Homework presentations for constructing and critiquing arguments

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My goal

- To share how I have used homework problems to **EASE** prospective teachers into constructing viable arguments and critiquing the reasoning of others.
My motivation

• When I observed my students solving problems in small groups, I noticed:
  – Awkward silence (individual work)
  – Hesitation to participate
  – Imposition

• Students were not even trying to come to a consensus on the approach/process/solution/answer to solve a problem – in general they were not listening each other!

• My assumptions:
  – Students did not know what was expected of them
  – Students did not know how to talk about solving a mathematical problem in small groups.
The setting

- Face-to-face class that meets twice a week for 75 minutes
- Class size is no more than 24 students
- Mostly female student (4 men)
- Ages ranged from about 18 to about 60
- Prerequisite is college algebra or equivalent
Homework process

• Before class:
  – Do some of the problems from the previous class
  – Read next section before class
  – Do some practice exercises or problems from the next section

• In class:
  – In small groups (3 or 4) share your solutions
  – One person from each group presents one problem (did not do them all)
Presentation Dynamics: Wearing three hats

• Child’s hat
  – Students may be playful and pretend they are grade school students, while “the teacher” explains how to solve a problem, and ask appropriate questions

• College student’s hat
  – Students ask questions/make comments
  – Students critique the presentation (more on next slide) mostly on content

• Teacher colleagues’ hat
  – Students imagine being coworkers during a peer classroom observation
  – Comments are made from a more pedagogical perspective
Presentation Dynamics: Wearing the College Student Hat

Being civil → offer opening expressions

• “I wonder how you went from step C to step D”
• “Would you care to repeat that last explanation?”
• “It seems to me that the computation of ... is not correct; I did ___ and got ___. Would you mind double checking that operation? I will do the same with mine.
• “I am afraid the method you propose does not work BECAUSE ____.”
• “I see your point, but it seems to me that you are {overlooking, not taking into account, not considering, ...}____”
Problem example 1

• Matteo is 4 feet 3 inches tall. Nico is 3 feet 11 inches tall. How much taller is Matteo than Nico? (3.3 # 8)
Solve this problem in two different ways.
Problem example 2

• Is $0 \div 3$ defined or not? Explain your reasoning.
Is $3 \div 0$ defined or not? Explain your reasoning.
Summarize two different explanations.
(6.1 # 6)
Outcome

• Most students were doing the problems before class!
• Most students were more willing to volunteer their solutions before the whole class (after they had discussed it in small groups).
• More students were participating in the small group discussions.
• More students were willing to engage in critiquing and in voicing arguments to solve mathematical problems.
References

• Beckman, S., Mathematics for Elementary Teachers, 2012, 4\textsuperscript{th} Ed. Pearson.