

A Brief Analysis on an Experimentation-Driven Undergraduate

Linear Algebra Instruction

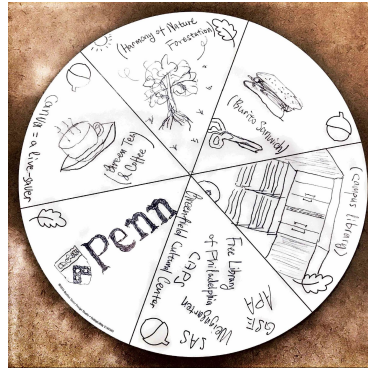
(Sun, D., Mar. 2024)



- Describe experience in teaching, tutoring and designing computer programming experiments for a linear algebra course at Stern College for Women at Yeshiva University during Spring 2024 semester
- Observe and discuss characteristics that were identified from my interactions with students
- Reflect on challenges and propose plans (optional)

(Left image credited Wikipedia - 245 Lexington Avenue, known familiarly as "the Stern Building," is a campus hub, including a beit midrash/study hall, cafeteria, library, and science labs.)

About Me (Currently of M.A. in Mathematics Program at Yeshiva)



Fall 2023-now: Mathematics

Reading/Writing “Literacy Education” at the University of Pennsylvania (2021-22)

Computing Science: Computer Graphics, and Image Analysis and Computational Photography/Geometry Algorithms (2014-18)

Engineering Student in College (pre-2014)



Recall: Women's Colleges

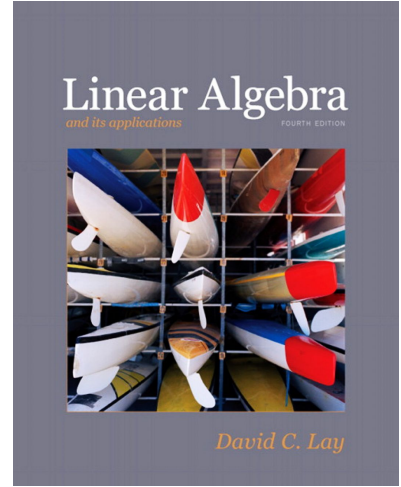
From *Women's Colleges in the United States* (Harwarth, I. et al., 1997)

- Definition of a Women's College: ... with an “institutional mission primarily related to promoting and expanding educational opportunities for women.”
- Women's colleges began with some developments of private secondary schools for young women, or “seminaries,” during the early 1800s.
- Founding of women's colleges during the mid- and late-19th century “in response to a need for advanced education for women at a time when they were not admitted to most institutions of higher education.”
- Challenges faced as more colleges became coeducational since 1960s-1970s, when (i) several all-male schools began accepting women, and (ii) many women's colleges either became coeducational themselves, or got merged with all-male or co-ed. institutions (and some others stop opening/closed their doors).

First Day's Logistics..

Logistics/Agenda:

- Test proficiency of technology and run diagnostics (e.g., white board, marker pen, any HDMI cables to connect to monitor display, etc.)
- Inform that I will be here for recitation meanwhile the instructor cannot make it at this hour on Tuesdays..
- Oversee upcoming recitations this Spring
- Introduce "Lab 1" material with the audience to explore with
- Given sufficient time, plan on watching video "The History of Linear Algebra"
- Tentatively introduce some optional readings (under "Week 2")



Linear Algebra [recitation]

"Systems" of Linear Equations [ch.1] [Linear Systems & Matrices, 'Elementary' Row Operations & Echelon Form & Row Reduction Algorithm, ..](#)

Matrix Algebra [ch.2]

Determinants [ch.3]

Vector Spaces [ch.4]

Eigenvalues/Eigenvectors [ch.5]

Orthogonality, Least Squares [ch.6]

About Recitation

recitāre (Latin, present infinitive) means

- to read aloud, recite, or
- to appoint, name (in writing)

In classes involving mathematics and engineering, a recitation is often used as the **vehicle to perform derivations** or **solve problems similar to those assigned** to the students (Seita, D., 2018) – from Wikipedia

“Sometimes a course may require a recitation, which is a companion section in which the instructor or a teaching assistant may collect homework or discussion questions. This is particularly common in language courses. If a recitation is a part of the course, it is a required section and a student must register for both lecture and recitation to be enrolled in the course.” – International Exchanges/Pitt Global at University of Pittsburgh, online resource at

<https://internationalexchanges.pitt.edu/content/recitation-rec>

Observation One: Attendance

Week 1: no data

Week 2: 20+ students

Week 3: ~5 students

Week 4: ~3 students

Week 5: ~3 students

Week 6: 6 students

Week 7: 3 students

...

I also found that nearly 1 student attended every time/week, 2 students attended most of the time, and apparently many did not attend since first appearance. Overall, this makes sense considering the voluntary (optional) nature of the recitation.

Observation Two: Group Tendency Toward Predicate-Related Questions

My personal analysis on students/audience's questions in class:

1. More "Why" Questions than "What" Questions
2. Philosophical Questions > Specifics or Result/Entity-Related Questions
3. Passive Questions > Progressive Questioning (esp. during my recitations)

e.g., Me: "I found some (a few) similar problems."

Student: "For us to practice?"

Me: "Yes, and there aren't many of them."

Student: "Is the answer also on there?"

Me: "Answer is not yet – I'm thinking about talking about it next Tuesday."

note that here above the student wasn't asking materials, but instead confirming the availability of answer keys.

4. More resistance questions (e.g. why-do-we-do-this); relatively few "ah-ha moments"

Example of Contextualization: About “Pivot”

I think there is a certain amount of difference between the semantics used in the mathematical topic, versus what it is being used in other contexts in English. Therefore I once used the following quote to provide a different context for the word “pivot,”

"My hand is to me what your hearing and sight together are to you. In large measure we travel the same highways, read the same books, speak the same language, yet our experiences are different. All my comings and goings turn on the hand as on a *pivot*. It is the hand that binds me to the world of men and women. The hand is my feeler with which I reach through isolation and darkness and seize every pleasure, every activity that my fingers encounter."

— from essay ‘The Seeing Hand,’ *The World I Live In* (Keller, H., 1908)

noun

the central point, pin, or shaft on which a mechanism turns or oscillates.