessments:
  – 3 tests, comprehensive final exam
  – Quizzes and/or homework exercises
  – Project(s) (2 instructors)
Challenges

Student-related:
• Underpreparedness (skills, mindset)
• Math Anxiety
• Misconceptions about Statistics
• Comfort with skill and drill
Challenges

Course-related:
• Compartamentalization versus transferability
• Lack of opportunity to apply concepts learned previously
• Lack of appreciation

Faculty-related:
• Teaching Philosophy
• More part-time faculty – qualifications, buy-in?
Steps Taking:

• Address Underpreparedness
  – New prerequisite course MA 124
  – Placement
  – Skills assessment
  – Regular exercises to develop skills

• Address Math Anxiety, Lack of Confidence
  – Minimize symbols, notation, formulas
  – More low risk assessments
  – Collaborative work
Steps Taking:

• Address Misconceptions
  – Small group discussions
    • Explain to rest of group your understanding of ....
    • Public—selected groups put on board
    • Whole class debrief
  – Critical Thinking Activities
    • Explain, Example, Translate, Illustrate
Steps Taking:

• Address Course-related Challenges: Align Goals, Activities, Assessments
  – Emphasize critical thinking over content-coverage
  – Identify the Big Ideas
    • Balanced definition of statistics
    • Variability
    • Uncertainty
    • Decision Making in face of uncertainty
    • Distribution of a Statistic
    • Randomization
    • Planned Experiments
  – Change pedagogy
Steps Taking:

• Address relevance: choose meaningful applications and activities

• Schedule:
  – First 5-7 weeks: Overview of big ideas
  – Last 8-10 weeks: Activities-based Curriculum
    • Choose a problem: Does texting really have an effect on driving?
    • Discuss design issues
    • Exploration of data (descriptive statistics)
    • Simulation for probability
    • Decision making (inferential statistics)
Steps Taking:

- Probability
- Descriptive Statistics
- Hypothesis Testing
- Study Design
- Estimation

Texting while driving
Steps Taking:

• Pedagogy: Collaborative Learning
  – Individual accountability (quizzes/tests, homework on readings, projects)
  – Small group work
  – Group accountability (reporting back to class, presentation of results, making public)
  – Whole class discussions
  – Reflections on what they have learned
Where do we go from here?

- Pilot activities in the summer
- Start implementing changes in two sections of course in fall
- Collect data on student performance, student satisfaction, and student attitudes
- Revise based on feedback, data
- Faculty Development Sessions for Part-time