PRACTICE BASED OPPORTUNITY : Mathematical Discourse

HLP: 12, 14, 15, 16, 18, 19, 22

Mathematics Teaching Practices: Establish mathematical goals to focus learning; Implement tasks that promote reasoning and problem solving; Use and connect mathematical representations; facilitate meaningful mathematical discourse; pose purposeful questions; build procedural fluency from conceptual understanding; support productive struggle in learning mathematics; elicit and use evidence of student thinking.

Standards for Mathematical Practice: MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning

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Description of the Activity: Mursion: Upper Elementary: Eliciting Student Thinking Long Division

Context: Learner is the teacher of record for a small group of upper elementary students. The learner must develop a lesson in which they are guiding discussion among the upper elementary students regarding long division. The learner must engage the students, develop a coherent lesson that guides the students through the learning process, include multiple methods of presentation with concrete-representational-abstract sequence as appropriate, and embed questioning to encourage discourse among the students.

STAGE 1: Developing Prerequisite Knowledge

What is this stage about: Ensuring pre-service candidates have prerequisite knowledge to be successful. This includes an understanding of the partial quotient model.

How does the instructor implement this stage: Provide content pre-service candidates need prior to the Simulation experience.

Materials/Resources needed to implement:
Elementary Formative Math Assessment Lesson
https://www.education.ky.gov/curriculum/conpro/Math/Pages/ElemFormAssessLessons.aspx
PPT on engaging students in math discourse This PPT includes ideas for sentence starters and cue cards for desks
In the IES Practice Guide Math have learners read the following sections and engage in conversation regarding: Systematic Instruction, Mathematical Language, Representations
PBS for Teachers K-8 Math Video Models: have learners view video models on Base 10, area model, etc. independently or in class and discuss the strategies they see
Division Strategies : Instructional resources related to partial quotient model
National Center for Intensive Intervention
https://intensiveintervention.org/resource/using-base-10-blocks-divide-164-3
GLEC Math SDI Tool Supporting Slides
https://docs.google.com/presentation/d/1dmuFnioH2Qp-c25y9-x2huIQ7QwTlNRp_EGcodbK2K8/edit#slide=id.p1
Resources on math discourse: KDE Math Tool Kit Practice #4
Concrete manipulatives- various manipulatives (specifically Base-10 blocks)
Virtual Manipulatives https://www.didax.com/math/virtual-manipulatives.html ; http://nlvm.usu.edu/en/nav/vlibrary.html; https://www.mathlearningcenter.org/apps ; https://toytheater.com/category/teacher-tools/virtual-manipulatives/

Questions faculty/ professional development providers might have when teaching candidates about Stage 1: Those implementing this instruction will need to understand the following strategies: Concrete-representational-abstract; use of Base 10 blocks; various types of algorithms (Standard algorithm/ partial quotient/ area model)

STAGE 2: Planning Stage

What is this stage about: Planning with pre-service candidates to interact with avatars in the simulation. Developing a lesson plan that includes mathematical discourse on long division.

How does the instructor implement this stage:
Overview of Simulation experience- provide the Mursion hand out on the scenario to the learners and how the learners a video of a simulation: UK SimLab

2. Discussion of the purpose of practicing this teacher behavior in this manner: allows for mistakes to be made with no consequence to a P-12 learner; allows for practice of a teacher behavior that has evidence of making a positive impact on student learning; provides an opportunity for rich feedback from instructor in context and immediately
3. Provide lesson plan format to learners- script opportunities to respond and feedback statements; have learners consider misconceptions the students may have; ensure that questions are at various levels of knowledge
4. Provide systematic instruction on lesson plan development if needed

Materials/Resources needed to implement:
Lesson Plan Format
Mursion Hand Out
Manipulatives as needed

Questions faculty/ professional development provides might have when teaching candidates about Stage 2: Those implementing the instruction will need to understand how to teach concrete, representational, abstract; they will need to have a clear understanding of lesson plan development including appropriate goals, assessment, and procedures; they will need to understand questioning and discourse in mathematics (see Principles to Action books from National Council of Teachers of Mathematics).

*Be mindful of the time constraints if you are using the Mursion simulation (i.e., lessons will need to be short)

*Sign up for the Simulation experience well in advance.

STAGE 3: Implementation Stage

What is this stage about: Having students teach the lessons using simulations (mixed reality or face/face)

How does the instructor implement this stage: Have students teach their lessons (small groups or through the UK SimLab mixed reality simulations). During the simulation, pause and provide feedback targeted to the lesson. If learners are teaching their peers, have a conversation about appropriate behaviors of those peers acting as students.

Materials/Resources needed to implement: UK SimLab, small group tables, various manipulatives as needed for learners to present their lesson; rubrics or other tools the instructor will use to score the lesson implementation.

Questions faculty/ professional development providers might have when teaching candidates about Stage 3: If you are using the UK SimLab sign up for the time slot and ensure technology is working properly.

STAGE 4: Reflective Stage

What is this stage about: Reflective practice provides a means for pre-service teachers to analyze their performance on the teacher behaviors they are learning to implement. Reflection is a key standard in teacher preparation (Council for Exceptional Children, 2020). Pre-service teachers are asked to reflect on their ability to implement all other teacher behaviors (e.g., high leverage practices, evidence-based practices).

How does the instructor implement this stage: Provide a model of a good reflective response. Discuss best practices in reflection with learners.

Materials/Resources needed to implement: Guided reflective practice document specific to the HLP and Mathematical practices listed above. Include guided statements for the learners to respond which allow them to state their behavior for that practice and the students' behaviors in response. Have learners share what they thought went well and what they could improve. Encourage specific examples for each. Rubric for the reflective response.

Questions faculty/ professional development providers might have when teaching candidates about Stage 4: Using deeper level questioning to elicit reflective responses that are robust and focused on the P-12 student learning.