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Title: *Developing Quality Kindergarten Math Assessments*
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School/Grade: Coman Hill/ Kindergarten

SUMMARY OF *INVESTIGATORS OF PRACTICE* ACTION RESEARCH PROJECT

Context:
As kindergarten teachers at Coman Hill Elementary, we realized that the math curriculum has changed significantly this year as a result of the new Common Core math standards. Over the past year, we have been involved in aligning our curriculum to match the new Common Core standards mandated by New York State. Through our work in revising our current math curriculum to reflect these changes, we wanted to focus systematically on developing assessments that are meaningful to our students and provide opportunities for student engagement. *Investigators of Practice* provided us with the opportunity to research and implement several different assessment tools and reflect on how these assessments could give us more detailed information regarding student knowledge and growth.

Assessing kindergarten students can often be a challenge as it typically needs to be administered individually, is summative in nature, and may not give opportunity for quality feedback. We wondered if there was a way to assess students in a larger group setting where quality feedback could be given and students would have the opportunity to be more involved in the assessment process. We focused on performance-based assessments and self-assessment as a means to gather quality and meaningful data on our youngest learners while helping them become more invested in their learning.

Action Plan:
Our research questions were: *"What math assessment tools can be used to collect valid and reliable data for kindergarten students? How can these assessment tools be used to guide instruction and show student growth?"* We chose these questions as a result of the changes to the math common core standards and our district focus on quality feedback through our work with Diane Cunningham (Learner-Centered Initiatives, LTD.) The quality feedback, given through our assessments, allowed students to reflect upon their own thinking and learning process.

We struggled to find current research on assessment that talked specifically about kindergarten-age students. We researched several different districts and websites such as Engage NY in order to read current research on math assessments and see how other districts are assessing our youngest learners. The National Council of Teachers of Mathematics (NCTM) stressed that:
- task expectations should be clear for students prior to the activity;
- students should be involved when appropriate in determining rubric criteria; and
- it is important for teachers not only to analyze student work, but to question students about the work in order to understand their thought process.

We found the last statement to be particularly important when assessing young learners, because conversing with them about their thinking often helps them to demonstrate their true understanding of the topic being studied. It also brings to light whether their incorrect responses are a mistake versus an error.

Teacher/Student Shape self-assessment

We began our journey with our math unit on shapes. After teaching a series of lessons that focused on shapes, their attributes, and recognizing them in the real world, we created a self-assessment that gauged student knowledge of shapes. The teacher also completed a similar assessment to evaluate the students' work, participation and understanding. A brief discussion followed where the teacher and students would talk about areas in which they disagreed.

Shape robot and rubric

Through our research and examination of the common core standards, we found it important to assess both knowledge of shapes as well as students' ability to apply their understanding to the real world. We designed an assessment that included two components. First, an individual assessment was given to the whole class followed by an individual interview. During the assessment, students had to identify various shapes in a 2-dimensional picture, count them and write the number. We differentiated this task by including shapes that were easily identified and challenged our advanced learners by including squares that needed to be counted twice, as both squares and as part of the rectangle family. The second component, the individual interview, assessed their ability to name some 2-dimensional and 3-dimensional shapes. They were then asked to find and draw a 3-dimensional object from their environment. In the interview, they were asked to explain their drawing as well as the shape's properties.

We designed a rubric to evaluate student performance. This four pointed rubric used a scale featuring 1 (Emerging), 2 (Developing), 3 (Proficient), and 4 (Exemplary).

The rubric targeted three common core math kindergarten standards:
- CCCSK.G.2. Correctly name shapes regardless of their orientation or overall size.
- CCCSK.CC.3. Write numbers 0-20. Represent a number of objects with a written numeral 0-20.
- CCCSK.G.5. Model shapes in the world by building shapes from components and drawing shapes.

Shapes survey

Within the days following the assessment, the teachers met with the students and completed a shapes survey that allowed students to reflect on their experience and give their opinion. This shapes survey was given individually. It asked students to evaluate their experiences working independently verses working with the teacher. It also asked them to evaluate the understanding of the topic as well as the difficulty of the tasks.

Results:

We had several findings from our research and implementation of different assessment tools.

First, directions were clear and students were able to demonstrate their knowledge as well as apply their knowledge to the real world during the "Shapes Robot" assessment. We found the interview portion of the assessment to be particularly valuable in gaining further information regarding how students were thinking in terms of shapes in the real world. It afforded them the opportunity to express themselves orally which gleaned richer vocabulary and math terms that they could not have expressed in written form due to their current writing abilities. However, we ran into difficulty

using the rubric to score this assessment. While we tried to reach our highest learners through counting squares as rectangles on the rubric, we found that students did not perform at this level. Also, scoring the "counting shapes" portion of the rubric led to confusing results for that given standard. A student could essentially score in all four categories for that standard. It also did not give us the information on student knowledge of shapes that we were looking for and in particular, how students' determined how the shape matched the name.

Second, the teacher/student self-assessment was our first foray into self-assessment with kindergarten students. We found that students who were told what the expectations were prior to the assessment performed better than those that were asked to complete the self-assessment rubric at the conclusion of the activity. Teacher and student rubrics were similar in comparison and led to very rich discussions regarding learning and behavioral expectations. Students that did not achieve happy faces in all areas initially were reassessed later in the unit and felt very proud to realize how much they had learned since the initial assessment. What was surprising was that most students at this age could be honest and reflective in the assessment of their learning and seemed motivated by the assessment to improve their learning and behavior throughout the unit.

Third, the shape survey was administered individually to a small group of seven kindergarten students. The survey concluded that 6 out of 7 students enjoyed the teacher interview portion of the Shapes Robot assessment as well as being able to work independently on the task. Two students brainstormed other ways to demonstrate how they knew about shapes such as "make a flower out of shapes." Students found that counting and finding shapes in the picture was an easy and fun part of the assessment. They found that counting circles inside of circles was difficult. They also thought that there were a lot of shapes to count and squares being part of the rectangle family was "hard."

Implications:

We found that very detailed information regarding students' thought processes was gathered through the interview portion of the Shape Robot assessment. While each assessment gave teachers information regarding students' learning and achievement, it was important to include students in the assessment process as it provided additional anecdotal information regarding their thought processes. Students felt more connected to their learning when expectations were set before the assessment activity. They also felt valued when asked to give feedback regarding their assessment. We will continue to design assessments that include students in both the development process as well as the assessment itself, building in time for individual student/teacher interaction when appropriate.

We continue to struggle with designing quality assessments that can be administered in small group settings in order to facilitate more performance-based, cooperative tasks that demonstrate student learning. We will continue to analyze our assessment data and receive feedback from students and teachers in order to test the reliability and validity of newly created assessments. We look forward to applying the action research skills learned through *Investigators of Practice* to other areas of our math curriculum in order to help us streamline lessons and ensure our curriculum is rooted in the NYS common core learning standards.

Name _____

Shape Survey

I like working on my own. ☐   ☐
       yes   no

I like the page where I count shapes. ☐   ☐

Why?   yes   no

I like the interview with the teacher. ☐   ☐

Why?   yes   no

Was this easy or hard? ☐   ☐

Why?   yes   no

Did this help me learn about shapes? ☐   ☐

How?   yes   no

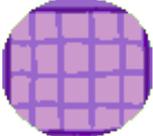Can you think of another way that you could show what you know about shapes?

Explain.   ☐   ☐
          yes   no

3-D Shapes Rubric

Teacher Name: Ms. Wall

Student Name:

CATEGORY	😊	😐	☹️
I can name the shapes.	😊	😐	☹️
I can tell about the shapes.	😊	😐	☹️
I can sort the shapes.	😊	😐	☹️
I can work with others.	😊	😐	☹️

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