The Centroid

In this Issue:

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The Centroid is the official journal of the North Carolina Council of Teachers of Mathematics (NCCTM). Its aim is to provide information and ideas for teachers of mathematics—pre-kindergarten through college levels. *The Centroid* is published each year with issues in Fall and Spring.

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Submission of News and Announcements
We invite the submission of news and announcements of interest to school mathematics teachers or mathematics teacher educators. For inclusion in the Fall issue, submit by August 1. For inclusion in the Spring issue, submit by January 1.

Submission of Manuscripts
We invite submission of articles useful to school mathematics teachers or mathematics teacher educators. In particular, K-12 teachers are encouraged to submit articles describing teaching mathematical content in innovative ways. Articles may be submitted at any time; date of publication will depend on the length of time needed for peer review.

General articles and teacher activities are welcome, as are the following special categories of articles:

- *A Teacher's Story*,
- *History Corner*,
- *Teaching with Technology,*
- *It's Elementary!*
- *Math in the Middle*, and
- *Algebra for Everyone*.

Guidelines for Authors
Articles that have not been published before and are not under review elsewhere may be submitted at any time to Holly Hirst, hirsthp@appstate.edu.

Submit one electronic copy via e-mail attachment in *Microsoft Word* or rich text file format. To allow for blind review, the author's name and contact information should appear *only* on a separate title page.

Formatting Requirements

- Manuscripts should be double-spaced with one-inch margins and should not exceed 10 pages.
- Tables, figures, and other pictures should be included in the document in line with the text (not as floating objects).
- Photos are acceptable and should be minimum 300 dpi tiff, png, or jpg files emailed to the editor. Proof of the photographer's permission is required. For photos of students, parent or guardian permission is required.
- Manuscripts should follow APA style guidelines from the most recent edition of the *Publication Manual of the American Psychological Association*.
- All sources should be cited and references should be listed in alphabetical order in a section entitled "References" at the end of the article following APA style. Examples:

  Books and reports:
  Bruner, J. S. (1977). *The process of education* (2nd ed.). Harvard University Press.
  National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*.
  Journal articles:
  Perry, B. K. (2000). Patterns for giving change and using mental mathematics. *Teaching Children Mathematics*, *7*, 196–199.
  Chapters or sections of books:
  Ron, P. (1998). My family taught me this way. In L. J. Morrow & M. J. Kenney (Eds.), *The teaching and learning of algorithms in school mathematics: 1998 yearbook* (pp. 115–119). National Council of Teachers of Mathematics.
  Websites:
  North Carolina Department of Public Instruction. (1999). *North Carolina standard course of study: Mathematics, grade 3.* http://www.ncpublicschools.org/curriculum/mathematics/grade_3.html

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About the Cover
The image on the cover depicts the centroid of a triangle.

Contact Information
The Centroid
c/o Dr. Holly Hirst, Editor
Mathematical Sciences
Appalachian State University
Boone, NC 28608
or send email to
hirsthp@appstate.edu
Please include a return email address with all correspondence.

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Fall 2024 State Math Conference And Leadership Seminar

Seminar: November 13
Conference: November 14-15

Benton Convention Center
Winston-Salem

Hotel Information and Speaker Proposal Submission coming soon at https://ncctm.org

President's Message

Karen McPherson
State President
karen.mcpherson@bcsemail.org

In recent years, my advocacy for the integration of instructional routines in the math classroom has grown significantly. The adoption of well-established routines has proven to be both efficient and impactful, requiring only a modest investment of time to grasp the intricacies of their implementation. Instructional routines—defined as "specific and repeatable classroom structures that enable all students to engage more fully in learning opportunities that develop their mathematical thinking and reasoning"[1]—have become a cornerstone of my teaching philosophy.

One exemplary routine that stands out is the *Think-Pair-Share* routine, a versatile approach applicable to various math tasks within a lesson. Distinguished from a simple *Turn and Talk*, this routine places a deliberate emphasis on allowing students ample time to think. This intentional pause is a pivotal aspect of the routine, affording every student the opportunity to reflect on a response, formulate a question, or establish connections. While students may be eager to engage in dialogue immediately, maintaining consistency in valuing individual thinking time is crucial. Monitoring and fostering this environment for everyone ensures that the subsequent discussions are enriched. During the *Think-Pair-Share* routine, students are encouraged to share their thoughts with a partner, utilizing discussion supports like sentence frames or stems. As a teacher, the ongoing monitoring of student responses aids in identifying noteworthy ideas to elevate during the broader class discussion. The intentional invitation of students to share and the strategic incorporation of ideas that stimulate discourse further solidify the effectiveness of this routine. Considered a high-leverage routine, the *Think-Pair-Share* structure extends its utility to support other instructional routines, such as the *Notice and Wonder* routine. This approach prompts students to think about what they notice and wonder. Then students engage in discussion with a partner before sharing.

The *Math Language Routines*, a set of routines designed to enhance language proficiency while concurrently supporting the learning of mathematical content, seamlessly integrates with the *Think-Pair-Share* approach. For instance, in the *Co-Craft Questions* routine, students are encouraged to think independently, engage in partner discussions, and subsequently contribute to a comprehensive class discussion. The *Routines for Reasoning*, developed by Amy Lucenta and Grace Kelemanik, present another collection of routines that not only nurture the application of the Math Practices but also align with the *Think-Pair-Share* structure. The *Contemplate then Calculate* routine, for instance, encourages contemplation time for students to reflect on their observations, deliberate with a partner, and subsequently share their insights before delving into the calculations.

In essence, the *Think-Pair-Share* routine emerges as an essential instructional strategy, seamlessly weaving through various mathematical routines, amplifying student engagement, and fostering a dynamic and enriching classroom environment. For a deeper exploration of the highlighted routines and others, consider consulting the following resources:

Achieve the Core Mathematical Routines

Fostering Math Practices

ELL Mathematical Language Routines

See also the two articles in this issue, both of which exemplify the *Notice and Wonder* routine!

[1] https://achievethecore.org/content/upload/Mathematical%20Routines.pdf

Connecting Mathematics to Students' Funds of Knowledge: Illustrations from the Elementary Classroom

Montana Smithey, Georgia Southern University
Lauren Akers Oglesby, Georgia Southern University

Mathematics classrooms are becoming more diverse in terms of the students that fill each room, dedicated teachers who strive to ensure their students learn, and the materials available to teach mathematics. Every classroom is unique from the next. To add to the richness of the classroom, students bring their own experiences, various identities, academic strengths, and areas of needed support. Thus, classroom teachers must sift through the abundance of curricular materials and mathematics tasks available online to modify for the diverse students that they teach. As the mathematics classroom shifts toward facilitating learning amongst students and activities focused on student thinking (NCTM, 2014), teachers need strategies for using curricular materials or available resources and modifying those items for their specific group of students. In particular, teachers may seek ways to connect student thinking to personal, community and family knowledge while increasing confidence in students (Bartell et al., 2017; Rhodes et al., 2023).

The authors share two Notice and Wonder *activities that exploit students' accumulative and culturally developed bodies of knowledge.*

This article shares strategies teachers can use to begin thinking about the assets and sources of knowledge students already have and use that knowledge to introduce new mathematics content. We share two elementary mathematics lessons in their entirety with a particular focus on the notice/wonder routine that draws from students' funds of knowledge. Finally, we share reflections on the lesson design from two perspectives—a mathematics teacher educator and a preservice teacher—and ways to continue attention on task design and modification based on individual students in classrooms.

Funds of Knowledge

As teachers strive to make mathematics relevant for students, one approach is drawing from students' funds of knowledge. Funds of knowledge can be defined as "the historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and well-being" (Moll et al., 1992, p. 133). In other words, we know a lot about the world around us, and we gain a wealth of knowledge from our families and cultural backgrounds that we use each day. Students arrive in our classrooms full of intelligence they can use to learn new information. For example, I have historically accumulated bodies of knowledge because I have lived in both the northern and southern parts of the United States. I am White, English-speaking, and have family who have worked in various areas, from agriculture and construction to public service and hospitality. These varying identities have given me knowledge of differences within geographic locations, insight into particular industries, and acknowledgment and perspective on societal representation. Of course, given my background as an educator for over 15 years, I have a body of knowledge related to education, but below the surface, have a great deal of knowledge about being a mother of multiple children, cake-making, creating complex schedules, the nervous system in the human body, and believe it or not, I know a lot about older Jeeps—all of which comes from day-to-day living. Some of those bodies of knowledge could help me better understand and make sense of new ideas. To offer another example from one of my preservice teachers:

> I have historically accumulated and culturally developed funds of knowledge, including the value of caring for others and being thrifty or economical. Aside from learning about teaching practices as a preservice teacher,

> I have skills essential for well-being and everyday functioning, such as budgeting. I also have an in-depth understanding of types of dance like ballet, tap, jazz, and baton. In the same way, if I am learning something new, making connections to these bodies of knowledge may help me better grasp a new concept. (Lauren Akers Oglesby, 2023)

Just as we have funds of knowledge we draw upon when learning, so do you and your students. Ultimately, as educators, we want students to see the relevance of their learning and both recognize and use knowledge they already have to learn mathematics. Asking students and their families questions about what they do, the places they go, and what they are interested in can be a way to gain insight into the bodies of knowledge students in our classrooms have and use in instructional planning (Foote et al., 2015).

Notice & Wonder **Routine**

One strategy to support students using their funds of knowledge to make sense of mathematics learning is through a *Notice and Wonder* routine. In planning for the notice/wonder routine, teachers start with a precise mathematical goal to guide student learning (NCTM, 2014) and this routine supports students in brainstorming connections to what they already know and understand as it relates to the mathematical goal of a lesson. A notice/wonder routine includes the display of a mathematical situation or a photo and poses two questions to students: What do you notice? What do you wonder? Typically, students have independent think time alone or with pairs before sharing with the whole class. As students report what they notice and wonder, teachers list students' questions and observations visibly while teachers avoid judgment of responses and patiently wait for mathematical ideas to surface (Rumack & Huinker, 2019; Smithey & Moldavan, 2023). Throughout the discussion, teachers monitor contributions to decide when to end the routine—at the point when students have shared enough knowledge or understanding to begin work on the mathematics task. Through engagement in a notice/wonder routine, every student is invited into the conversation and shared ideas can refine their thinking and before the start of the task (Rumack & Huinker, 2019). Overall, the notice/wonder routine supports students in making sense of mathematical ideas in the context of the world around them and provides opportunities to draw on students' funds of knowledge.

The following two lesson examples come from our collaboration between our university and a local elementary school. I teach an elementary mathematics methods course, and my co-author was one of the preservice teachers in my course who wanted to write about their implementation of the notice/wonder routine with elementary students. Along with classroom teacher input—two 1st grade teachers and a 5th grade teacher—two lessons developed. Prior to developing the lessons, I sat down with each of the classroom teachers for about 15-20 minutes to ask about their students' funds of knowledge, including their race, gender, background, dispositions, interests, and places students and their families go in the community, academic strengths, and the mathematical goals the teachers had for their upcoming units. I then used the information to consider possible photos for each notice/wonder routine.

Tybee Beach and Counting Collections

The following sample lesson was implemented in two 1st grade classrooms. In the initial interview, both 1st grade classroom teachers shared that their students knew how to count beyond ten, count by tens, and students knew how to decompose numbers into tens and ones within 20 from their Kindergarten experiences aligned with Common Core State Standards, K.NBT.1 (*Compose and decompose numbers from 11 to 19 into ten ones and some further ones to understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation*; NGA & CCSSM, 2010). However, their students needed further support in recognizing and explaining that ten ones were the same as one group of ten, especially when composing and decomposing two-digit numbers. Thus, this lesson aimed to understand how numbers can be composed and decomposed into tens and ones, how to describe the quantities, and what the digits represented aligning with, 1.NBT.2 (*Understand that the two digits of a two-digit number represent amounts of tens and ones*; NGA & CCSSM, 2010). Interestingly enough, both teachers mentioned that their students loved using manipulatives and hands-on activities. Overall, tools supported their students' thinking. Teachers also shared that their students enjoyed going places with their family members, like their grandma, auntie, cousins, and siblings. Aside from local stores and favorite places to eat, students always shared with their peers

during their morning meetings when students had ventured to Tybee Island for the day and what shells they may have found. For the learning goal, the knowledge students had about Tybee Beach seemed most appropriate to consider for a notice/wonder routine and the following mathematics task.

Tybee Island is a beach about an hour and 15 minutes from our community. Students love the sand, water, and, most of all, seashells. Seashells seen on the beach are scattered in various ways and make the perfect image to discuss how we can count objects when there are a lot of them in a large group. Students often need support counting items in scattered patterns or lose track of what they have counted. However, using seashells had the potential to elicit what students already knew about grouping items in different quantities (like tens) or composing ten ones into a group of ten. The image chosen for the notice/wonder routine within the lesson was a photo from Tybee Island with many seashells scattered across the sand (Figure 1). After collecting student observations and questions, teachers could follow up with questions about making tens, grouping, or counting that connect to ideas students already shared.

Figure 1. First Grade Lesson: Notice & Wonder with Tybee Beach and Counting Collections

LAUNCH

Notice/Wonder: Tybee Island Photo
(Photo Credit: Tinawit, 2020)

-Possible follow-up questions: How many seashells do you think there are? How would you count all of those? How would you group the shells to count? Tell me more about ____, What are some other things at the beach someone could put into piles and count?
-Highlight in conversation: When we count lots of things, we make piles and count the groups. We can count the piles and we can also count individual items in each pile.

Set Learning Goals and Work Expectations

EXPLORE

Counting Collections Math Task[2]

- Teacher Observation Focus: How are they counting and grouping items, how are they keeping track of what they have counted, are students working together? Are they combining groups to make larger groups?
- Potential Questions To Ask: What to ask about: How will you count this collection? Do you know how you want to start counting today? I see you are counting by 1s…Is there a faster way you could count this collection? How do you know there are __? How did you count? Can you explain? Can you show me what you did? How many groups of ____ do we have? Are your drawings the same? How are they different? Can you show me on paper how many you counted?
- Encourage partners to talk to each other:
    - I agree with you because… & I disagree with you because…

Teacher selects 2-3 students to share their work with peers during whole-class discussion

DISCUSS

Math Focus for Discussion

- *1 group of 10 is the same as ten individual ones. Sometimes counting in groups is quicker than counting 1 at a time. When a number is decomposed into tens and ones, each digit represents a quantity (i.e., In the number 26, the 2 represents 2 groups of ten or 20 ones, the 6 represents 6 ones, the digits 26 together could also be explained as 26 ones).*

Students Share Strategies

- 2-3 students share work with the whole class. Teacher uses talk moves such as agree/disagree, repeat, or add on to facilitate classroom discussion.

Re-display Notice/Wonder Photo: Tybee Island Beach

- Turn/Talk: How might knowing how to count in groups of ten be helpful when you go to the beach or playing at home or outside? What is something at home you have a lot of that you can practice putting in groups of 10?

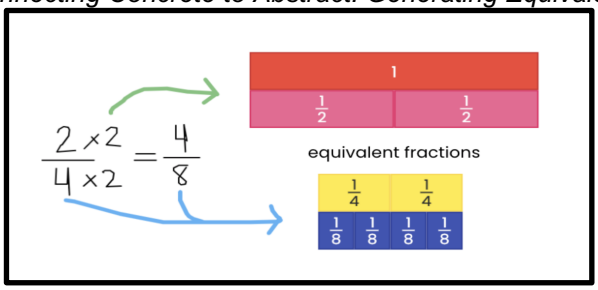
[2] Counting Collections is a math task that supports students' development of efficient counting strategies. It allows them to practice oral counting, strategically grouping objects, and recording their thinking to make it visible to others (Schwerdtfeger & Chan, 2007).

In this lesson, students ultimately could use what they already knew about Tybee Island—specifically sorting, organizing, and counting seashells—to learn more about grouping objects and describing quantities. Students could practice and develop their understanding that ten ones are also considered one group of ten, and this concept is foundational in understanding place value. After the counting in collections math task, teachers re-displayed the original notice/wonder picture, and students made connections to mathematics and discussed its application to everyday objects with which they are familiar.

Slime and Equivalent Fractions

In another sample, the following lesson was taught in a 5th grade classroom. In the initial interview with the classroom teacher, she shared the need for her students to review foundational fraction concepts like part/whole relationships and equivalent fractions. Although students explored these concepts in previous grade levels, the classroom teacher shared that review of equivalent fractions with visual models would support student learning. Specifically, 3.NF.3 (*Explain equivalence of fractions through reasoning with visual fraction models; Compare fractions by reasoning about their size*; NGA & CCSSM, 2010) and 4.NF.1 (*Explain why two or more fractions are equivalent by using visual fraction models*; NGA & CCSSM, 2010) would support students in an upcoming unit on adding and subtracting fractions with unlike denominators which aligns to 5.NF.1 (*Add and subtract fractions and mixed numbers with unlike denominators by finding a common denominator and equivalent fractions to produce like denominators*; NGA & CCSSM, 2010). Adding and subtracting fractions with unlike denominators is often taught by memorizing the procedure of "multiply the numerator and denominator by the same number to get the least common denominator." Many students use this procedure without conceptual understanding, including how equivalent fractions and the identity property of multiplication (any number multiplied by 1 result in that number) are used (Figure 2). In the interview, the classroom teacher spoke about their students' recent fascination with slime, amongst other interests and places students liked to go in the community. For the learning goal, students' knowledge about slime seemed most appropriate to consider for a notice/wonder routine.

Figure 2. Connecting Concrete to Abstract: Generating Equivalent Fractions



The latest trend amongst students nationwide is creating slime from various products ranging from glue to contact solution and adding unique elements such as glitter, beads, or food coloring. Students find countless recipe options and even triple those recipes depending on their needs. Students frequently use measuring spoons and cups or make estimates based on containers they have available. Students may also mix and match ingredients without precise measurement until their desired consistency is reached. The most common fractions seen in recipes include ½ and ¼; however, the possibilities of the unique ingredients are endless. Students may have also generated equivalent fractions informally without realizing it. For instance, a recipe called for 1 teaspoon of baking soda. A student may have only had ½ teaspoon and used two ½ teaspoons to create a whole teaspoon. Through making slime, students are also familiar with the idea that the "parts" of the recipe" will create the "whole" slime product. Thus, a photo was selected that included a visual of the part/whole relationship and various measurement tools (Figure 3).

In this lesson, students ultimately could use what they already knew about slime to learn more about generating equivalent fractions with fraction models–in preparation for adding and subtracting fractions with unlike denominators. After the lesson, teachers re-displayed the original notice/wonder picture, and students made connections to the mathematics within their slime-making recipes.

Figure 3. Fifth Grade Lesson: Notice & Wonder with Slime & Generating Equivalent Fractions

LAUNCH

Choral Count[3]: Start: 4, Stop at 64
-Stopping points: 36 and 60
-Possible questions: What patterns do you see? What number would come next/how do you know? What do you notice about the ones place? tens place? What is a multiple?
-Highlight in conversation: All are even numbers, Digits always end in 0, 2, 4, 6, 8

Notice/Wonder: Slime photo
(Photo Credit: Elmer's Glue, n.d.)

-Possible questions after student ideas: Tell me more about ____, What do you already know about making slime? What are the parts of slime? What do we usually see on measuring cups? How big do you think those cups are? How much slime do you think is in each hand?
-Highlight in conversation: Numerator, denominator, part, whole

Set Learning Goals and Work Expectations

EXPLORE

Make One Whole Activity[4]

- Possible questions as students are working: What is another way you can show the whole? How many ways can you come up with one whole? Can you write a fraction to go with your picture? I noticed you wrote _/_, what do it represent? What do you notice about the equivalent fractions you made?
- Manipulatives needed depending on group needs: Cuisenaire rods, fraction tiles, fraction circles

Teacher selects 2-3 students to share their work with peers during whole-class discussion

DISCUSS

Math Focus For Discussion

- *Understanding part/whole relationship, finding equivalent fractions and using understanding of multiples to generate equivalent fractions*

Students Share Strategies

- 2-3 students share work with the whole class. Teacher uses talk moves such as agree/disagree, repeat, or add on to facilitate classroom discussion.

Re-display Notice/Wonder Photo: Slime

- Turn/Talk: Thinking back to your slime recipes, have you made equivalent fractions? Would anyone share an example? How might knowing how to make equivalent fractions help you in making slime? Then a few students share out whole class

Perspective of Preservice Teacher Oglesby: Lessons Learned

As a preservice teacher, I was exposed to many lesson plans throughout my college experience. I knew I always wanted to be a "hands-on math teacher" but did not fully understand what that would look like in the classroom. Getting the experience to plan a notice/wonder routine within a lesson and implement that in a classroom has exposed me to what is attainable. I have seen that being attentive to students' funds of knowledge when planning mathematics lessons helps them become more engaged in the lesson, which then helps them understand the mathematics content better. At the end of the Tybee Beach lesson, I heard students talk about ten shells that could be one group and students began listing other things from their homes they could count, group, and describe. I also understand the need to go beyond surface-level connections, like using student names in word problems. While making those connections is a way to engage students, using what they already know a lot about and then helping them make connections to what we are learning in mathematics takes it a step further. One thing I plan to implement in my classroom is using a notice/wonder routine to introduce lessons. Recently, I planned a lesson focused on problem solving. When thinking about different topics for problems, I thought about a student who discussed how he loves to go to the local snow cone stand. To start my lesson, I showed a picture of this popular place in our community. Instantly, multiple students became excited. I heard gasps and discussions spark, "I have been there!" and "My favorite is the rainbow one!" After students shared their experiences, we pivoted into unpacking the word

[3] Choral counting is a number sense routine that supports sense-making and problem solving by exploring patterns and relationships of numbers (Turrou et al., 2017).
[4] The Make One Whole Activity was downloaded free from k-5mathteachingresources.com. To access the task, hover over "Number," then "3rd grade," and scroll down to NF.3 standards to select the task.

problem. A conversation about the snow cone place helped students use context to solve the word problem instead of relying on key words. I also noticed that being able to pick out specific interests and experiences of individual students and incorporate them into a notice/wonder routine helped engage students in the lesson. The notice/wonder routine also contributed to building a classroom community. I have also observed that when the use of notice/wonder is established, it becomes easier to incorporate every student, including their cultural backgrounds and experiences.

Perspective of Teacher Educator Smithey: Lessons Learned

As a teacher educator the experience of collaborating with classroom teachers, planning lessons, and observing preservice teachers work with students during the implementation of these lesson has made me consider two key ideas. First, there is a distinction between connecting mathematics to "things students like" and allowing students to use bodies of knowledge they have to learn mathematics. Starting a lesson using a notice/wonder routine allowed students to consider what they already knew to prepare them for the mathematics task to follow. However, it is essential that students then use that knowledge in the mathematics task itself and are aware of how it connects. If teaching these lessons again, it would be essential to support students in naming the knowledge they used and how they expanded upon that knowledge instead of assuming students made that connection. This idea is important because students should see the value in what they know from their own experiences and see themselves as someone who can do math (Rhodes et al., 2023). The second key idea I took away from the overall planning and observing of these lessons is that classroom teachers often use students as sources of information. As a teacher educator, I learned about students from the classroom teacher however, I could have sought further information from the students themselves by asking various follow-up questions for a deeper understanding of their funds of knowledge (Foote et al., 2015). Further, using families as resources and sources of information may be something else to consider to better understand students' bodies of knowledge. For instance, a Google form or a message sent in the chat feature of a classroom communication app could have been helpful for families to share and submit potential photos or ideas. As teachers, we could have then used their resources in lesson planning such as preparing a notice/wonder routine.

In essence, our students and their families are resources of tremendous bodies of knowledge that we, as educators, can harness and use in the classroom as we explore ways to ignite curiosity about mathematics. We can explore what those bodies of knowledge are by listening and asking questions not just about our students but their families. The notice/wonder routine not only allows space for students to be curious but also makes visible the knowledge they have as we support students in connecting that intelligence to everyday curricular materials.

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Applying for NCCTM Mini-grants

NCCTM provides funding for North Carolina teachers as they develop activities to enhance mathematics education. This program will provide funds for special projects and research that enhances the teaching, learning, and enjoyment of mathematics. There is no preconceived criterion for projects except that students should receive an on-going benefit from the grant. In recent years, grants averaged just less than $800. The application is available on the NCCTM website [ncctm.org]. Proposals must be postmarked or emailed by September 15, and proposals selected for funding will receive funds in early November. Be sure that your NCCTM membership is current and active for the upcoming year! Each year we have applications that cannot be considered because of the membership requirement. Email Joy McCormick [jmccormick@rock.k12.nc.us] with questions.

Rankin Award Nominations

The Rankin Award is designed to recognize and honor individuals for their outstanding contributions to NCCTM and to mathematics education in North Carolina. Presented in the fall at the State Mathematics Conference, the award, named in memory of W. W. Rankin, Professor of Mathematics at Duke University, is the highest honor NCCTM can bestow upon an individual.

The nomination form can be obtained from the “awards” area of the NCCTM Website, www.ncctm.org. More information can be obtained from Emogene Kernodle, nekernodle@yahoo.com.

Innovator Award Nominations

The North Carolina Council of Teachers of Mathematics accepts nominations for the Innovator Award at any time. The Committee encourages the nomination of organizations as well as individuals. Any NCCTM member may submit nominations. The nomination form can be obtained from the “awards” area of the NCCTM Website, www.ncctm.org. More information can be obtained from: Dr Ana Floyd, afloyd@randolph.k12.nc.us.

Problem Solving Through a Social Justice Lens

Alesia Mickle Moldavan and Montana Smithey, Georgia Southern University

The authors share an activity that focuses on a topic in social justice and includes an interdisciplinary connection to a literacy text.

Connecting problem solving through a social justice lens in elementary settings can be challenging. One way to make meaningful connections is by centering problem-solving contexts with real-life issues of injustice, such as inequities related to race, gender, ability, socioeconomic status, healthcare, climate, immigration, food insecurity, voting rights, and others. When students have opportunities to use mathematics as a tool to examine and confront inequities in and around their communities, they can see direct connections between skills learned in classrooms and real-world applications (Gutstein, 2006). To guide social justice lessons, teachers can reference the Learning for Justice (2016) standards, which detail domains targeting issues of identity, diversity, justice, and action with developmentally appropriate learning outcomes. In this article, we pose reflection questions teachers can ask themselves when considering ways to teach problem solving through a social justice lens. We also share a social justice lesson designed for use in a fourth-grade mathematics classroom, printed in its entirety at the end of this article. The lesson is organized into three parts, highlights an interdisciplinary connection to a literacy text, and addresses solving multistep word problems using four operations (Common Core Mathematics Standard 4.OA.A.3; NGA & CCSSM, 2010).

Making Meaningful Connections to Social Justice Issues

A social justice lens can be used to teach mathematics to empower students to examine and challenge inequities using mathematical skills and critical thinking (Berry et al., 2020). Balancing mathematical and social justice pedagogical goals when planning lessons must be considered if teachers aim to make meaningful connections (Bartell, 2013). When students generate social and mathematical understanding that leads to action and public products, they can begin to develop their mathematical consciousness to see value in actionable change that embraces identity and diversity and, ultimately, disrupts biases and inequities (Kokka, 2020). Well-designed lessons that offer rich mathematical experiences and opportunities to develop mathematical consciousness can be challenging to conceptualize. Table 1 suggests reflection questions teachers can ask themselves when considering ways to teach problem solving through a social justice lens. We also recommend referencing additional texts (see Bartell et al., 2022; Koestler et al., 2022) to learn more ways to teach social justice in elementary settings.

Elementary-aged students have knowledge and experiences with social issues, so it is not too young in elementary settings to begin the conversation (Chao & Jones, 2016). Once a social justice issue is identified, it is important to unpack the biases and stereotypes associated and create a space of respect for learning about historically marginalized identities and perspectives. Studying ways to develop classroom norms and equity-based practices supportive of creating cultures of respect for identity and diversity can be helpful (see Aguirre et al., 2013; Rhodes et al., 2023). It is necessary to acknowledge that such lessons might evoke controversy and discomfort for students and teachers, especially when challenging the status quo. Knowing what social and emotional supports are needed during instruction is vital to prepare learning environments to explore social justice issues. Teachers know their students best, so they must consider potential reactions and anticipate support that may (or may not) be needed. Furthermore, to critique and disrupt particular social justice issues, it is important to gain collective support from the students, families, and communities involved by focusing on topics that are important to them.

Table 1: Reflection Questions for Teaching Problem Solving through a Social Justice Lens

Stage of Lesson	Guiding Questions for Reflection
Design	● What is a social justice issue that is relevant to my students? ● How do the lesson's learning goals support mathematical problem solving that can be used to examine social justice issues? ● How does the lesson design personally and meaningfully connect to my students? ● How can the design of the lesson inform my students' next steps to plan and carry out collective action against inequities?
Implementation	● How can lesson implementation prompt my students to contextualize mathematics skills and ideas to solve real-world problems? ● How can my students use mathematics to create visual representations to model a situation and elicit varied problem-solving strategies to prompt multiple solution approaches? ● What explicit connections can be made during instruction to encourage my students to use mathematics to examine and critique social justice issues? ● How will my students be empowered during the lesson to make sense of their mathematical identity and see their role and responsibility in advocating for social justice?
Evaluation	● How can my students use the lesson to guide self-assessment and reflection tied to the learning goals? ● How can feedback from the lesson encourage my students to see how mathematics can be used to decide when and how to stand against injustices and inequities? ● How can student work be used to help students take action?

Conceptualizing the Lesson "Math from Everywhere"

We designed a fourth-grade lesson called "Math from Everywhere" for a rural, Title-1 elementary school in the southeast. The lesson launched (Part I) with a Notice and Wonder activity accessing students' prior knowledge when reviewing a photo array of societal inequities. After a prompted discussion, students read Romito's (2018) "Pies from Nowhere: How Georgia Gilmore Sustained the Montgomery Bus Boycott" as an entry point for students to examine issues of racism and discrimination. By using a text with storytelling emphasizing diverse representations of characters, contexts, and historical events, our lesson could invite students to challenge perspectives traditionally representing a white, westernized, and colonized lens. Students used the text to summarize and reflect on ways the bus boycott illustrated key elements in achieving social transformation led by a group of Black women who planned collective action against racial bias and discrimination.

In Part II, students worked through two sample word problems referencing real-life examples using problem solving to raise money for a cause. Then, students were asked to create their own word problems to raise awareness and money for causes important to their families and communities. Students answered their word problem and shared one solution strategy and/or a sample model representation. The word problems focused on providing students with opportunities to solve multistep word problems using four operations (Common Core Mathematics Standards 4.OA.A.3; NGA & CCSSM, 2010). Students made sense of problems and persevered in solving them as well as modeled with mathematics (MP1 and MP4, respectively).

In Part III, students worked with a group to create their own Cause Flyer to present their fundraising project to the class/school. Their flyer incorporated creativity and writing opportunities to encourage interdisciplinary connections to ELA. To accompany their flyer, students rewrote their word problems and solutions from Part II, given the peer and teacher feedback received. When finished, students shared their flyers with the class, voted on what event to implement as a class fundraiser, and presented their ideas to the principal to initiate support from the PTA and/or local fundraising groups. This part of the lesson invited students to share how they recognized unfairness and addressed ways to plan and carry out collective action to fight injustice (Justice 12 and Action 20 standards, respectively; Learning for Justice, 2016).

While developing the social justice lesson, we worked with the teacher to receive feedback on the design. We noted the teacher's shared insights about her students' prior knowledge and experiences discussing racism and discrimination across interdisciplinary contexts (e.g., social studies) and how the classroom norms would create a space to explore social justice issues. We wanted to create a lesson that connected challenging mathematics content

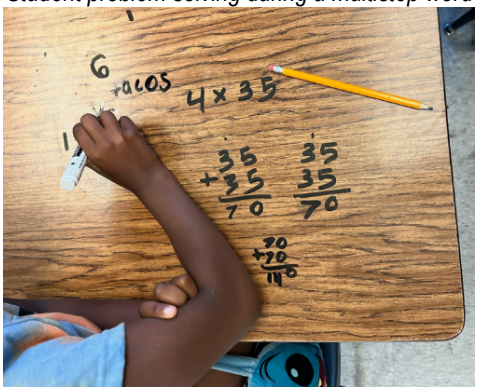
to real-life applications. Students could raise awareness for causes that were meaningful to them and contribute an action plan for serving as an advocate for others. They could see ways mathematics could guide and justify their action plan and positively impact their communities. Additionally, they could use skills learned in the lesson to continue developing their mathematical consciousness by building on opportunities to critique and self-reflect about equity.

Lessons Learned

Social justice lessons that engage students in learning opportunities that help develop their criticality toward injustices and establish their mathematical agency can be used to support student reflection on ways to take action that advocates for themselves and others. The social justice lesson shared provides an example of ways to engage students in learning about inequities, like racism and discrimination, and how advocates can fight injustice. When we launched the social justice lesson, we were surprised to see how easily and passionately the fourth graders identified inequities in the photo array. In the photos shared, students identified issues of inaccessibility to a ramp (ability), food disparities (socioeconomic status), and a historical picture of segregated water fountains (race). When asked how the photos reminded students of inequities in their contexts, they felt comfortable sharing their experiences and witnesses of others in the community. The students began to brainstorm solutions that could be offered to people in the described solutions, commenting on ways they could help or how others could help (e.g., local organizations). For instance, one student shared how she visits a clothes closet run at her church. Another student reflected on how he and his family collect toys in his neighborhood to distribute to families who cannot afford to buy gifts during holidays. Having students feel comfortable openly sharing their observations and reactions to injustices showed established classroom community norms as well as student interest and investment in the lesson. Furthermore, students displayed their willingness to engage as confident, critical thinkers.

As students read Romito's (2018) text, they responded to the storyline by empathizing with the main characters faced with racial discrimination, being critical of those perpetuating stereotypes, and being excited for and passionate about those who took civic responsibility. This commitment extended to the sample problems, where students showed interest in choosing meaningful causes in their own lives and using mathematics to solve real-life problems. While creating their own word problems, students learned about each other's lives, including personal encounters with unfairness and how students may be able to help one another to create positive changes. For instance, one student shared how his mother recently battled breast cancer. He wished to create a fundraiser to support others fighting breast cancer by selling tacos and quesadillas, two cultural meals his mother loved to make. Other students in his group rallied around his fundraising mission and asked him questions about Mexican sauces and types of tacos and quesadillas. The students calculated how many tacos and quesadillas would need to be made with considerations to the fundraising goal and how much the ingredients would cost (Figure 1). The multistep word problem provided a mathematical challenge for the students, but they showed determination to tackle the real-world problem for a cause important to their peers.

Figure 1. Student problem solving during a multistep word problem.



The lesson ended (Part III) with an opportunity for students to formally present their fundraising idea with a Cause Flyer. When evaluating student performance in the lesson, the focus was placed on the mathematics content

and the product being created. The product served to create an action plan to disrupt biases and inequities as well as advocate for social change. Students proudly shared their work with the class and became eager to convince the class to choose their cause. While we could not support the students in enacting their action plan due to the lesson's implementation at the end of the school year, we wish to coordinate this part of the lesson with the PTA and/or local fundraising organizations for the next school year. Helping students to see that their action plan contributes to social change is an important next step for us.

Conclusions

Lessons grounded in theories of equity and justice can affirm the benefits of teaching mathematics and social justice together. In particular, social justice lessons can offer students various ways to represent their problem-solving strategies and provide continued learning opportunities outside the classroom. Additionally, social justice lessons engage students in robust problem solving that makes meaningful connections to solve real-world problems, which is important to conceptually developing a deeper understanding of mathematics (National Council of Teachers of Mathematics, 2014, 2020). In this article, we shared an example social justice lesson and suggested reflection questions teachers can consider when teaching problem solving through a social justice lens. We hope these tools inspire teachers to teach for social justice in their contexts. Doing so will help empower students as citizens who can lead efforts to challenge and dismantle social disparities.

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Math from Everywhere Task

Standards:

- CCSS.MATH.CONTENT.4.OA.A.3: Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- CCSS.MATH.PRACTICE.MP1: Make sense of problems and persevere in solving them.
- CCSS.MATH.PRACTICE.MP4: Model with mathematics.
- Justice 12: Students will recognize unfairness on the individual level (e.g., biased speech) and injustice at the institutional or systemic level (e.g., discrimination).
- Action 20: Students will plan and carry out collective action against bias and injustice in the world and will evaluate what strategies are more effective.

Part I: Launch Reading

Launch the task by asking students to engage in a Notice and Wonder activity where they must access their prior knowledge when reviewing a photo array of societal issues. Ask students to discuss what resources are not available to the people in the photos and how the photos remind students of inequities in their contexts. After students share their observations, pose the following questions:

1. What solutions could be offered to the people in the described situations?
2. Are there people or organizations trying to aid these people?
3. How might you help these people?

Then, read Romito's (2018) "Pies from Nowhere: How Georgia Gilmore Sustained the Montgomery Bus Boycott." Have students discuss how this book recounts the historical event of the Montgomery Bus Boycott from Georgia Gilmore's role. Note how the bus boycott illustrates key elements in achieving social transformation led by a group of Black women who planned collective action against racial bias and discrimination.

Part II: Problem Solving for a Cause

Building from Part 1's discussion, have students work through the two sample problems. Then, students will work in groups to design their own word problems.

Problem 1: A group of friends wants to raise money to participate in a Cystic Fibrosis fundraising walk to raise money for children who do not have access to medicine due to financial hardship. The friends thought it would be nice to make a lemonade stand since it was a hot summer day. When sold, one cup of yellow lemonade had a profit of $2, and one cup of pink lemonade had a profit of $3. Solve the following problems:

a. One pitcher of lemonade makes 4 cups. How much money will they raise if they sell one pitcher of yellow lemonade? What about one pitcher of pink lemonade?
b. At the end of the day, the friends sold 4 pitchers of yellow lemonade and 6 pitchers of pink lemonade. How much money did they raise in total?

Problem 2: A boy scout troop is hosting a car wash to raise money to send bottled water to families displaced due to forest fires. It will cost $75 to supply materials for the car wash (e.g., buckets, soap, sponges, towels). The boy scouts plan to collect $20 for each car they wash.

a. How many cars would they need to wash to raise the following amounts: (a) $675 and (b) $1,000? Be sure to note any remainders and what that means for justifying the solution.

Your Turn: With your group, design a word problem to raise awareness and money for a cause that interests you. To help write your word problem, answer the following questions:

a. What is your cause? Why is the cause important to you?
b. What product do you wish to sell or serve?
c. How much does it cost to create the product or do the service?
d. How much money must you raise to meet your fundraising goal?

Students must write their word problem referencing their fundraising goal. Then, they must answer their own word problem sharing one solution strategy and/or a sample model representation. Students can be encouraged to exchange their word problems with each other to see how others share their problem-solving strategies.

Part III: Planning for a Fundraiser

Building on Problem 3 of Part 2, students will work with a group to create their own Cause Flyer to present their fundraising project to the class/school.

1. The Cause Flyer will be an infographic that can be shared as a social media post or printed to hang at local organizations and stores. The Cause Flyer must include information about the fundraising event addressing the following:
    a. A title
    b. Time, date, and location of the event
    c. What will you be selling or providing a service of? How much will it cost?
    d. Who are you raising money for? What fundraising goals do you have?
2. To accompany the Cause Flyer, students will rewrite their word problem and solution, making any revisions given peer and/or teacher feedback.
3. Students will share their Cause Flyer with the class. The class will vote on what event to select as their class fundraiser. Students will discuss what plans need to be made to implement the fundraiser. Students will compile these ideas into a class presentation to share with the principal, PTA, and/or local fundraising groups.

Trust Fund Scholarships: $1000

Scholarships are available from NCCTM to financially support North Carolina teachers who are enrolled in graduate degree programs to enhance mathematics instruction. Applicants must be:

- Currently employed as a pre-K-12 teacher in North Carolina;
- Currently an NCCTM member (for at least one year) at the time of submitting the application;
- Currently enrolled in an accredited graduate program in North Carolina;
- Seeking support for a mathematics or mathematics education course in which they are currently enrolled or have completed within the previous four months of the application deadline.

Applications will be reviewed biannually, and the deadlines for applications are March 1 and October 1. The application can be downloaded from the NCCTM website under the “grants & scholarships” link. The nomination form can be obtained from the grants and scholarships page on the NCCTM Website (ncctm.org). More information can be obtained from: Janice Richardson Plumblee, richards@elon.edu.

Donating to the NCCTM Trust Fund

Did you receive a Trust Fund Scholarship that helped you to complete your graduate coursework and you want to show appreciation? Do you wish to memorialize or honor someone important to you and your career as a math teacher?

Consider making a donation to the NCCTM Trust Fund, please send your donation, payable to Pershing LLC for the NCCTM Trust Fund, to:

Joette Midgett
North Carolina Council of Teachers of Mathematics
P. O. Box 33313
Raleigh, NC 27636

2023 Outstanding Teachers

Reported by Denise Schulz, NCDPI

Each year, principals are encouraged to nominate the teacher who does the most effective job teaching mathematics in their school. From those nominated, each LEA selects one teacher to represent the best in mathematics teaching from the entire system. The teacher receives a membership in NCCTM, recognition at the State Conference, and a special memento of the occasion. The grade level cycles, and Outstanding Secondary Teachers were honored this year.

Pictured: Outstanding Secondary Teachers who were present at the Awards Ceremony in November

Congratulations to these outstanding teachers!

Karen Rhea, Alamance-Burlington
Jim Brown, Alleghany
Rebekah Robbins, Asheboro City
Hank Williams, Avery
Tina Petty, Beaufort
Tammy Jernigan, Bertie
Paige Priest, Bladen
Holli Hudson, Brunswick
Dawn Baker , Burke
Jenny McCarthy, Cabarrus
Shawna Greeno-Bridges, Caldwell
Lindsey Fodrie, Carteret
Heather Anderson, Chapel Hill-Carrboro
Larkin Smith, Charlotte-Mecklenburg
Matt DeCerbo, Chatham
Cierra Roberts, Cherokee
Brenda Puett, Clay
Noa Chavez, Columbus
Heidi Helms, Craven
Elwanda McLaurin, Cumberland
Kim Odum, Davidson
Shannon Byrum, Edenton-Chowan
Peter-Gay Ferguson, Elizabeth City-Pasquotank
Kathleen Harrison, Franklin
Amber Carpenter, Gaston
Freda LeMay, Granville
Ricardo Arias Ruiz, Greene
Mason Kelly, Guilford
Margaret McDade, Henderson
April Kauffman, Hickory City
Shea Youell, Hyde
Amanda Moore, Iredell-Statesville
Kathryn Ray, Jackson

Kelly Bradshaw, Johnston
Jeremy Thiel, Kannapolis City
Tonnette Wicker, Lee
Pauline Lindo, Lenoir
Patti Elkin, Macon
MaryAnn Basney, McDowell
Brittany Jarrett, Mitchell
Christy McIntyre, Montgomery
Michael Micklow, Mooresville Graded
Diane Renck, Nash-Rocky Mount
Deborah Kellogg, Newton Conover City
Jason Throckmorton, Pender
Tyler Bridgers, Perquimans
Kristen Korzelius, Polk
Ashley Lynch, Roanoke Rapids City
Katherine Griswold, Robeson
Robin Hayden, Rockingham
Amanda Carter, Roxboro Community School
Education Region 3
Tanya Klanert, Rutherford
Emily Johnson, Surry
Jennifer Oetting, Swain
Adria Hardy, Transylvania
Jennifer Brickhouse, Tyrrell
Sarah Lefebvre, Union
Katherine Kirby Griffin, Wake
Clarice Johnson, Washington
Leigh Worrell, Wayne
Annabelle Anderton, Weldon City
Shanna Hawkins, Wilkes
Lee Ann Snyder, Winston-Salem/Forsyth
Lori Maske, Yadkin
April Buchanan, Yancey

2023 Lee Stiff Instructional Leader Award

Dr. Solomon Lee Willis

Reported by Ana Floyd, Randolph County School System, Asheboro NC

The purpose of the Lee Stiff Instructional Leader of Mathematics Teaching Award is to recognize an individual who has made an outstanding and noteworthy contribution to mathematics education and NCCTM by working directly with classroom teachers to improve student learning of mathematics. This year's award posthumously honors **Dr. Solomon Lee Willis**, former Mathematics and Education Department Chair at Cleveland Community College.

Solomon Willis taught mathematics for over 20 years. He began his career as a math teacher at Burns Middle School, after completing his bachelor's degree at Gardner-Webb University. He was later employed as a middle and high school math teacher at Gaston Day School, during which he also became a department chair and completed his master's degree at Appalachian State University. Solomon transitioned to Cleveland Community College in 2002 where he served as a full-time professor, a coordinator for developmental math, and a Department Chair. He later earned his doctorate in Curriculum and Instruction at Liberty University.

Solomon was a model in the classroom. He spent a large amount of time adjusting curriculum needs to students and utilized instructional strategies to establish solid foundations for beginning mathematics courses. He was known to work tirelessly, and he often reached out to students who may be on the cusp of passing a course in order to provide them with the full opportunity towards success. Solomon exemplified the role of a coach, mentor, and instructional leader, regularly serving as a mentor to new and seasoned instructors both in and outside his department. He conducted many workshops and presented at state and regional NCCTM events, as well as NCTM, T-Cubed, and Cengage Learning. He was a board member and contributor for NCCTM's journal, *The Centroid*.

Dr. Willis passed away in February 2023, before he could be informed of the award. His contributions to NCCTM and to mathematics education will be greatly missed.

2023 Outstanding Math Contest Coach's Award

Amanda Gerken

Reported by Ana Floyd, Randolph County School System, Asheboro NC

The purpose of The Outstanding Math Contest Coach's Award is to recognize and reward an individual who has made an outstanding and noteworthy contribution to mathematics education and NCCTM by having formed, coached, or sponsored teams or groups of students in mathematics competitions. We are pleased to recognize **Amanda Gerken**, an AIG specialist at Hickory Public Schools (pictured with NCCTM President Karen McPherson).

Prior to entering her role as AIG specialist, Amanda was a Math 1/8th grade math teacher at Northview Middle School. In that role she cultivated a love of math in her students, encouraged competitive problem solving and inspired students' love of competition throughout their high school career. While at Northview Middle, her teams consistently ranked in the top 5 places at MathCounts and earned top places at the ASU Level 1 and Lenoir-Rhyne Level 2 contests. Not only does Amanda cultivate a love of mathematics in her students, she cultivates it in her colleagues as well. One nominator (from a school in the same school system) remarked that Amanda encouraged her to create teams at her own school. Now, even in her current position as AIG specialist, Amanda strives to make both middle schools in her system equally competitive in as many math contests as possible. She meets weekly with groups of students from each grade level at each school who are interested in competing. She makes the practices fun and competitive. The students love these meetings! Even though the two school teams compete against each other, she always promotes that in the end they are "one team" from Hickory Public Schools, and they cheer each other's successes.

2023 Innovator Award Winners

Dr. Joshua Griffin and Project Math Success

Reported by Ana Floyd, Randolph County Schools, Asheboro NC

The purpose of the Innovator award is to recognize and reward individuals or groups who have made an outstanding and noteworthy contribution to mathematics education and NCCTM by having founded, initiated, pioneered, or developed some program in mathematics education of service to a geographic region of the state or the entire state.

NCCTM proudly recognizes **Joshua Griffin** (pictured with President Karen McPherson) as a 2023 NCCTM Innovator for his innovative and collaborative efforts to connect teaching and assessment in the state of North Carolina. Josh was a high school mathematics teacher for 6.5 years in Wake County before deciding to leave the classroom. He applied for a job with the NCDPI Division of Testing and School Accountability to both learn about and be involved with test development and implementation at the state level. In 2015, he took the Test Measurement Specialist position at NCDPI where he led the creation of summative mathematics assessments from grades 3 to pre-calculus. He is currently the Director of Testing and Accountability for Franklin County Schools.

Josh was interactive with the teaching community and instrumental in helping teachers and administrators better understand how standards were being tested. He provided critical insight on assessment development to public school educators and mediated between mathematics educators and NCDPI assessment, and he was willing to share important information with educators across the state so that assessment could inform teaching.

Josh has also been an asset to the NC2ML (North Carolina Collaborative for Mathematical Learning) community. He met with NC2ML teams during the creation of the Instructional Frameworks to explain the process of creating assessments and the ways in which such documents would be used in the process. As such, he was instrumental in ensuring that the development of the NC Check-Ins would align with the Instructional Frameworks that NC teachers had worked so hard to develop. One nominator stated, “We feel strongly that Josh Griffin is an outstanding nomination for the NCCTM Innovator Award. It is rare to find someone so willing to help bridge the gap between policymakers/test designers and public schools. Such bridge building is innovative in this state.”

NCCTM proudly recognizes **Project Math Success** for a 2023 NCCTM Innovator Award for their efforts to support secondary mathematics students. Project Math Success is a strategic partnership between Guilford County Schools and North Carolina A&T University (pictured: project leaders Thomas Coleman and Paula Price with NCCTM President Karen McPherson). The goal of this project is to increase educational equity within secondary mathematics through the purposeful enactment of high impact tutoring. Project Math Success leverages the content expertise of NC A&T graduate students in non-education degree programs such as engineering, computer science, and information technology to provide students in Guilford County additional, effective mathematics tutoring.

Project Math Success purposefully recruits racially and ethnically diverse tutors from NC A&T. These tutors engage in continuous professional development surrounding pedagogical best practices that are vital to providing high impact tutoring. They act as mentors and provide opportunities for diverse secondary students to form relationships with similarly diverse instructors currently in graduate school. Given the disproportionately low diversity present within the teacher workforce, increasing representation in this way is an important feature of the project. The project hopes to encourage tutors to continue to be involved with education. One such tutor stated: “I think the Project Math Success program is an amazing program for both the students and the tutors. Through the Professional Development materials, tutors can learn and put to practice this knowledge to impact the lives of the students.”

Under the leadership of Dr. Thomas Coleman, Dr. Faith Freeman, Dr. Paula Price, and Kara Hamilton, this innovative partnership has resulted in initial positive student outcomes, as well as widespread support from students, school administrators, and families. It has also garnered national attention as a model for enacting high impact tutoring.

2023 Rankin Award Winners

Sandra "Sandy" Watson Childrey and Ana Lupton Floyd

Reported by Emogene Kernodle, Elon NC

NCCTM is pleased to announce recipients of the prestigious W. W. Rankin Memorial Award for Excellence in Mathematics Education, the highest honor that NCCTM can bestow upon an individual. At the 2023 State Mathematics Conference in November, NCCTM honored two dedicated individuals: **Sandra "Sandy" Watson Childrey and Dr. Ana Lupton Floyd**.

Sandy Childrey began teaching high school in the late 80's with a very challenging load, but faced it each day with a smile on her face and positive attitude. She moved on and developed a passion to teach middle grades mathematics, and she has also taught science and added certification in learning and mental disabilities.

A supporter states that when she observed Sandy's classroom it was full of energy and engagement. The students demonstrated a deep understanding of the mathematics being discussed and the culture of the room was one of support and encouragement. While serving as department chair, Sandy was thinking ahead and questioned if new initiatives were reasonable for the math department and how the new initiatives would impact student learning with fidelity and with the most benefit to the students. She is a tireless student advocate and shares resources developed to keep up with IEP and 504 accommodations.

Sandy received National Board Certification in Early Adolescence Mathematics in 1999 and has successfully renewed this certification twice. She was one of the team members who co-authored the NCTM Middle Grades Geometry Navigation book. She served several terms on the NCCTM Board of Directors and has been a frequent speaker at the state math conferences. But probably the greatest contribution to NCCTM is chairing the NCCTM Mini-grants committee, which supports teacher innovation. During the many years of this chairmanship, the process was converted from the paper and pencil application to an electronic application. This was accomplished very smoothly by careful planning and clear communication. One letter in support of this nomination to the Rankin Award Committee, shared the following qualities: a positive attitude, a continued professional commitment to growth, and an obvious joy of teaching.

Ana Floyd is an Elementary Math Specialist for Asheboro City Schools and has been an active member of NCCTM, serving on a variety of committees and serving in many offices. She has willingly volunteered time to the NCCTM organization since entering the teaching profession and has remained a loyal and contributing member. She has presented at each of the NCCTM conferences since 2004 as well as serving multiple times on the NCCTM Board of Directors and Executive Board.

Ana has been a writer and collaborator on numerous state projects. She was a writer for the revised NCDPI Mathematics Strategies, the Partners grant projects, the formative assessment grant, and the TAP Math grant. The materials and professional development from these grants transformed thousands of North Carolina teachers! She served on the standard revision team for third through fifth grade prior to the adoption of the 2018 Standard Course of Study and co-authored, reviewed, and provided feedback for the K-5 Mathematics Unpacking Documents. She was a lead author and professional development facilitator of the fourth grade Tools4NCTeachers grant and served as a member of the North Carolina Collaborative for Mathematics Learning Instructional Framework group providing feedback and helping to determine which standards would be grouped into clusters.

The nominator states "Ana is a passionate mathematics educator and a consummate professional. One who has dedicated life's work to helping elementary teachers understand the mathematics they are teaching, ensuring students have opportunities to reason and make sense of the mathematics they are learning, and creating resources and providing professional development that is grounded in the decades of research promoted by NCTM. Her handprint is all over elementary mathematics teaching and learning across the state of North Carolina and we are a better community of learners because of it!"

Problems2Ponder

Holly Hirst, Appalachian State University, Boone, NC

In each issue of The Centroid, Problems2Ponder presents problems similar to those students might encounter during elementary and middle school Olympiad contests. Student solution submissions are welcome as are problem submissions from teachers. Please consider submitting a problem or a solution. Enjoy!

Problem or solution submissions: If you have an idea for a problem or a student creates a particularly well explained solution, we will publish it. Email Holly Hirst (hirsthp@appstate.edu) a typed or neatly written problem or solution. Include your name and school so that we can credit you. For student solutions, include the grade level of the student(s), the name of the student(s) if permission is given to publish the students' names, and the name of the teacher.

Spring 2024 P2P Problems

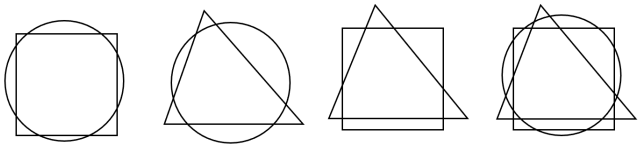
Problem A: We call a number *funny* if it is the product of three prime numbers, two of which are the same e.g.,12 = 2x2x3 Is funny). How many funny numbers are between 30 and 60?

Problem B: 1x1x1 blocks will be placed in a 4x4x4 box with an open top. A red block is placed in the corner of the box. Then the least number of green blocks needed to hide the red block from view are placed in the box. Lastly the least number of yellow blocks needed to hide the green blocks from view are placed in the box. After this, how many blocks are in the box?

Fall 2023 P2P Problems

Problem A: A circle, triangle, and square are drawn on a piece of paper. No side of the square is all or part of the triangle. What is the greatest number of points of intersection?

Solution: Consider each pair, separately. As pictured below, a circle and square can intersect at most 8 times; A triangle and circle 6; and a triangle and square 6. Thus, the solution cannot be more than 8+6+6. Drawing the three carefully shows we can avoid any intersections lining up so that answer is exactly 8+6+6 = 20.



3			
	1		
5	*		*
		16	

Problem B: Each number from 1 to 16 is written, one to a box in the grid shown. The numbers fall on a path with consecutive numbers in adjacent boxes horizontally and vertically (not diagonally). Given the four numbers shown, find the sum of the numbers in the starred boxes.

Solution: There are multiple ways to determine the answer. Let's start with a square for which there is only one choice: 4 must be between 3 and 5, which means that 2 must be in the square to the right of 3. Then 6 must be below 5 rather than to the right of 5, because the position of the number 16 means that otherwise the space below 5 would be a dead end with a number less than 16. To continue, 7 must be next to 6 and 8 above 7. Once again, the position of 16 next forces 10 to be above 9 (rather than to the right of 9). Continuing on, we find that final positions (in red) imply that the sum of the numbers in the starred boxes is 8+14 = 22.

3	2	11	12
4	1	10	13
5	* 8	9	* 14
6	7	16	15

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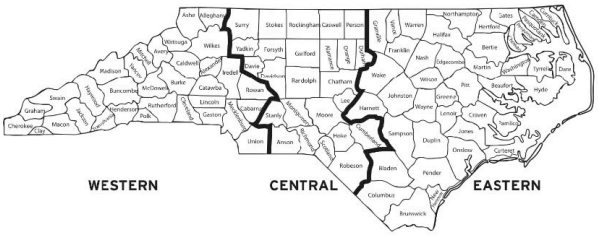

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