Engaging Students via Active Learning

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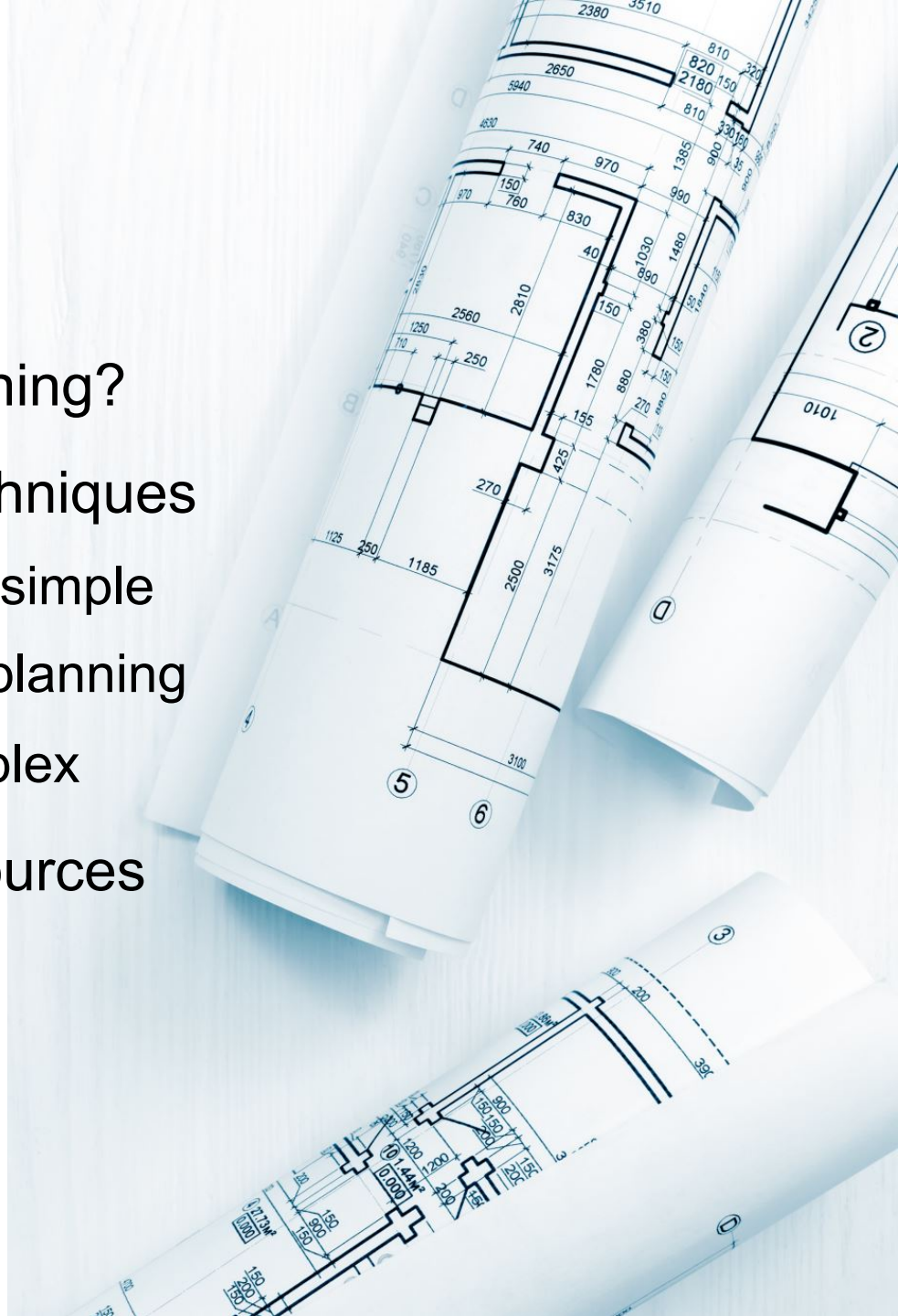
Session Outline

- What is Active Learning?
- Active Learning Techniques
  - Part 1: Quick and simple
  - Part 2: Moderate planning
  - Part 3: More complex
- Follow-up and Resources



Learning Outcomes

- By the end of this session, you will be able to:
  - Understand why active learning is important
  - Identify different active learning techniques and suitable situations to use them in
  - Feel more comfortable implementing active learning in your own teaching

What is Active Learning?

Active Learning

- Any educational method in which **all students** are asked to engage in the learning process while **in class**

- Students are not passively receiving information
- Students are participating in their own learning
- Learning as a process, not a product

Active Learning

Active Learning Overview

- Lots of research and evidence that students retain more information and perform better on exams when active learning is used in the classroom

- **YOU** also have to be active
- Might require more instructor preparation or involvement than traditional lecture
- Potentially “cover less material”
- Can incorporate both lecture and active learning
- *Purpose, Process, Product*

Part 1

Quick and Simple Techniques:

Brainstorming
Think-Pair-Share
Minute Paper

Brainstorming

- Limited preparation necessary
- Can be used to assess prior knowledge
- Easy way to get students talking if they're quiet or disengaged
- **How it works:**
  - Ask students a question
  - Students call out answers
  - Collect answers
- Can adjust for any length of time
- **Important**: acknowledge answers

Brainstorming

Example:

What active learning strategies have you experienced as a student?

- Collect answers via
  - **In-person**: white board, power point slides
  - **Online**: chat box, screen shared document

Think-Pair-Share

- Useful if faced with awkward silence after asking a question of the class
- **How it works:**
  - Ask students a question
  - Give students time to *think*/write
  - Students *pair* with a neighbor and discuss responses
  - Students *share* their discussion with the class
- Set **timing guidelines**
  - E.g. think for 30 seconds, pair for 2 minutes

Think-Pair-Share

Example:

What active learning strategies have you experienced as a student?

- Collect answers via
  - **In-person**: class discussion
  - **Online**: chat box (“flood the chat”), DM, breakout rooms

Minute Paper

- Assessment to determine how students are learning
- Done at the end of the class period or unit
- **How it works:**
  - Ask students a question that prompts them to reflect on the lesson
  - Give students some time to write a response
- Avoid yes/no questions
- Goal is to get students to reflect on the content of the lesson

Minute Paper

Example:

What are the two most significant things you learned today?

What is one item you still have a question about?

Part 2

Moderate Planning Techniques

Clicker Questions:
One-Stage
Two-Stage

Clicker Questions: One Stage

- Use to assess student prior knowledge, misconceptions, and current understanding
- Each student is required to respond
- **How it works:**
  - Ask students a question and have them select from a list of possible answers
  - Each student uses a “clicker” to select an answer
  - Instructor receives answers and reviews responses
  - Instructor can provide further explanation on answers as needed
- Immediate feedback

Clicker Questions: One Stage

Example:

"Quick and simple" active learning techniques include

a. Think-pair-share
b. Minute Paper
c. Both a and b
d. None of the above

Clicker Questions: Two Stage

- Incorporate **peer instruction**
- Same set-up as one-stage, but now students discuss and re-vote
- **How it works:**
  - Ask students a question and have them select from a list of possible answers
  - Each student uses a “clicker” to select an answer
  - Instructor receives answers and assesses class understanding
  - Students discuss their choices with each other
  - Students re-select an answer
  - Instructor can provide further explanation on answers as needed

Clicker Questions: Two Stage

- Number of students who answer correctly usually increases substantially in the second round
- Initial percent correct between 30% and 70%
- **Benefits**
  - Requires students to take action to correct wrong answers
  - Students may better understand sources of misconceptions

Clicker Questions

Technologies

- In person
  - Labeled/colored paper cards
  - Fingers on chest
  - Clicker devices
  - Phone apps, e.g. *Plickers* or *Poll Everywhere*
- Online
  - Computer and phone apps, e.g. *Poll Everywhere*
  - Integrated platform software, e.g. *Zoom Polling*

Clicker Questions

Things to Consider

- Types of questions
  - Conceptual: answer in a minute or less
  - Solve: need a few minutes to work out
- Class size
- Time to revisit topics as needed
- Cost of technology and time for testing

Part 3

More Complex Techniques

Group Problem Solving
Extended Problem Solving

Group Problem Solving

- Impactful way to hold class discussions and promote peer instruction
- Open-ended so requires **clear instruction** and **follow-up**
- **How it works:**
  - Split students into small groups (3-4 students)
  - Students work on some question, problem, or task
  - Record thinking reasoning, steps, and ideas on the board
- **In-person:** Use wall-mounted or lap whiteboards
- **Online:** use breakout rooms and shared document or digital whiteboard

Extended Problem Solving

- Example of a “flipped classroom”
- Recitation or discussion sections in large classes
- Relies upon peer teaching
- **How it works:**
  - Same as above, but the majority of the class might be spent this way
- **Important**: instructor and TAs circulate and interact with different student groups
- Instructor follow up or review student work to ensure all students engaged and learning

Extended Problem Solving

Things to Consider

- Ensure everyone active and participating!
- Group size: 3-4 students per group suggested
- Group roles
  - Manager, Recorder, Presenter, Facilitator
- Whether to change group members or not throughout term

Final Thoughts

Active Learning: Instructor's Role

Instructor moves from being the **authority** to being a **guide**

Next Steps

- Please visit https://teach.caltech.edu for more resources on teaching remotely
- Visit https://learn.caltech.edu for more resources on learning remotely