HARVARD | BUSINESS | SCHOOL

Teaching Quantitative Material

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Core Principles

Teaching quantitative material with the case method challenges students to build their capabilities in identifying and solving problems embedded in context, think critically about approaches and assumptions, and grapple with the managerial implications of an analysis. Although case instructors exhibit a variety of styles and approaches in teaching quantitative material, many incorporate the following principles:

1. **View quant segments as "workshops"—not polished performances**. Approach quant segments as focused explorations of the numbers that provide an opportunity for students to: develop competencies in quantitative analysis, learn to compare and contrast different approaches, and develop skill and comfort in communicating technical material. In practice, this can involve:
    - *Include time for student questions and comprehension checks*: Budgeting time for questions and real-time learning, rather than trying to rush through the calculations as quickly as possible (especially with new material or early in the term). A correct answer isn't always a green light to rocket ahead: even here, consider taking time to delve into the intuition behind the numbers.
    - *Embrace learning opportunities*: Embracing mistakes, "failures," and non-standard approaches, which can provide powerful learning opportunities when examined respectfully.
    - *Inquire into process and application*: Including questions and scenarios that challenge students to apply the material in different contexts, in order to build situational awareness and process fluency.

2. **Focus on process fluency as well as results.** Right answers are important, but so is an informed process. Create opportunities for learning on multiple levels by facilitating a discussion that goes beyond content-delivery. Incorporate questions that encourage:
    - *Process awareness*: What data would help us solve this problem? How would you analyze it? What would you expect to find? What analysis did you run—why? What assumptions did you make? How did you set up the calculation? How did you account for *x* factor?
    - *Sensitivity analysis and boundary conditions:* How precise an answer do we need? What range would you expect given the industry or circumstance? What would happen if we changed the variables or assumptions in a particular way? How would the numbers change if situation *y* manifested itself? Why do it *x* way and not *y* way?
    - *Interpretive skills:* What does this tell you? Relative to industry standards is this good, bad, high or low? How does this inform your decision? How would you communicate this to stakeholders?

3. **Be conscious of participation, including how you use experts and novices.** Be aware that your students most likely represent a range of comfort and exposure to quantitative analysis. No one should be exempt from a quant discussion, but you may need to manage students differently, depending on their comfort with the numbers.
    - *Experts:* Class experts may be adept at running a particular analysis; calling on them to walk through calculations can sometimes save time. However, be aware that not every expert is equally adept at explaining the intuition behind the mechanics, and in some cases they may offer comments that are technically impressive but outside the scope of the case.
    - *Novices:* Cognitively, students new to a particular analysis rely on memorization until the material is engrained by repetition and frequent practice. Be aware that working with novices may require slowing down, pausing to ask definitional questions, and creating learning opportunities out of errors and misapplications.

Pre-Class Preparation

As with any discussion element, thorough preparation of the material (for example knowing where to go in the case and exhibits to access key data) and planning the boards and any other classroom technology, is essential. Preparation for quant discussions should enable you to address each of the following questions:

1. Which analyses or quantitative tools, if covered, will advance my students' decision-making abilities?
2. What critical insights, concepts, and techniques need to emerge? How will I surface (or present) them?
3. What stumbling blocks or common errors might appear in class? What can students learn from them?
4. What relevance does the analysis have—to the case, and more broadly, to the module and the course?
5. How will I transition into and out of the quantitative segment?
6. Throughout the course, am I teaching in ways that build my students' quantitative intuition and fluency?

In-Class Facilitation

As an instructor, it's helpful to think about quant-heavy segments as fulfilling three purposes: 1) to increase students' comfort and intuition around the numbers, 2) to demonstrate the role of numbers and quant analyses in decision-making, and 3) to come up with answers pertinent to a problem or situation embedded in the case. Structuring quantitative segments with these goals in mind can help the class avoid falling into "numbers for numbers' sake."

Don't underestimate the importance of framing quant segments before launching into the numbers—consider transitioning into the analysis itself with a statement of purpose or roadmap to help structure the discussion. Framing the quant segments can be particularly important early in the term, or when introducing new concepts. Pre-class planning should also include some thought into board-setup, including pre-boarding (if any), and student selection.

Once you've introduced the quant segment, the following framework provides a starting point for organizing and guiding questions for students. Each component allows opportunities for you to intervene to punctuate a student comment, solicit questions, summarize, or otherwise interject to advance student learning.

Discussion Component	**Illustrative Questions for Students**	**What to write on the board**
Set-up	-How did you think about or approach this problem? -Did others approach it differently?	A few words about the broad approach
Mechanics	Stage 1 -What formulas, processes, etc. did you use? Why? -What were your key assumptions? -Where did you go for data? Stage 2 -What numbers did you plug in? What were your results? -Are there questions? *Or*, Any questions for [student]?	Stage 1 -The equation (no numbers) Stage 2 -Numbers that plug into the equation, including units
Implications	-What do the results mean? What are the implications? -What happens if we change assumption x, y, z? -Did anyone approach [or interpret] this differently?	Board work optional