CMEF Working Group 1: Assessing for Problem Solving Development

Reflection by Working Group facilitator Kathryn Stewart

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During the CMEF 2009 in Vancouver, our working group had the pleasure to come together to share our projects, our successes and our challenges. Charles Schilling, Jennifer Maybe and I were the working group members who had been working on our projects for a year or more. We had each read each other's project summaries and we had communicated briefly before we came together at the event. Our discussions were enriched by the participants that joined us who pushed us to think deeply about what we are doing and what needs to be done. Many thanks to all of the people who joined us! A special thank you is due to Sara Forsey and Leslee Francis-Pelton who worked with us from the first session to the very end when we created the document and presented it in the closing session.

Our working group thoroughly enjoyed getting together with the Problem Solving in Secondary Mathematics working group to think about the attributes of effective assessment and to engage in a problem together that allowed us to explore the variety of strategies that students may bring to that problem and discuss the implications for our practice.

It was truly wonderful to be among like minded educators who believed that teaching through problem solving informed by assessment of student understanding was an effective way to develop critical thinking in students. We each had our own definitions of problem solving and we each used assessment tools and strategies in different ways. We agreed wholeheartedly in the generalities and enjoyed debates around the specifics.

We had all encountered teachers who were reticent to try teaching through problem solving. There are a variety of reasons that teachers prefer traditional means of teaching mathematics. We decided that one of the greatest hurdles for teachers was to imagine what assessment of student achievement might look like in a student centred problem solving lesson. We hoped that if this barrier could be removed, teachers may be more willing to try teaching through problem solving in their classrooms.

We talked about design down planning, the role of the curriculum and big ideas, what assessment for learning and of learning looks like and the processes we used in our own work. From these discussions, we created a document that answered the question: What is a process that teachers can use to assess through student centred problem solving?

Recognizing that a book could be written on the topic with a chapter dedicated to each of our ten points, we tried to outline the process at its simplest level. It is interesting to note that nine of the ten processes happen outside of the actual delivery of the lesson.

We also gave an example from our own work to give a practical example of each process described. At our presentation at the final session, we shared a short video segment from Charles' class in which he presented the cube problem and asked the question to be investigated: *Given a variety of cubes made of unifix blocks dipped into paint, how does the number of faces painted change in relation to the side length of the cube?* We cannot share the video segment on a website because we do not have the appropriate signed permission forms from the students.

Our document is entitled: *Moving from "what I teach" to "what they learn." What is a process that teachers can use to assess through student centred problem solving?* We hope you enjoy.

Assessing for Problem Solving Development

Moving from what I teach to what they learn

What is a process that teachers can use to assess through ***student centred problem solving***?

Process	***Example***
1. Start with curriculum and cluster expectations/outcomes	Determine surface area… Draw and interpret views… Develop and apply formulas…
2. Identify what students need to know, understand, and do to demonstrate achievement of outcome(s) (e.g. component of summative task)	Summative assessment plan: Design a house with dimensions that shows an understanding of surface area and volume
3. Consider continuum of understanding (what comes before and after this idea)	What can be assessed during diagnostic Prior - Knowledge of area, faces, edges, vertices, volume, prism, cube Prior - Familiarity with making a table, drawing, diagram, list, building a concrete model Future - Cross sectional area, developing a formula
4. Decide upon context – pick/create a really good problem the students will solve that gets to the math	(See video) Cube made of unifix blocks dipped into paint to explore how the number of faces painted is a function of the number of blocks in the side length
5. Identify student entry points through activities that elicit prior knowledge (e.g. clickers, exit cards, building cubes)	Diagnostic assessment plan: Build cubes of different sizes, Examine variety of number of faces that can be painted after dipping.
6. Anticipate student responses (i.e. do it yourself, consider alternate solution methods – What mistakes will they make? What strategies will they use? What models will they use?	What will be formatively assessed Strategies/Models – Table, drawing, counting cubes Ideas – surface area, volume Struggles – don't realize number of corners doesn't change, number of faces constant, visualizing cubes inside or forgetting cubes inside, counting edge cubes for each face

Process	***Example***
7. Identify components of problem solving lesson: • beginning (hook, context, setting up problem, set up of class environment, articulation of learning targets) • middle (tools, groupings, record sheet) • end (debriefing process)	Answers may vary depending on classroom routines, structures, access to materials and your own comfort zone.
8. Prepare list of questions and prompts that don't give it away	Formative assessment opportunity: How do you know? Tell your partner what you're thinking. What did your partner just say? Do you agree? What do you notice about..,. Is there another way to organize this information? What do you notice? Is there a pattern?
9. Deliver lesson (implement plan for before, during and after) – ***assess formatively throughout*** • Introduce problem • Students solve problem • Debrief problem	Formative Assessment Plan: Use points from #6 above as an observational checklist (e.g. using comments or a marking scheme) Assess through observations, conversations and products. Check for understanding of ideas students present
10. REFLECT ☺	Assessment of the student learning (i.e. the success of your lesson) What did the students learn? Are your students where you want them to be as determined in #2? • Yes → Repeat process with new cluster of expectations (#1) • Not quite → Go back to #3

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