

Activity 1

Thinking-Aloud Pair Problem Solving

Pre-Class Assignment

- Read section **10.3 Pool Boiling**, “Fundamentals of Heat and Mass Transfer”, Bergman, et al, 7th Ed.
- Give examples of the three main forms of pool boiling.
- Identify a situation where you have seen or experienced a form of pool boiling.

Materials for class: Handout of the modes of pool boiling and provide a typical boiling curve with labeled points.

In-Class Activity

Explain the process and why this type of learning is effective. Emphasize that students learn more when they are actively engaged in the process of learning.

Spend 5 minutes reviewing the handout individually. In pairs, have students take turns answering the questions below alternating between the speaker and the listener. After each question, the instructor solicits input from the listeners to answer the question. Once the instructor assesses and if necessary discusses the appropriate answer to the question, the process repeats for the next question. Instructor observes and interacts with students during problem solving and student discussions.

Questions for problem solving

- What is excess temperature? What is excess temperature “in excess of”?
- Why is there an excess temperature?
- What mode of heat transfer, radiation, convection or conduction, dominates when boiling water?
- What is significant about the maximum heat flux q_s ’?
- What physically happens when the excess temperature increases beyond that which is necessary to reach maximum q_s ’?
- Additional short questions...

Activity 2

Think-Pair-Share

Pre-Class Assignment

- Read section **10.4 Pool Boiling Correlation**, “Fundamentals of Heat and Mass Transfer”, Bergman, et al, 7th Ed.
- Identify the terms in Eqn. 10.5.

Materials for class: Handout of pool boiling correlations, table of $C_{s,f}$ values, max and min heat flux correlations, and film pool boiling.

In-Class Activity

Explain the process and the student roles for this activity. Emphasize that this is an effective way to learn.

Work through a complex problem by dividing the problem into smaller sub-problems and using the Think-Pair-Share technique step through questions and concepts. Instructor will read a question. Students have 30-seconds to come up with an appropriate response. After 30-seconds, one of the students in each pair will share their response with the other student. After 2 or 3 minutes, student pairs will coordinate with a neighboring student pair and discuss their responses. Student pairs will alternate roles of speaker and listener for each question. The whole class will get involved with feedback from the instructor to answer the question completely before moving on to the next question. Instructor observes and interacts with student pairs during the sharing time.

- Example Problem
 - The bottom of a copper pan, 0.3 m in diameter, is maintained at 118C by an electric heater. The pan contains water at atmospheric pressure.
- Think-Pair-Share Questions
 - What is the excess temperature?
 - What type of boiling mode or regime exists?
 - What is the term h_{fg} ? How is it related to boiling?
 - What is the term $C_{s,f}$? How is it determined?
 - What is the heat transfer rate to the water?
 - What is the rate of evaporation for the water?