

STEM - FIT

FORUM FOR INCLUSIVE TEACHING

03/08/2021

CONCEPT

Cognitive Presence, introduced in STEM-FIT edition 8 as a component of the Community of Inquiry (CoI) Framework, relates to curricular activities that allow students to construct their own knowledge through discussion, reflection, problem-solving, and other deep-learning tasks. Below we feature the work of Dr. Topaz Wiscons from the Department of Mathematics & Statistics, as she uses discussions following problem-solving activities to promote cognitive presence through her math instruction.

TIPS AND TOOLS

In Math 35: Linear Algebra and Math 107B: Fundamental Mathematical Concepts, Dr. Wiscons couples weekly problem-solving with peer review and discussion using the Canvas Discussions feature.

For this assignment, students are:

- Assigned 10-12 problems to solve independently.
- Asked to choose two problem/solution sets to post in the discussion board thread.
- Placed in small groups of 5-6 to review the work of their peers and compare it with their own work.
- Asked to submit two meaningful responses that further the discussion around the problem/solution sets posted by their groupmates.
- Provided a list of suggested “sentence stems” or “talk moves” to use when constructing their response (see Resources for the link to this list).

The result is a discussion board that contains student solutions to (ideally) all problems in the assignment. This activity gives students the opportunity to view the mathematical thinking of their peers, engage with different methods of solution, check their own work, and engage in discussion around the problem sets. Providing a list of “talk moves” gives all students access to professional language that leads to deep thinking and rich conversations. Furthermore, students can view the discussions before posting, which assists those who may be struggling with a particular problem. These are low-stakes assignments that receive full credit for genuine attempts at a solution and thoughtful responses to peers.

Handwritten student work on grid paper showing row reduction steps for a system of linear equations. The work includes matrices, row operations like $-r_2 + r_3 \rightarrow r_3$ and $\frac{1}{2}r_3 \rightarrow r_3$, and solving for variables x_1, x_2, x_3 , and x_4 . It concludes with "Thus, this set is linearly dependent" and a final matrix equation.

Nov 10, 2020

Again, very well organized and easy to understand. I do have a few questions, though. Why was it necessary to swap rows 1 and 2 in 13c? I thought that was only allowed when finding determinant, which becomes negative when rows or columns are swapped. As for 15b, it was flawless. Both are correct, but I would just like some explanation as to why you decided to swap in the matrix of 13c.

Nov 10, 2020

Hi there!

You can switch rows when finding Reduced Echelon Form or Row Reduced Echelon Form since it is an elementary row operation. I switched the rows in order to move the 1 in row 2 to row 1. This way we could begin the process of turning the matrix into RREF.

Nov 10, 2020

Thank you for the explanation! I actually didn't remember this until you said it so thank you for the reminder. I'll try to apply it to my own work as well.

This activity also promotes social presence, as each time a new group is formed, students introduce themselves with the response to a prompt asking for them to reveal something about themselves, such as their “favorite snack food” or “superhero power.” Dr. Wiscons has found that these weekly discussions have succeeded in building community and a support structure as students navigate distance learning and challenging times. The example below illustrates the encouragement and support students are giving each other through this activity.

Tuesday

Sorry about not participating in the discussions until now. I've been going through a lot and I'm finally back.

Math 35-01

8a) $\begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} = A$

9a) $\begin{vmatrix} 1 & 2 \\ 2 & 4 \end{vmatrix} = A$

$|A| = a_{11}(a_{22}) - a_{12}(a_{21})$

$= 2(2) - (-1)(3)$

$= 4 + 3$

$= 7$

$|A| = a_{11}(a_{22}) - a_{12}(a_{21})$

$= 1(4) - 2(2)$

$= 4 - 4$

$= 0$

Tuesday

Hi [redacted]! No worries, I was struggling at the beginning of this semester too and needed to take some time for myself. Self-care is super important :) Your work is really clear too, I got the same answer as you!

RESOURCES

Talk moves for mathematics can be found at <http://teach.conceptuamath.com/talk-moves#justify>.

Please see the STEM-FIT Canvas Course for the detailed assignment instructions and more examples of student work. <https://csus.instructure.com/courses/71792>