

# A Mathematical-Thinking University Classroom

Directed Reading Program in Mathematics

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## Background

Peter Liljedahl is a mathematics professor who wrote *Building Thinking Classrooms*, which is intended for K-12 teachers to help create math classrooms that promote critical thinking and problem solving.

## Problem

Mathematical classrooms are meant to promote thinking and learning from students. Yet, many students in K-12 classrooms are not actively thinking on their own and are instead "mimicking, faking, stalling, or slacking." In introductory university math classes, I observed the same problems occurring. Many students were only writing down information or memorizing formulas, instead of processing and thinking about the mathematical concepts on their own.

## Observation

Through the observation of multiple MAT 21 courses, the following were the top student behaviors seen in a 50-minute lecture and discussion section:

- Note-taking
  - Many were actively taking notes, but were playing catch up with the lecturer.
- Falling asleep
- Staring off

The formats of the material being presented were:

- Lecture style
- Note taking on the whiteboard
- Walking around the classroom
- Real life applications
- Step-by-step format of how to solve the type of problem



## Class Example

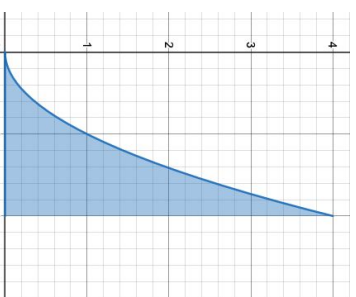
**Context:** This example will introduce students to approximating the area of shaded regions, leading to the introduction of integrals.

**Problem:** How can we approximate the area of the shaded region?

$$y = x^2$$

$$0 \leq x \leq 2$$

$$0 \leq y \leq 4$$

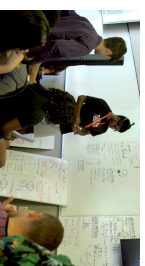


**Set up:**

Give students the opportunity to try solve the problem in randomized groups, then give students the chance to share solutions. Use whiteboards to explain to each other.

**Expected Goals:**

- Students will come up with different solutions, some of which can include using shapes, endpoints, etc.
- The collaboration between the students is intended to promote sharing ideas and helping build knowledge off each other, along with presenting and explaining their thought process.



## A Thinking Classroom

- The ideal classroom that promotes thinking should have:
- Furniture placement that allows for thinking to occur
    - Vertical Individual Whiteboards
    - De-centered classrooms
  - Highly engaging thinking tasks
  - Collaboration within and between groups
  - Mobilized knowledge



## Limitations

- Quarter System:
  - 50-minute lectures
  - 10 weeks
- Classrooms:
  - Need to account for large groups of students
- Book addresses K-12:
  - More Research is needed within the university level classrooms

## References

Liljedahl, Peter. *Building thinking classrooms in mathematics, grades K-12: 14 teaching practices for enhancing learning*. Corwin Press, 2020.  
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