MATHEMATICS TEACHER

Learning & Teaching

PK 12

Mathematics Teacher: Learning and Teaching PK-12, is NCTM's newest journal that reflects the current practices of mathematics education, as well as maintains a knowledge base of practice and policy in looking at the future of the field. Content is aimed at preschool to 12th grade with peer-reviewed and invited articles. *MTLT* is published monthly.

ARTICLE TITLE:

Our Children Are Not Numbers

AUTHOR NAMES:

Guarino, Jody; Cole, Shelbi; Sperling, Michelle

DIGITAL OBJECT IDENTIFIER: 10.5951/MTLT.2021.0299

VOLUME: 115

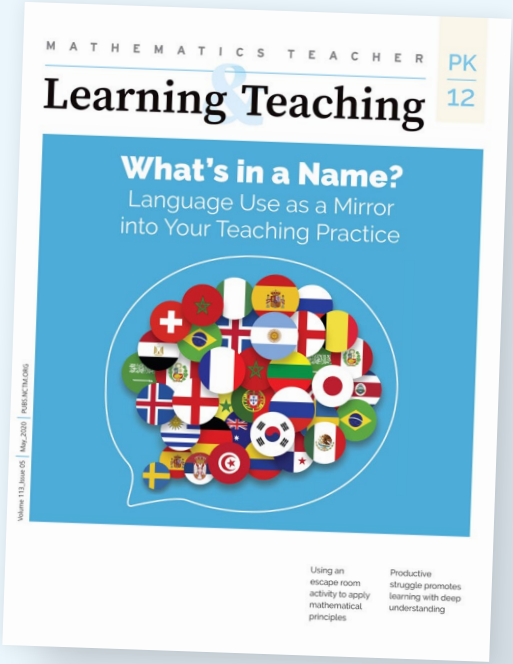
ISSUE NUMBER: 6

Mission Statement

The National Council of Teachers of Mathematics advocates for high-quality mathematics teaching and learning for each and every student.

Approved by the NCTM Board of Directors on July 15, 2017.

CONTACT: mtlt@nctm.org



NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Access digital content at nctm.org/mtlt11506gp.

Our Children Are Not Numbers

In a humanized approach to assessment, the design of the instrument itself is only a small part of the overall process.

Jody Guarino, Shelbi Cole, and Michelle Sperling

What does the word *data* typically mean in education circles? Often when educators refer to data, they are talking about numbers—numbers that have been assigned to students on the basis of test results. Take a moment to consider a recent conversation with an eight-year-old: The child explained that she was not allowed to read a particular book because she was a "Level 2B" and not a "Level 2F." Eight days into the school year, the child's identity had already been reduced to a code: 2B. She was no longer Trinity, a girl who reads books that make her smile. She was 2B, a child who could read only books from the 2B basket.

Watch video 1 (link online) to hear about the role of assessment in dehumanization.

HUMANIZING ASSESSMENT DESIGN

The word *assess* comes from the Latin root *assidere*, which means "to sit beside." What would it look like to engage in more humanizing assessment practices, practices that support the positive development of students' identity, agency, and belonging? In a Southern California school district, a group of teachers have been working toward doing exactly that. One of the first things the teachers did

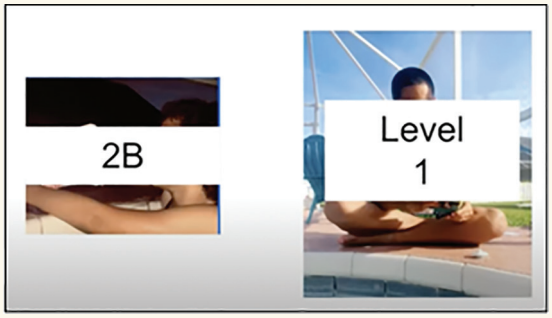
was to recognize that the curriculum-embedded assessments were too long and were not providing evidence of student learning that was helpful to the formative process. So, together they crafted shorter assessments aligned to major mathematical takeaways that provided more robust ways for students to show their thinking.

These educators also needed to shift their own views about how and why they were using assessments to begin with. One teacher shared, "We used to think about our math assessments as being for the district, for the data being entered into the district data platform. Now I don't think about it like that at all. . . . It's more of a continuum way of thinking, rather than Unit 1 finished."

Revisiting the meaning and purpose of assessment was important for these teachers. Assessment had morphed into a practice of compliance—sorting students and reporting their progress—rather than a process in which student thinking was elicited in multiple ways, interpreted, and used to inform further teaching and learning.

As we think about humanizing assessment practices, we might start by considering the students we serve and ourselves as educators. Gutiérrez (2018) noted, "Not until we seek to stand in the shoes of our students, to understand their conceptions [not misconceptions], will we be on the path toward recognizing and embracing their humanity" (p. 2). If our goal is to elicit student thinking in ways that recognize and embrace their humanity, how do the assessments we use do this? How is student thinking made visible in ways that foster a positive mathematical identity? What information can we glean from the tasks we provide to students and the ways in which we listen to them?

Video 1 How Assessment Can Be Dehumanizing



Watch the full video online.

HUMANIZING DATA PRACTICES

> Some teachers hate entering that data because it reflects poorly on them that their student got 30% or whatever it is, you feel like you have to justify yourself, like that's because he's an English learner, he just moved from Vietnam. You feel like you have to judge . . . that child receives special services or has an IEP. It's freeing to get rid of that percentage because you're truly looking at what they understand and what they don't understand and what they almost understand so you can identify next steps. (a California teacher)

In a humanized approach to assessment, the design of the instrument itself is only a small part of the overall process. Next, let's consider humanizing assessment from a data lens. How do our current uses of data

Jody Guarino, she/her, jguarino@uci.edu, Twitter: @jody_guarino, is a lecturer at the University of California–Irvine and a mathematics coordinator at the Orange County Department of Education, where she supports teacher and student learning at the elementary level. She holds an EdD in educational leadership from Azusa Pacific University in California.

Shelbi Cole, she/her, scole@studentsachieve.net, Twitter: @ShelbiCole1, is a designer at Student Achievement Partners. Prior to this role, she served as the mathematics director for the Smarter Balanced Assessment Consortium. Cole has also worked as a research assistant for the National Research Center on Gifted and Talented and as a high school mathematics teacher. She holds BS and MA degrees in mathematics education and a PhD in educational psychology, all from the University of Connecticut.

Michelle Sperling, she/her, msperling@nmusd.us, Twitter: @msperling777, is a first-grade teacher in Costa Mesa, California. She devotes her time to create and maintain a positive environment where students thrive in all learning areas.

doi:10.5951/MTLT.2021.0299

support or diminish students' agency, identity, and belonging? What do we see as data? Is it the percentage of questions a student answered correctly? Or is our definition of data broader than numbers and percentages, perhaps including information students give us based on what they know, evidence of their current thinking, how they are making sense of things, what they understand, or what they are working toward understanding?

An asset-based lens offers opportunities for us to see and listen to students and the strengths they bring, things we can build on and leverage in the classroom. For example, in a first-grade assessment (see figure 1) students provide an explanation in response to question 5:

Fig. 1

Name _____ | Date _____

Grade 1 Assessment 1 page 1 of 3

1.OA.8 - Determine the unknown whole number in an addition and subtraction equation relating three whole numbers.

1 Complete the equations.

a. 4 + ☐ = 5 **b.** ☐ + 3 = 6

1.OA.6 - Add and subtract within 20 using strategies.

2 Add. Show your thinking.

3 + 2 = ____	6 + 4 = ____
9 + 4 = ____	3 + 7 = ____

Name _____ | Date _____

Grade 1 Assessment 1 page 2 of 3

1.OA.6 - Add and subtract within 20 using strategies.

3 Subtract. Show your thinking.

5 - 1 = ____	12 - 5 = ____
5 - 5 = ____	10 - 8 = ____

Name _____ | Date _____

Grade 1 Assessment 1 page 3 of 3

1.OA.1 - Use addition and subtraction within 20 to solve word problems (add to - change unknown).

4 Kim had 4 crayons. She found some more. Now she has 6 crayons. How many did she find? Use numbers, pictures or words to show your thinking.

1.OA.4 - Understand subtraction as an unknown addend problem.

5 Joe said he solved the problem,

Kim had 4 crayons. She found some more. Now she has 6 crayons.

using subtraction. He said 6-4=2. Does this strategy work to solve this problem? How do you know?

For a first-grade revised assessment, students provide an explanation in response to question 5.

Joe said he solved the problem, "Kim had 4 crayons. She found some more. Now she has 6 crayons. How many did she find?" using subtraction, 6 – 4 = 2. Does the strategy work to solve this problem? How do you know?

Student responses are shown in a partial data table from a first grade assessment (see table 1, column 7). We see in this data that some students are beginning to use representation-based proofs: "Yes, because you can use your fingers to get the same answer," whereas others use the relationship between addition and subtraction as proof: "2 + 4 = 6 and 6 – 4 = 2. These are the same, equal" or "Yes, because 2 + 4 = 6." Others agree and are working on how to justify: "I don't know, but I agree." This information gives us insight into both students' mathematical sense making and ways students are able to explain their thinking.

Let's zoom in to Presley's response (see figure 2). "Yes, you can use your fingers and get the same answer." We can present Presley's response to the class and analyze it together: "What do you think Presley meant when she said, 'You can use your fingers and get the same answer?' Who can show us what you think she meant?" This move positions Presley as competent; something in her work is worth spending time thinking about together, and it positions other students as contributors to the classroom community. The question, "Who can show us what you think she meant?" offers a way to build both mathematical understanding and explanation for all the students in the class. Used in this way, data contributes to how we see students (as having

Table 1 Partial Data Table from First-Grade Revised Assessment

Student Name	1.OA.8 (Two Problems)	1.OA.6 (Four Problems)	1.OA.6	1.OA.1	Strategy	5 (1.OA.4)
	4 + _ = 5 _ + 3 = 6 (A)ccurate or response	3 + 2, 6 + 4, 9 + 4, 3 + 7 (A)ccurate or response	Strategy	4 + _ = 6 (Join Change Unknown) (A)ccurate or response		Joe said he solved the problem, "Kim had 4 crayons. She found some more. Now she has 6 crayons" using subtraction. He said 6 – 4 = 2. Does this strategy work to solve this problem? How do you know?
Ethan	A	A	Direct Model (representing and showing all quantities)	A	Direct Model	She started with 4, then 2 more, and then if you count them together, it makes 6.
Mia	A	3 of 4	Direct Model	A	4 + 2 = 6 (Maybe DM?)	Yes, 6 – 4 = 2
Brad	A	A	Direct Model	A	4 2 6 (and circled 2)	I don't know, but I agree.
Robert	A	A	Known	A	4 + 2 = 6 (Maybe DM?)	2 + 4 = 6 and 6 – 4 = 2 These are the same, equal.
Presley	A	A	Count On	A	2 llll 6, 2 crayons	Yes, because you can use your fingers to get the same answer
Marco	A	A	Direct Model	A	4 + 2 = 6	Yes, because 4 + 2 = 6

See the supplemental data table (link online) that can be downloaded and customized to implement similar practices.

assets and knowledge to offer the community); how they see themselves (as competent contributors and sense makers), and how they see each other (a community of learners, all with things to offer). See video 2 (link online) to hear one first-grade teacher's perspective.

Mathematics answers are often viewed as binary—correct or incorrect. Let's take a look at an example where a student has given a correct answer and where there is still value in allowing her the space to continue processing and making sense of the mathematical work in which she is engaged. In video 3 (link online), the

Fig. 2

Name Presley | Date

Grade 1 Assessment 1 page 1 of 3

1.OA.8 - Determine the unknown whole number in an addition and subtraction equation relating three whole numbers.

1 Complete the equations.

a. 4 + [1] = 5 **b.** [3] + 3 = 6

1.OA.6 - Add and subtract within 20 using strategies.

2 Add. Show your thinking.

3 + 2 = 5 | 6 + 4 = 10

9 + 4 = 13 | 3 + 7 = 10

Name | Date

Grade 1 Assessment 1 page 2 of 3

1.OA.6 - Add and subtract within 20 using strategies.

3 Subtract. Show your thinking.

5 - 1 = 4 | 12 - 5 = 7

5 - 5 = 0 | 10 - 8 = 2

Name | Date

Grade 1 Assessment 1 page 3 of 3

1.OA.1 - Use addition and subtraction within 20 to solve word problems (add to - change unknown).

4 Kim had 4 crayons. She found some more. Now she has 6 crayons. How many did she find? Use numbers, pictures or words to show your thinking.

2 Crayons

1.OA.4 - Understand subtraction as an unknown addend problem.

5 Joe said he solved the problem,

Kim had 4 crayons. She found some more. Now she has 6 crayons.

using subtraction. He said 6-4=2. Does this strategy work to solve this problem? How do you know?

Yes you can use your fingers and get the same answer

By analyzing an answer from Presley's completed assessment together, Presley was presented to the class as competent in mathematics.

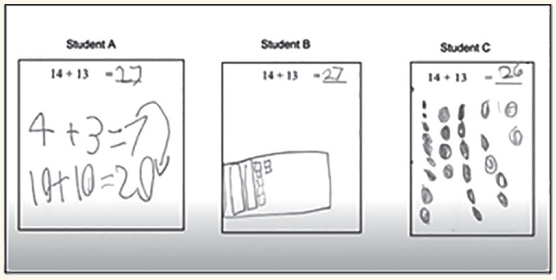
child has already "solved the problem" (see figure 3), and continues to grapple with the mathematical ideas and relationships she is exploring. Although she correctly answered the question, she needed more processing time to communicate her understanding of the solution relative to the problem's context.

Now let's consider a system in which color-coded data reports show the percentage of students that correctly (or incorrectly) responded to a question, and responses were deemed correct or incorrect. For example, the student who responded, "I agree, but I don't know why," may be viewed as incorrect. This student may be perceived to have an understanding of the mathematics and be working to articulate why. Systems like this provide no insight into students' understandings and how we might leverage their strengths within a mathematics community. What if the system color coded student responses—correct responses as green and incorrect as red—and provided a display like the one shown in figure 4. How does this display contribute to how we see students? This data might tell a story of students who do not understand mathematics or who have gaps. Data systems like this contribute to the dehumanizing of students, teachers, and mathematics as a discipline.

HUMANIZING COMMUNICATION

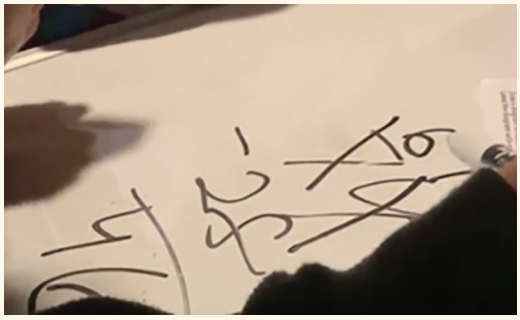
What is the role of communication in developing students' agency, identity, and belonging? How and

Video 2 Michelle Sperling's Instructional Practice



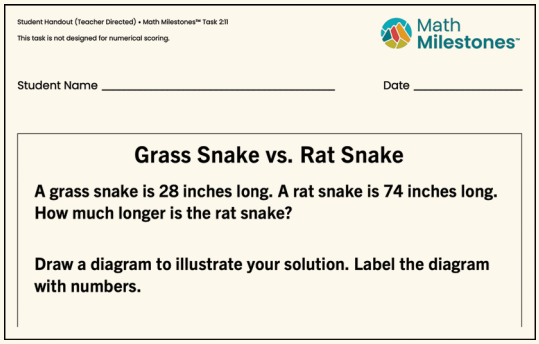
Watch the full video online.

Video 3 Trinity Shares Her Thinking



Watch the full video online.

Fig. 3



Student Handout (Teacher Directed) • Math Milestones™ Task 2:11
This task is not designed for numerical scoring.

Math Milestones™

Student Name _____ Date _____

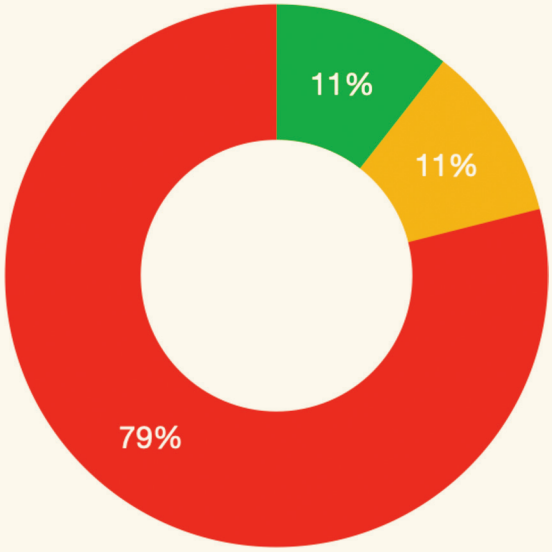
Grass Snake vs. Rat Snake

A grass snake is 28 inches long. A rat snake is 74 inches long. How much longer is the rat snake?

Draw a diagram to illustrate your solution. Label the diagram with numbers.

The grade 2 problem from video 3 is available at Math Milestones (link online).

Fig. 4



Some systems, such as this sample image from a data-reporting system, contribute to the dehumanizing of students, teachers, and mathematics.

what do we communicate to parents and children? Communication is an important consideration in thinking about assessment data. What messages are we sending through the ways in which we communicate? How do we hope that communication is taken up? Let's consider these questions from the lens of Presley and her parents. Through analyzing her work (see figure 2), we can see that Presley—

- solves missing addend addition problems;
- understands addition as joining quantities;
- represents her thinking as she shows both quantities being joined;
- counts to find the total;
- understands subtraction as removal or taking away;
- represents subtraction problems by showing both quantities and removing the subtrahend, counting to find the quantity remaining;
- makes sense of and solves add-to, change-unknown word problems; and
- uses a representation-based proof to analyze the use of subtraction to solve an unknown-addend addition problem.

We know a lot about Presley's thinking. How do we communicate that? We might share with her and her parents some of the bulleted information above. We might show them that when solving addition problems, Presley represents and counts all of the quantities. She successfully uses a direct-modeling strategy. We can explain that a next step for her might be counting on, a strategy in which she may abstract one quantity and add on the second value. By communicating about her assets, we position Presley as a capable, competent mathematical thinker. Her mathematical understanding can be seen as a continuum or trajectory with information about what she understands now, as well as some next steps. Parents may glean some ideas for working with Presley at home. For Presley, she may see herself as a successful contributor to her classroom mathematics community. In this way of communicating, we are not trying to check boxes or see learning as something that's been "completed."

Now let's juxtapose that with other forms of communication. Perhaps we grade the paper and share that Presley correctly solved 9 of 12 problems, or scored 75 percent. What does that communicate? Presley has some understandings and some areas that need improvement. What if when this assessment is handed back to Presley, she sees her 75 percent and notices two of the students at her table get 100 percent? "They're the smart ones," she thinks. Jake, her table partner, receives 40 percent, so she considers him to not be good at math. Do Presley and Jake see themselves as being contributors to the classroom mathematical community? Do others see them as having ideas to contribute? Or do we look to the students who have attained 100 percent, leverage their thinking, and position them as competent and the others not? What role does our communication have in developing students' agency, identity, and belonging? One teacher explained:

> If I had an assessment from earlier in the trimester that I could show them, this is how they were solving a problem. . . . Look at what they're doing now, perhaps solving in a more advanced way or understanding a concept better than before. Rather than talking about numbers and percentages, showing them specific examples because I felt like I knew better how each child was thinking about math than I did before, I felt like I could talk about it more with parents.

Another teacher explained how percentages can be misleading:

> When we used percentages, a student might have gotten a 50% on a test. The student may have made some calculation errors; however, the percentage could have led us to think of the student as being halfway there, but this wasn't the case. Students could be almost there, understanding the concepts and ideas, just needing to attend to precision in computation.

The scores that we are accustomed to assigning provide very little information about student learning.

In a more humanized view of how we communicate about student learning, we must also consider grading practices. What is the purpose of grades? Does the very existence of failing grades signify that we expect some students to meet expectations and others not? What if instead we assumed that each student would get what they needed to keep moving forward?

Assessment data through grade reporting is another form of communication. Traditionally, grades are calculated as a compilation of scores averaged together over a period of time. Presley's 70 percent may be translated into a C or perhaps a numerical score and then

interpreted as a "C-student"—average, but not excellent. To humanize grading, we need to shift to practices that better communicate what students can do, rather than what they cannot, and districts should discuss how they could proceed without letter grades and leverage formative data that more accurately capture student knowledge (Cintron, Wadlington, and ChenGeng 2021).

We have raised several practices worthy of being reexamined, and we offer alternative practices (see table 2). This list is by no means exhaustive, but instead offers some ideas for consideration.

FINAL THOUGHTS

Rehumanizing assessment requires challenging the current narrative about what counts as assessment. We have to reject the false promise of "quick fixes" by understanding that data derived from black boxes are unlikely to provide the nuanced information we need to truly support students' learning. We have to understand the many ways students might reveal their brilliance in mathematics—through pictures and diagrams, in writing, by creating, by acting out a scenario as they understand it, or through spoken language. These are all valuable forms of data, but to see them as such, we must acknowledge the role that tests have played in narrowing what we view as mathematics. To get even more concrete, we offer three suggestions for beginning to shift practice toward a more humanized way of engaging in assessment that is closer to the definition where we "sit beside" our students:

1. Ask fewer, more robust questions and provide multiple ways for students to demonstrate their understanding. Testing has led to the development of a mindset that we get better evidence of student

Table 2 Alternative Practices to Replace Current Problematic Practices

Current Practice	Why Is This Problematic?	What Should I Do Instead?
Distribute assessments with final scores and no instructional follow-up	Scores affect student identity and self-efficacy. Without further instruction, students may view themselves as unsuccessful and do not have access to the tools they need to further develop partial understandings.	Use completed assessments as learning opportunities to continue to build student understanding. For example, identify student work samples that can be leveraged to unpack important mathematical ideas, including student work that shows partial understandings. This positions students as competent and builds on the knowledge of the classroom mathematics community.
Assign a percentage score	A child achieves 5/10 correct on an assessment. Teachers and students may view themselves and their abilities as 50 percent. If a student understands a problem, has a valid strategy, and makes a calculation error, does that mean the student knows 50 percent? Is that the message conveyed by the percentage?	Rather than assigning any score, offer feedback. Compliment students on what they have done well and pose questions to further elicit their thinking.
Average assessment grades	Students are penalized for learning over time, the very thing we want them to do, when assessment scores are averaged. These data do not reflect what students currently know and understand; instead, they produce inaccuracies (O'Connor and Wormeli 2011).	Share recent information. Communicate through an asset lens, referring to a student's most current understandings.
Grade reporting based primarily on formal assessments	Student progress should not be reduced to formal assessments. Ignoring the evidence that students provide us with every day would be eliminating important insight into student thinking.	Use multiple pieces of evidence, (including daily work, formal assessments, listening to students) to document the student's progress toward standards.

understanding by asking multiple questions on a topic. This is false. In fact, we gain much more useful information by having deeper interactions with students on one or two problems.

2. Recalibrate on the purpose of the data, expand your ideas about what counts as data, and push back on systems that ask us to use data in dehumanizing ways. View every assessment as an opportunity to see how much insight students have to share with us about their learning. Allow yourself to see and be critical of how little value numerical scores actually bring to the learning process.
3. Ask questions of yourself that will allow you to continue to refine your practice. Standing back and thinking about the things we want to do are easy. How do we create space to ensure our actions are aligned with those things we value? For example, one might ask, How am I positioning my students as intellectual leaders? When students give a response, do I move on or consider what this response means to the student who shared and the other students in the classroom community? How can I position that student as a competent sense maker and leverage his or her thinking to advance the thinking of the group? Am I recognizing student responses as data that support learning?

It is time to take the word *assessment* back to its Latin roots. Next time you are ready for your students to share their brilliance with you, take the time "to sit beside" them.

REFERENCES

Cintron, Sonia, Michelle, Dani Wadlington, and Andre ChenGeng. 2021. "A Pathway to Equitable Math Instruction: Dismantling Racism in Mathematics Instruction." Oakland, CA: The Education Trust—West. https://equitablemath.org/.

Council of Chief State School Officers (CCSSO) Formative Assessment for Students and Teachers (FAST) State Collaborative on Assessment and Student Standards (SCASS). 2018. *Revising the Definition of Formative Assessment*. Washington, DC: CCSSO. https://ccsso.org/sites/default/files/2018-06/Revising%20the%20Definition%20of%20Formative%20Assessment.pdf.

Gutiérrez, Rochelle. 2018. "The Need to Rehumanize Mathematics." In *Annual Perspectives in Mathematics Education: Mathematics for Black, Indigenous, and Latinx Students*, edited by Imani Goffney, Rochelle Gutiérrez, and Melissa Boston. Reston, VA: National Council of Teachers of Mathematics.

O'Connor, Ken, and Rick Wormeli. 2011. "Reporting Student Learning." *Educational Leadership* 69, no. 3 (November): 40–44.

