

ABSTRACT

- Problem: Traditional paper exams provide a single opportunity for students to demonstrate their knowledge and skills

- You can only write one answer

- Information is unidirectional

- There is usually no way to understand the student's thought process

- The format is not typically administered outside of academia

- Solution: Assess students via a dialogue with the professor

- Incorrect responses and unsound logic may be immediately corrected

- Professors have a better idea of a student's understanding of the material (i.e. do they really "know it" or is it simply luck)

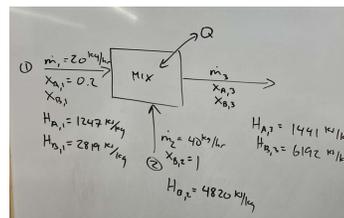
- Improves presentation skills and ability of student to "think on their feet", which is more appropriate for professional practice

IMPLEMENTATION

- Method I (Thermo II – Remote – n=5)
- Generate and present a slide deck of the material for the section
- Students are allowed to have notes
- Camera must be turned on
- No third party help (no phones, recordings, electronic devices, screen sharing, etc.)

- Method II (MEBs – In-Person – n=5)
- Generate and present a slide deck of the material for the section
- Professor gives a problem to a student and the student is required to work up a solution at the board
- You may have the textbook for reference
- Only the student and professor are in the room

EXAMPLES (From MEBs)



Material Balance

$$\dot{m}_1 + \dot{m}_2 = \dot{m}_3$$

$$20 + 40 = \dot{m}_3$$

$$\dot{m}_3 = 60 \text{ kg/hr}$$

$$\dot{m}_1 x_{A1} = \dot{m}_3 x_{A3}$$

$$(20 \text{ kg/hr})(0.2) = (60 \text{ kg/hr})x_{A3}$$

$$4 = (60 \text{ kg/hr})x_{A3}$$

$$x_{A3} = 0.067$$

Energy Balance:

$$Q + \dot{H}_1 = \dot{H}_2 + \dot{H}_3$$

$$Q + \dot{H}_1 = \dot{H}_2 + \dot{H}_3$$

$$Q = \dot{H}_2 - \dot{H}_1 - \dot{H}_3$$

$$Q = (60 \text{ kg/hr})[(1441 \text{ kJ/kg} \times 0.067) + (6192 \text{ kJ/kg} \times 0.933)] - [(20 \text{ kg/hr})(1247 \text{ kJ/kg} \times 0.2) + (40 \text{ kg/hr})(2819 \text{ kJ/kg} \times 0.2)]$$

$$Q = (60 \text{ kg/hr})(4820 \text{ kJ/kg})(1)$$

RUBRIC

	Excellent	Above Average	Adequate	Poor
Content (Methods I and II)	Clear mastery of the concepts. All questions were answered correctly. (7 points)	Mastery of most concepts, but there are some points of misunderstanding. Most questions were answered correctly. (5 points)	Mastery of some concepts, but there are several points of misunderstanding. Most questions were not answered correctly. (3 points)	There are many points of misunderstanding. No questions were answered correctly. (0 points)
Presentation (Method I)	Slides are clear, numbered, visually pleasing, and well-organized (3 points)	Slides are mostly clear, may not be numbered, but some portions are disorganized (2 points)	Slides are somewhat clear, may not be numbered, but there were many portions disorganized (1 point)	Slides are not clear, not numbered, very disorganized (0 points)
Presentation (Method II)	Diagram is correctly drawn, and the solution is ordered left to right, top to bottom (3 points)	There is a minor error in the diagram, or the solution is presented in a disorganized way (2 points)	There are a few errors in the diagram, or the solution is presented in a very disorganized way (1 point)	The diagram is not applicable to the problem, or the solution is not organized at all (0 points)

STUDENT REACTIONS

(From Thermo II – 2 of 5 responses)

Student 1: Very weird at first

Student 2: I thought the oral exam was very fair in comparison to a real exam. It required a lot of preparation, and it's a good representation of whether you know the material or not. It's obviously a little tough and strange considering it's so different and something we're not used to. I hadn't done a PowerPoint up until now in college, but found it to not be that bad

Student 3: I would rather have an exam. It is not like we can master all the concepts in such a little amount of time.

(From MEBs – 2 of 4 responses)

Student 1: I loved doing the oral exam. It made it very easy to think in a logical way and reduced the panic of paper exams.

Student 2: The oral exam did test the knowledge one has instead of just being given a paper test to just memorize how a problem should be done

ISSUES

1) Scale

- Implementation is difficult for large class sizes

- Assuming 180 min to generate an traditional exam, 75 min to proctor, and 20 min to grade each, vs 45 min for each oral exam, **the breakeven is 10 students**

2) Fear

- Students were initially afraid of presenting by themselves in front of a professor.

- Not presenting in front of peers helps

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