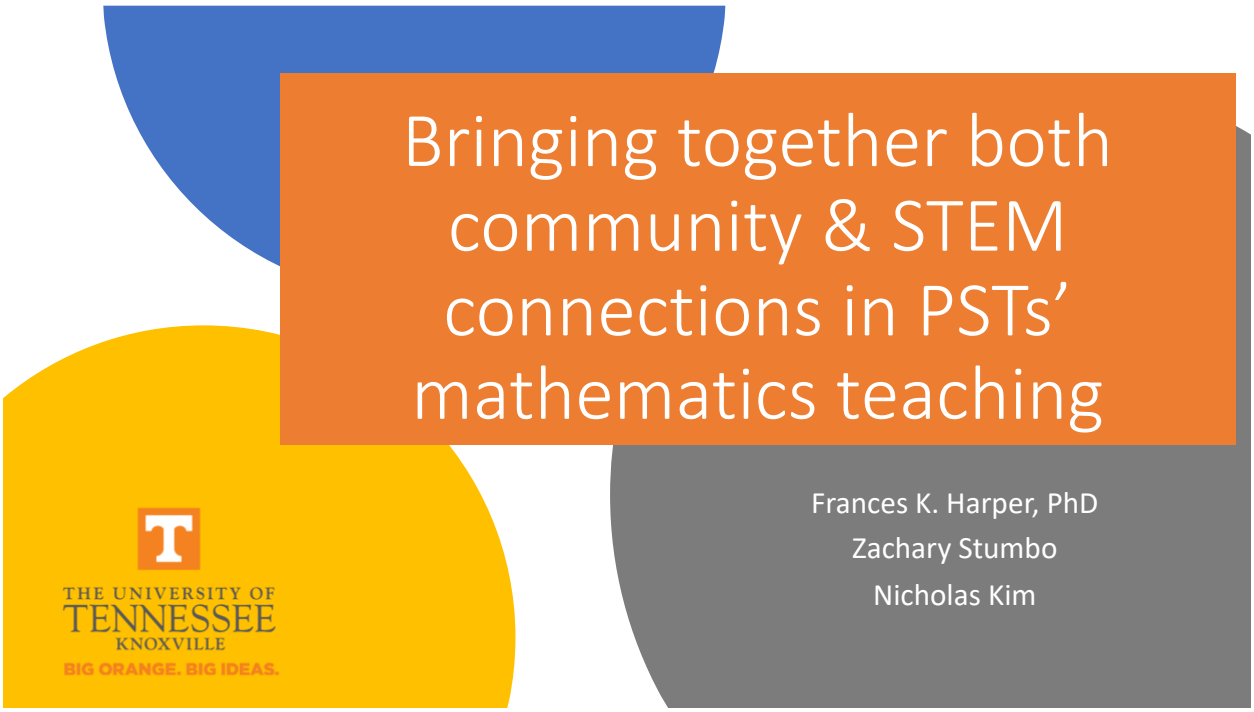

Handouts for AMTE Webinar

Wednesday, April 22, 2020

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CODE A PATHWAY THROUGH THE COMMUNITY at Geraldetta Dozier Elementary
Hollie & Idil

COMMUNITY WALK: The group visited a local grocery store (Tienda Mi Pais and a local barber shop. Their initial idea was to "We discuss coding and using problem solving skills to create the best route to get from point A to point B" because "many in the community walk to various places, therefore using routes are mathematical skills that are used on a daily basis by residents of this community."

CORE Task	FLOOR Task	Ceiling Task
Students will be coding a path from one place in the community to another. The places that students will be developing pathways for will be depicted by images printed out on paper in advance to the lesson facilitation. Students will choose two places that they want to develop a pathway for and then begin thinking about how they travel from one to the other. Here, students will be engaging in sequencing and spatial awareness as they think about what they see when travelling between the two places in the community they chose. Students will use the map pieces (green blocks) to set up a board for the robot mouse to travel on. Next, individuals will program the mouse to travel as they would from Point A to Point B. These tasks require students to engage in mathematics as they code the mouse step by step to make its way through the maze and gives students the opportunity to showcase their understanding of spatial awareness as they create a maze pathway based on their knowledge (mental images/maps) of the community.	The task will be modified to students who are struggling to engage by providing them with a chance to work in pairs to work together on one example putting the coding cards in a pattern and maybe acting it out before coding it. It might be hard for students to know their left from their right so practicing that first would be important. We would scaffold for them by first modeling what direction left is and what direction is right.	The task will be modified to extend student thinking by asking them to create an alternate route for the same two places used in the first path they created. Students will also extend their thinking when given more barriers in their maze.

Rationale for why this activity is engaging for and accessible to students & families in the community:
This task is engaging to students and families because it incorporates community assets into the key problem/question. By asking individuals to develop a pathway between places that are important to their everyday experiences, individuals are able to showcase their understanding of spatial awareness and sequencing in a way that is exciting, motivating, and relevant. Students will be given the opportunity to choose images within the community (e.g. the school, park) to code a pathway between and can draw images of places that are important to them if places that are most important to them are not pictured. Students and families will use knowledge of places in the community to formulate a path between two businesses or places that they frequently visit. This requires that students think about what they know about the location between two points as well as their experience walking, driving, biking, etc. from one to the other in order to code a pathway using the Code & Go Mouse Robot Activity Set. Further, students are using community knowledge and experiences to engage in mathematics by demonstrating an understanding of sequencing (e.g. determining, step-by-step, how to go from place to place in the community) as well as visual/spatial awareness (e.g. mapping and coding the pathway from Point A to Point B).

Rationale for transdisciplinary connections (including technology):
Utilization of the Code & Go Robot Mouse Activity Set incorporates aspects of STEAM such as technology and engineering. The mouse itself is a form of technology that moves on its own once programmed by the participants. Engineering is incorporated into the lesson via the actual programming of the robot mouse by the students and families. This activity also incorporates ELA standards because students will be describing what would happen if the mouse is programmed in a specific order and they will be identifying cause and effect relationships by using "if this, then" (Standard RI.3).

Post-enactment Reflections
Hollie & Idil

How did you see children and families engaging in mathematics during your task?

HOLLIE: I saw students connecting to patterns much more than I expected. For example, when deciding a route for the code and go mouse to take, it was necessary to add a "forward" command anytime the mouse would be turning because the "rotate" command only turned the mouse but did not cause it to move. Once students understood that, they got in a rhythm of always adding a "forward" command with any rotation. It was interesting to see how quickly some of the older students picked up on the patterns presented within the different pathways. They quickly got the hang of the coding and wanted to be challenged by adding in obstacles or a more difficult path.

IDIL: The students were engaging in the mathematical idea of pattern recognition. Students understood there was a pattern involved when they created a pathway to the place in their community. They gained problem solving skills when they made their first mistake where the mouse did not go to its destination. Students recognized the pattern that the mouse turned on the same square so the should have to press forward twice or add another forward to move to the other square.

How did you see children and families connect your mathematics task to or align it with family or community knowledge or practices?

HOLLIE: Many students enjoyed seeing pictures from the community and visualizing that they were traveling from the school to one of the locations. By offering an option for students to draw their own location (or just visualize in their brain) students were able to choose a location that is particular to them. They were able to use their knowledge of the community to create a pathway that would be loosely similar to the one taken in real life from point A to point B.

IDIL: Many of the students recognized the community places that we offered for the maze. A lot of the students and even their parents liked the park and picked it to go to from the school. Other students found other places in the community to be more valuable. I noticed a lot of the family members encouraged the students to pick a place in the community that they liked. When the students were struggling with the path to create the parents would help the students with the directions. I know one girl picked her home and when she was creating the pathway from school her parents helped her with directions.

How did you see children and families connect your mathematics task to other content areas (e.g., STEAM, literacy)?

HOLLIE: Our task directly related to STEAM since students were interacting with the code and go mice. They thoroughly enjoyed being able to choose their own pathway and code the mouse to go where they wanted it to. Many students who did not correctly program the mouse the first time wanted to keep trying and learning. It was obvious that many of them had never interacted with this type of equipment and it was fun to see them learning how to use it.

IDIL: The students were using a lot of "if I go this way... then this will happen" when talking to their families or us about their pathway. That description is a part of ELA standard for cause and effect. A lot of the parent were asking their kids why they coded a certain way and on their second attempt what they will think will happen if they coded another way.

How to use this template: The text in orange is provided as a guide. It is not expected that you will address every question in orange. Instead, you should refer to the rubric to make sure that you plan, overall, addresses expectations for the assignment. Use the guiding questions to complete the lesson plan, and DELETE THE ORANGE TEXT in your final lesson plan. Text in black should remain as part of the final lesson plan.

NAMES:

TASK TITLE:

<table>
<tr><th colspan="4">1. Learning Intentions & Connections</th></tr>
<tr><td>MATHEMATICS</td><td colspan="3">What mathematics knowledge and conceptual understandings does the CORE task uncover? The FLOOR task? The CEILING task? Be specific! In other words, do not just say, “area of shapes.” Instead, describe what ideas about area students will engage with throughout the task. For example,“Students will come to understand area as size of the flat space taken up by an object.” How do students engage with this knowledge or these ideas through the task? Again, be specific! For example, you might say, “Students will come to understand area as the size of the flat space taken up by an object as they manipulate shapes and compare how the area changes.” <u>(If appropriate, cite any TN state standards that are relevant for these mathematical ideas).</u></td></tr>
<tr><td>STEAM or LITERACY</td><td colspan="3">How, if at all, does the task uncover interdisciplinary connections between mathematics and science, technology, engineering, art, or literacy? Be specific about which other disciplinary areas your task relates to. How do students engage with knowledge and ideas in other disciplines? How does that cross-disciplinary learning support their mathematics engagement? IF YOUR TASK DOES NOT INCLUDE CROSS-DISCIPLINARY CONNECTIONS, THEN DELETE THIS BOX. REMEMBER THAT YOUR TASK IS REQUIRED TO MAKE <u>EITHER</u> CROSS-DISCIPLINARY CONNECTIONS <u>OR</u> COMMUNITY CONNECTIONS. BUT IT MAY MAKE BOTH.</td></tr>
<tr><td>COMMUNITY</td><td colspan="3">Provide a rationale for why you think the task will be engaging for and accessible to students and families in the community. (THIS IS REQUIRED FOR EVERYONE). In other words – what makes the work of the task interesting or engaging (more so than just the answer)?

How can students and families use community knowledge or experiences as resources to engage with mathematics through the task? IF YOUR TASK DOES NOT INCLUDE COMMUNITY CONNECTIONS, THEN YOU DO NOT HAVE TO RESPOND TO THIS QUESTION. REMEMBER THAT YOUR TASK IS REQUIRED TO MAKE <u>EITHER</u> CROSS-DISCIPLINARY CONNECTIONS <u>OR</u> COMMUNITY CONNECTIONS. BUT IT MAY MAKE BOTH.</td></tr>
<tr><th colspan="4">2. Task</th></tr>
<tr><th colspan="2">CORE TASK</th><th>FLOOR</th><th>CEILING</th></tr>
<tr><td colspan="2">Describe the mathematics task that you think MOST students will engage with, as you will present it to students. From what you include here, it should</td><td>How will you modify the core task for students who are struggling to</td><td>How will you modify the core task for students who are ready to extend</td></tr>
</table>

be clear what students will be doing & what mathematics they will be engaging with. Make sure that you cite the source of the task if this task is adapted from another one (use APA citation format)	***engage?*** *From what you include here, it should be clear what students will be doing & what mathematics they will be engaging with.*	***their thinking?*** *From what you include here, it should be clear what students will be doing & what mathematics they will be engaging with.*
TASK MATERIALS	*List materials needed for the task.* *Include any materials that need to printed either as a link to another google doc or at the end of this plan.*	
3. Anticipated Solutions or Strategies & Responses		
TASK SOLUTIONS or STRATEGIES	**Assessing Questions**	**Advancing Questions**
Describe at least 2 different solutions or strategies that you anticipate students might use for the CORE task. Provide at least 1 solution or strategy for the FLOOR task & 1 for the CEILING task. Describe specific strategies students might use, possible roadblocks that might arise, etc. You can add additional rows as needed. **Solution/Strategy for CORE task:**	*For each idea/solution/strategy explain how you might respond to understand more about what students are thinking, Include SPECIFIC questions you will ask students.*	*For each idea/solution/strategy explain how you might help students address roadblocks, help students persevere in problem solving, help students extend their thinking or make mathematical connections, etc. Include SPECIFIC questions you will ask students.*
Solution/Strategy for CORE task:		
Solution/Strategy for FLOOR task:		
Solution/Strategy for CEILING task:		
Engaging children's families: *What might you say to family members to help them engage in the task alongside children? What questions might you ask to encourage them to support mathematics or STEM learning through play? Or to encourage them to share their expertises of the community?*		
4. Wrap Up		
Student Success	*How will you know that students are successful with the task? In other words, what will indicate that students have uncovered the mathematics knowledge or understandings in the task (Core, Floor, and Ceiling)?*	
Summary Statement	*What will you say to help make the mathematics connections explicit to students before they leave your station?*	

REFLECTION QUESTIONS

The first set of questions are designed to demonstrate your ability to recognize what it looks or sounds like for children to engage with mathematics and other knowledge bases.

Q1. How did you see children engaging in mathematics during your task? Give details about one specific mathematical idea that you saw (i.e., Don't just say "area". Instead describe what children did or said and how that related to a specific idea about area.)

Q2. How did you see children connect your mathematics task to or align it with family or community knowledge or practices?

Q3. How did you see children connect your mathematics task to other content areas (e.g., STEAM, literacy)? (Answer only if this was applicable.)

The following questions are designed to help you describe what you learned about mathematics teaching and learning by doing your task with children. You'll have the option of sharing any additional insights you gained about mathematics teaching and learning at the end.

Q4. What were your strengths at supporting students to grapple with a challenging mathematics task?

Q5. What is an area of growth for you to support students to grapple with a challenging mathematics task?

Q6. How did this experience help you see what diverse learners are capable of doing in mathematics (versus what they can't do)?

Q7. Based on your experience, what opportunities and challenges do you see for using these types of tasks in your future mathematics teaching?

Q8. Anything else that you'd like to share about what you learned about mathematics teaching and/or learning? (Optional)

Resources

Published lessons from PSTs:
https://francesharper.com/community-steam/

Project details:
https://sites.google.com/utk.edu/medu530k-5/assignments/summative-assignments/major-project

Community Exploration Module from TEACH Math:
https://teachmath.info/modules/community-exploration-module/

References

Aguirre et al. (2012). Making connections in practice: How prospective elementary teachers connect to children's mathematical thinking and community funds of knowledge in mathematics instruction. *Journal of Teacher Education, 64,* 178-192.

Buchheister, K., Jackson, C., & Taylor, C. E. (2019). "Sliding" into an equitable lesson. *Teaching Children Mathematics, 25,* 224-231.

Featherstone, H., Crespo, S., Jilk, L., Osolund, J., Parks, A., & Wood, M. (2011). *Smarter Together! Collaboration and Equity in the Elementary Math Classroom.* NCTM: Reston, VA.

Leonard, J., & Guha, S. (2002). Creating cultural relevance in teaching and learning mathematics. *Teaching Children Mathematics, 9,* 114-118.

Minetola, J., Serr, K., & Nelson, L. (2012). Authentic geometry adventures. *Teaching Children Mathematics, 18,* 434-438.

Neumann, M. D. (2005). Freedom quilts: Mathematics on the Underground Railroad. *Teaching Children Mathematics, 11,* 316-321.

Quigley, C. F., & Herro, D. (2019). Making STEAM relevant to students. *An educator's guide to STEAM: Engaging students using real-world problems* (pp. 41-58). Teachers College Press: New York, NY.