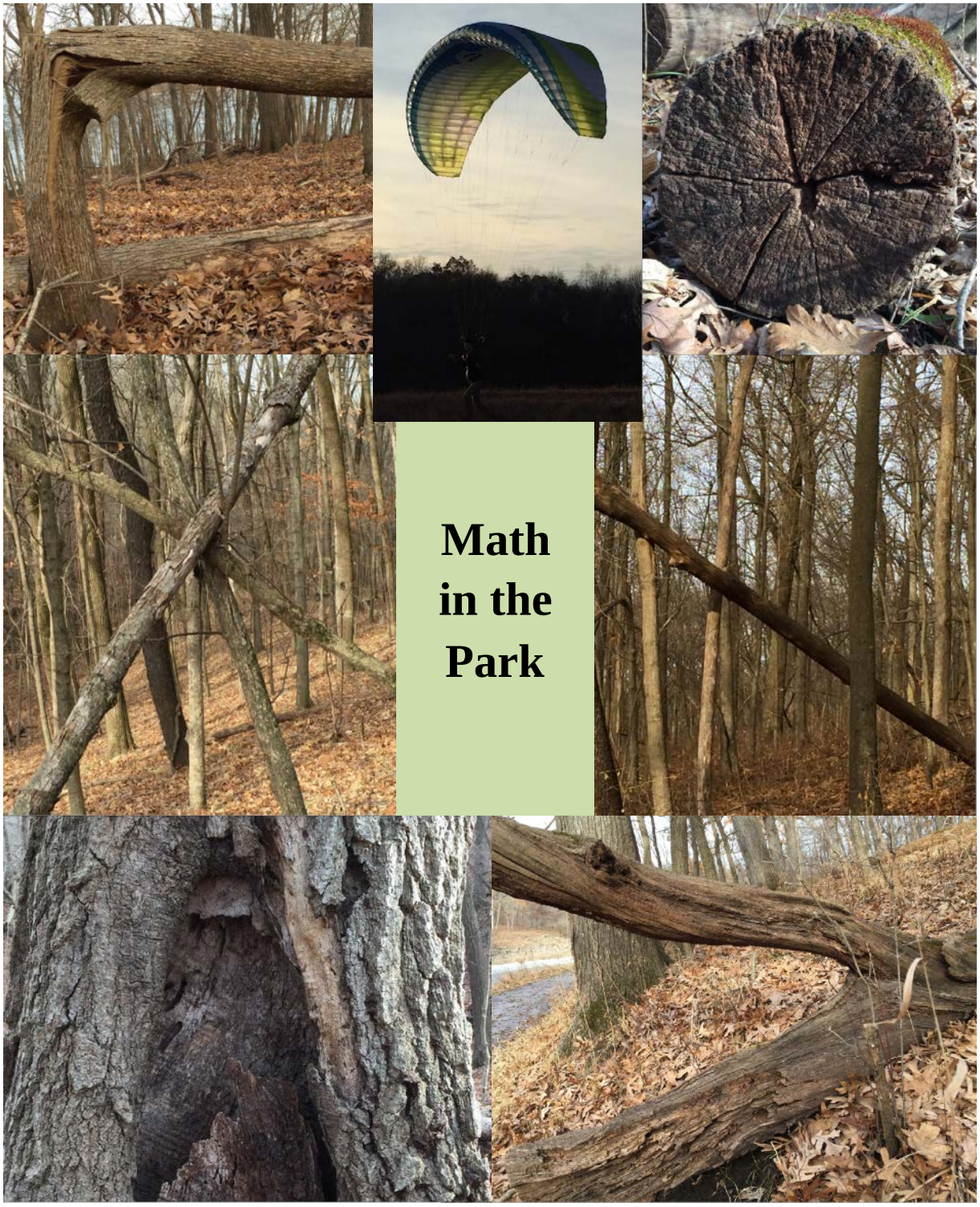
Iowa Council of
Teachers of Mathematics

Journal

Volume 43 Winter 2019-20



Iowa Council of Teachers of Mathematics Journal

Iowa Council of Teachers Of Mathematics

52nd Annual Conference

October 12, 2020

7:30–4:00

Valley High School

West Des Moines, Iowa

Pre-Conference Evening for Preservice Teachers is Sunday evening before the conference

Keynote Speakers

Jon Sangiovanni

Pam Weber Harris

Focus on the Future

20/20 Vision

Watch for information at
www.iowamath.org

J.R. Zietler, Bloomfield

About this issue…

Once again we have had some great articles submitted for our ICTM Journal. Educators from all across Iowa and beyond have shared their ideas and successes with us.

Please feel free to send an email with ideas or suggestions that you have for future issues of the journal. We are here to serve you and would love to hear from you. If you would like to contribute an article for the Journal, now is the time to be thinking about the next issue. Article submissions may be as short as one page or as long as twelve pages.

The *ICTM Journal* is written by and for our state's mathematics educators. While brief reports of research can be valuable and might be published, a focus on classroom practices and challenges to inspire readers to try something new that might contribute to students' learning is preferred. As you write or edit a manuscript to submit to the *Journal*, keep the interests of our readers in mind.

Additionally, please consider the following **guidelines for manuscripts**, adapted from those of NCTM, before submitting your work.

1. Feature manuscripts should be between 1000 and 2000 words, not including tables and figures. Include a reasonable number of tables and figures selected as essential to understanding.
2. Please use Microsoft Word size 12 Times New Roman or Trebuchet MS size 11 fonts.
3. Use double spacing for all material, including quoted matter, lists, tables, notes, references, and bibliographies.
4. Be certain of permission for use of photos and student work.
5. Leave margins of 1 inch on the sides, top, and bottom of each page.
6. Indicate a paragraph by including an extra space between paragraphs.
7. Provide accurate and complete bibliographical information. All references cited in the manuscript should be listed at the end of the manuscript. We encourage your use the *APA Publication Manual* or the *Chicago Manual of Style* for complete style/format guidelines.
8. Use dialogue and direct quotes sparingly. Incorporate the key ideas of conversations into the text when possible. If material is quoted, supply the complete source in the references and cite the page number with the quotation.
9. Do not use footnotes. Integrate this information into your manuscript.
10. Use mathematics editors (e.g., *MathType*) sparingly. Expressions and equations that can be typed using the keyboard, such as $f(x)=3x^2$ and $x < 3$, should simply be typed, as you would the general text. Other mathematics displays that contain characters not found on the keyboard should be set using an equation editor program. For example, y = 2^1/5 should be expressed using an equation editor as

$$y = 2^{\frac{1}{5}}$$

11. Please proofread and *spell-check* your manuscript before submission. Review it for grammar, completeness, mathematical correctness, and accuracy of references. Be sure to spell out all proper names, and fully identify all organizations and groups that are mentioned by initials or acronyms.
12. Figures and tables should be embedded in the manuscript near their mention in the text. Each figure or table needs to have a title relating it to the text.

Guidelines for Advertising

All advertising should support the purposes of ICTM. Services or products advertised should pertain to mathematics and exhibit NCTM's mathematical principles. All claims must be verifiable. All designs should align with the appearance and technical limitations of the publication. All advertisements shall be labeled as such.

Email your submission to us at

ictmjournaled@gmail.com

Regional Directors listed on back cover.

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Articles

Books of Interest

STEAM: Science, Technology, Engineering, Arts, Mathematics

Web Bytes

ICTM Member Highlights!

Great ICTM Conference Opportunity!

Schools who send a team of one coach and at least 2 teachers per district building will receive one free registration for the team.

Message from our Past President

Deidra Baker

Hello,

As 2019 comes to a close and we start a new decade, I would like to take time to thank each member of ICTM for their dedication to improving math education in Iowa. Thank you for contributing to the ICTM Journal. Thank you for attending our conference. If you were a presenter or vendor at the annual conference, we appreciate you!

The October 14th conference this year went very well, and we received lots of positive feedback. We had speakers from inside and outside of Iowa, and from Canada! We are becoming a more diverse group of learners, educators and coaches. I am excited we have broadened our perspectives and am grateful to those who shared their experiences with ICTM members.

It has been wonderful meeting many people and appreciate the opportunity to serve you and learn from all your best practices and experience.

I know that as a group we will continue to welcome new ideas and perspectives in order to be the best organization for math educators. I look forward to our continued growth. Thank you for joining me and ICTM on this journey of learning.

Join me in welcoming Lori Mueller as our new President! I know she will continue to grow ICTM and do fantastic work.

Sincerely,

Deidra Baker, ICTM Past-President

dlfbaker@gmail.com

Welcome to our newly elected President

Lori Mueller

Welcome to a new year, and a new decade! I am presently a math consultant for Great Prairie AEA in Burlington. For more than twenty years I have been teaching middle grades 6-7, with the last 4 years being only mathematics. I am passionate about teaching true mathematics, our students need to know and understand how to work with numbers in real life situations and become problem solvers.

As I work with teachers in this AEA and talk with other math consultants and teachers around the state I sense a big change in the way that we teach and learn mathematics. There are many new curriculums available that have really stepped up the expectations for the way we teach. These materials are all well aligned to the Iowa Standards for Mathematics. It is very exciting to see teachers from across the state learning more about mathematics themselves as we teach real math and not just simply rules and procedures. We are truly preparing our students for a different future than the world that I graduated into when I left high school and college.

There are changes on the horizon for mathematics. *Catalyzing Change* (NCTM, https://www.nctm.org/catalyzing/) has talked about many of those changes for high school and their *Catalyzing Change* books for middle school and elementary school soon to be released will address changes at those levels as well. ICTM hopes to be there to support you in the changes that are happening so that we all stay current in the educational needs for our students in an ever-changing world.

Stay up to date on what is happening by visiting our web site often at iowamath.org. We will also be posting ideas and resources on our Facebook page at Iowa Council of Teachers of Mathematics. Follow us on Twitter and share your thoughts and ideas with us. @iowamathteach, #iowamath and on Instagram at iowamathteach.

I invite you to get involved by

- attending our annual fall conference https://www.iowamath.org/pastconf,
- reading our Journals https://www.iowamath.org/journal/,
- writing an article for our Journal,
- presenting at our annual conference,
- applying for a grant https://www.iowamath.org/grants,

and following us on social media. It is time to let our voices be heard and embrace the mathematics that we know our students are capable of learning!

Wishing you the best in 2020!

Lori Mueller

ictmpres@gmail.com

Legislative Update

January 2020

Catherine Miller

Government Relations Director

millerc@uni.edu

Advocate and Educate

ICTM is working for you! With the increase in communication using social media and the website, iowamath.org, ICTM's service to the community of mathematics educators in the state has grown. Use ICTM's resources frequently and ask other mathematics educators to join our community. Together, we can make a difference in the lives of Iowa's children and youth through mathematics instruction that will make the future better.

One of the ways ICTM can serve you is through the government updates that are posted on its website. These are done roughly once a month, with additional updates when current activity in the state or federal legislature warrant the attention of mathematics educators. Use these to be informed about the future of our profession and the schools where we work. You will find a link to the government updates using the *Publications* tab on ICTM's website.

To track what is happening in state government on your own or for more current information you can use a couple of tools. Iowa's Department of Education webpage has a section for Legislative Information where you can learn about past legislation and bills being worked on in the current legislative session. You can also sign up for email updates to keep up with what is happening in Des Moines related to education.

NCTM's Advocacy and Legislation webpage has been updated so more current information can be shared. Currently, NCTM is calling for "Faithful implementation of ESSA and to support of its goals" (NCTM, 2019, p. 1). Additionally, NCTM is calling on federal lawmakers to support the TEACH grant in a way that attract and prepare more people to be successful mathematics teachers (NCTM, 2019). Read the details about these and find out how you can support our profession with NCTM's help by visiting this webpage frequently. Note that you do not need to be a member of NCTM to access this part of their online material.

I have been a mathematics educator for more than forty years and never before have I worried about our profession more than now. It is time for action, for advocacy and no longer being silent in hope that the problems we face will go away on their own. Please stay informed about how our state and federal governments support the schools where we work. For me, it is about the students we teach and how we can prepare them for the future. After all, the future of our students is the future for all of us.

References:

Seivert, Shan. (n.d.) Legislative Information. Retrieved from https://educateiowa.gov/resources/legislative-information .

NCTM. (n. d.) Advocacy and Legislation. Retrieved from http://cqrcengage.com/nctm/?2 .

NCTM. (2019). 2019 Legislative Platform. Retrieved on January 9, 2020 from https://www.nctm.org/uploadedFiles/2019-NCTM-Legislative-Platform-Final%20.pdf .

Catherine M. Miller

ICTM Government Relations Director

ICTM Government Updates: https://www.iowamath.org/government-update/ —

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The purposes of the Iowa Council of Teachers of Mathematics are:

1. To encourage an active interest in mathematics and its teaching, and work toward the improvement of mathematics education programs in Iowa.

2. To provide a medium for exchange of views and facts about current problems, techniques, and experimental programs in the teaching of mathematics.

3. To provide cooperative experimentation and study of problems relating to the teaching of mathematics at all levels, and to assist in the development, coordination, and carrying out of a sustained program for improving instruction in mathematics through the provision of such aids as meetings, bulletins, research studies, and informative services.

4. To encourage and assist other state and national organizations concerned with mathematics education at all levels.

Find your friends at our conference!

Below: Marty, Lori, Dr. Robert Berry, Deidra, Angie at 2019NCTM AFFILIATE LEADERSHIP CONFERENCE Denver, CO

April Pforts

State Supervisor of Mathematics
Iowa Department of Education

april.pforts@iowa.gov

Hi Everyone!
Happy New Year 2020!

I am very excited to be starting my fifth year at the Iowa Department of Education. There are so many great things that have happened over the last four years, I am hopeful year five will be just as grand!

1. PAEMST

The Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) has expanded to include Technology and Engineering (STEM including Computer Science).
This year's awards will honor science, technology, engineering, mathematics, and/or computer science teachers working in grades K-6. Nominations close on **March 1, 2020**.

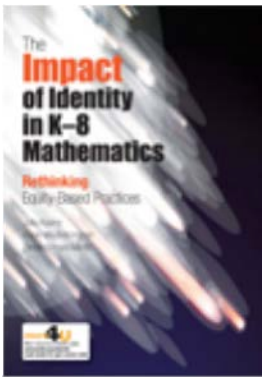
Nominate a Teacher Apply

Applications for teachers of grades K-6 are now open. Applications must be completed by **May 1, 2020**.

Begin an Application

2. Access and Equity

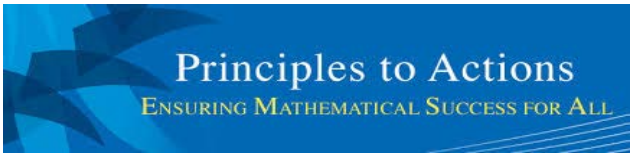
We have all the continued work on Access and Equity. One of the best things we can do for our students is to continue to work towards our standards implementation. Our statewide leadership team has been reading the ***The Impact of Identity in K-8 Mathematics: Rethinking Equity-Based Practices***.



Additionally, we have previously studied the work below.

A. All of our students having access to grade level instruction. Check out the *Opportunity Myth* *Executive Summary*, *Full 68 page report*, *Interactive Website*.

B. I would encourage us all to work through the two modules that are part of the *Principles to Actions* Toolkit.
https://www.nctm.org/ PtAToolkit
There are two on the Guiding Principles of Equity and Access. One is Equitable Pedagogy and the other is Using Identity and Agency to Frame Access and Equity.



C. Standards Professional Learning Opportunities highlight the mathematics tools in the Universal Tier Tool for Building Blocks #2,3, and 4.

a. Course with all modules for one license renewal credit

b. Individual Modules - (no cost)

i. Module 1 Standards and Enacted Curriculum

ii. Module 2 Instructional Practice

iii. Module 3 Instructional Materials

3. Social Media

Over the last few years, the social media presence of mathematics education has continued to grow. I would encourage you

to check out the below to stay up to date on happenings.

Iowa Mathematics Standards

Iowa Mathematics Resources

ICTM DE Briefs

Facebook: @apriliowamath

Twitter: @apriliowamath, #iowamath

Q&A mathematics blog

Call to Action: Consider becoming an advocate for access and equity and the standards by doing the modules listed above and tweeting it out! Be sure to tag @iowamath @apriliowamath #iowamath

Math Learning COMMUNITY

Join a Community Today! Many more Communities are developing such as Principles to Actions and others will be announced through the communities below. Anyone and anyone is welcome to join any of the ones below. Just fill out a quick form below to get started.

Community links to sign-up and receive email updates:

•IA Illustrative Mathematics Sign-up (IM)

•IA Desmos Sign-up

Teacher.desmos.com

Coaches

•IA Coaching Sign-up (General):

- This community is geared toward coaches, teacher leaders (even-self identified), and anyone wanting to learn about coaching mathematics.

Standards

•IA Core Advocates Sign-up (Standards) This community will be learning about the SHIFTs and how they can impact instruction.

Numeracy

•IA Number Sense Sign-up (Numeracy)

- This community will be learning about Number Sense and Fraction resources and strategies.

Instruction

IA Principles to Actions Sign-up (Instructional Practices)

- This community will be learning about the Teaching and Learning Principle and the 8 Effective Teaching Practices for mathematics.

For questions, contact April Pforts (Mathematics) at (515) 314-6243 or april.pforts@iowa.gov, or Deborah Cleveland (AEA Learning Online) at dcleveland@aealearningonline.org.

April Pforts

State Supervisor of Mathematics

IOWA Department of Education

See what's new -

https://illuminations.nctm.org/

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NCTM ILLUMINATIONS

Lessons Interactives

E-Examples

From Principles and Standards for School Mathematics

Pre-K – Grade 2 | Grades 3 – 5 | Grades 6 – 8 | Grades 9 – 12

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Standards-based Grading Implementation Pitfalls to Avoid in Secondary Math

Matt Townsley

Assistant Professor of Educational Leadership University of Northern Iowa

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A growing number of Iowa schools are striving to improve communication of student learning by implementing standards-based or standards-referenced grading. Building upon the challenges identified by the earliest adopting secondary schools (Peters & Buckmiller, 2014), one recently published study suggests there may be a "second wave" of Iowa high schools considering standards-based grading (Townsley, Buckmiller, & Cooper, 2019). As these school leadership teams decide to move from traditional grading to standards-based grading, teachers will need to be provided just-in-time support not only related to overall assessment and grading practices, but also specific to their content area.

A number of articles document effective secondary school implementation of standards-based grading within disciplines such as music (Duker, Gawboy, Hughes, & Shaffer, 2015; St. Pierre & Wuttke, 2017), English/Language Arts (Miller, 2013), science (Noschese, 2011; Wilcox, 2011), and family/consumer sciences (Shippy, Washer, & Perrin, 2013). Secondary math teachers using standards-based grading in their classrooms would similarly be well served to understand the experiences of their content colleagues who have gone before them.

During the 2008-09 and 2009-10 school years, I was a high school math teacher in Solon, IA using standards-based grading. For the following eight years, I served as the district's curriculum director supporting our secondary schools' complete transition to standards-based grading. All of these experiences and supporting literature inform the purpose of this paper, which is to suggest several common pitfalls to avoid when implementing standards-based grading in a secondary math classroom.

Standards-Based Grading

Standards-based grading (SBG), also called standards-referenced grading, target-based grading, proficiency-based grading or mastery-based grading is a philosophy of communicating students' levels of learning directly using an integer scale in the gradebook rather than documenting points for tests, quizzes, homework and extra credit activities (Iamarino, 2014; O'Connor, 2018; Townsley, 2018).

Homework is valued as an opportunity to practice rather than a means of point-accumulation. Students are provided opportunities to demonstrate understanding throughout the reporting period rather than exclusively on the day of the end-of-unit assessment. Furthermore, employability skills such as timeliness, participation and grit are not directly factored into the academic grade, and instead communicated separately.

Students receive a score for each standard which is reported in the grade book (i.e. "Identify zeros of a polynomial and use them to construct a rough graph of the function"). The integer scores represent levels of learning via a scale such as 1=little understanding; 2=developing understanding; 3=close to understanding; 4=demonstrates understanding. In many elementary and middle school buildings using standards-based grading, these integer scores are reported directly to parents on the report card whereas at the high school level, a quarter, trimester and/or semester course grade is determined based upon the integer scores for each standard. If standards-based grading was easy to implement, it would be the predominant practice in math classrooms. SBG, while necessary to better communicate student learning in the grade book, comes with several unique challenges for math teachers. The following paragraphs document several of these challenges and propose potential practices to overcoming each one.

Circumvent the blind reassessment trap

When providing students multiple opportunities to demonstrate their understanding, teachers may wonder what this looks like and how to make it manageable (Schimmer, Hillman, & Stalets, 2018). After all, educators agree that students learn at different rates and in different ways. In theory, we might offer students the opportunity to reassess until the minute before grades are due to the principal or perhaps even after the end of the semester. However, the thought of issuing countless incompletes to students and grading papers at the last minute does not make sense in practice.

Scaffolding learning opportunities throughout the reporting period rather than encouraging students to re- learn and re-assess for the purpose of improving their grade at the last minute is a more noble and realistic approach. Perhaps most importantly, re-assessing learning blindly without some type of intervention creates a predictable outcome: the same poor result a second time for the student, and more meaningless grading for the teacher. Circumventing this blind reassessment trap involves creating a meaningful re-learning plan for students.

Instead, math teachers should consider proactively communicating a re-learning plan through their course syllabus, class website and other mediums parents and students may access. The most effective plans require students to show evidence they will be successful on the reassessment (O'Connor, 2018). Prior to an 8th grade student, Danielle, re-assessing her understanding of the Pythagorean Theorem, a teacher might require her to complete extra practice problems and participate in a brief tutorial. Once the math teacher is confident an increased level of understanding is likely, she will be offered a chance to demonstrate understanding on a new version of the Pythagorean Theorem assessment. Once Danielle has demonstrated a higher understanding, the new score will replace the older score in her grade book.

To further make this process manageable, some math teachers establish a meaningful deadline for beginning the reassessment process. For example, a re-learning plan may state that students must begin participating in the intervention process within two weeks of the teacher handing back the end of unit assessment. Failing to do so disqualifies him/her from the benefit of further demonstrating understanding of this standard. Finally, math teachers should require all reassessment attempts to be completed several days before grades are due to allow adequate time for grading and recording.

Avoid the temptation to depend solely upon publisher generated materials

Nearly every set of commercially produced math materials claim to be "aligned with the Common Core." Evidence of this claim is found in the typical teachers' guide within tables aligning the standards to specific lessons. Some publisher produced materials also include test generator software in which the teacher can select the math standards he would like and the number of questions desired to create a written or electronic exam. Yet, trusting these materials are indeed fully aligned to the standards is not always safe.

As I often joke with educators around the state, "there is no such thing as the Iowa Core police" stamping letters of approval on materials well aligned to the core and handing out citations to others for false advertising. It is our job as math teachers, curriculum consultants, and district office administrators to assess the alignment between publisher generated materials and the standards, a process which takes time.

One potential practice that may be helpful in overcoming this implementation pitfall is taking a close look at the math assessments we use with students. Whether we choose to modify the tests and quizzes provided by the textbook or create our own, ensuring the cognitive complexity of the standard is represented in our expectations for students is key.

For example, a high school Algebra standard suggests students should "Know and apply the remainder theorem" (HSA.APR.B.2). In the assessment prompts, we will need to ensure students are not merely asked to know the remainder theorem, but also apply it to their understanding of polynomials. Publisher generated materials may give us a false assurance that standards are being assessed, therefore it is up to us as math professionals to do the detailed work of ensuring alignment, which sometimes may mean creating our own prompts.

Balk at the business as usual approach to homework

In a typical secondary math classroom, one of the purposes served by homework is points to be recorded in the gradebook. Many teachers continue to assign points to homework because they feel students will not otherwise complete it, believe this practice rewards hard work, and/or think it helps students who do not test well (Vatterott, 2011). My math experience as an adolescent involved checking homework at the beginning of class, asking the teacher when I had questions and then turning it in for grade book recording purposes. The next day, the assignment was returned with a score at the top, often representing how much work I showed or how many problems I completed. Because we have trained students to view homework as an exercise in point accumulation, it may come as no surprise to see fewer students completing homework assignments in the early stages of

standards-based grading classrooms when no point value is attached. Unless we balk at this "business as usual" approach towards homework, we will likely experience this common pitfall and wonder how to swing the pendulum the other way.

One potential practice that may be helpful in changing this paradigm is to repurpose homework as practice. My high school track coach was excellent at personalizing our running workouts during practice based upon recent performances and upcoming meets. The same mindset should be present in a math classroom.

A possible shift in practice is to use a 3-3-free strategy with students. The first three practice assignments (formerly known as homework) are strategically selected and required to be completed during class time. As the teacher walks around the room to check the accuracy of these three problems, he/she exhibits freedom to personalize the remaining practice assignment. For example, if Brooke knocked the first three practice problems out of the park, she may not have any additional problems to complete for the evening. When Tim misses the question about distinguishing between correlation and causation and correctly answers the other two about measures of central tendency, he receives a customized evening practice assignment based upon his current misconceptions. Through this 3-3-free strategy, math teachers reclaim the purpose of homework as a daily check for understanding rather than an artifact to be documented in the grade book. When done well over time, the classroom norm will more likely shift from task completion to a focus on demonstration of learning (Vatterott, 2011).

Final Thoughts

Secondary math teachers are in a unique position to implement standards-based grading. Our state standards have been in place for nearly twenty years with very few changes. Resources to support the Iowa Core Mathematics Standards are abundantly available. Yet, implementing standards-based grading comes with several challenges including the reassessment trap, false assurance of publisher-generated materials, and a business as usual approach to homework. The intent of this article was to share several of these predictable pitfalls and potential practices to instead consider. As we collectively strive to communicate students strengths and weaknesses related to the standards in the grade book, I believe our best days as math teachers are yet ahead.

References

Duker, P., Gawboy, A., Hughes, B., & Shaffer, K. P. (2015). Hacking the music theory classroom: Standards-based grading, just-in-time teaching, and the inverted class. Music Theory Online, 21(2).

Iamarino, D.L. (2014). The benefits of standards-based grading: A critical evaluation of modern grading practices. Current Issues in Education, 17(2).

Miller, J. J. (2013). A better grading system: Standards-based, student-centered assessment. English Journal, 103(1), 111-118.

Noschese, F. (2011). A better road: Improve teaching and student morale through standards-based grading. Iowa Science Teachers Journal, 38(3), 12-17.

O'Connor, K. (2018). How to grade for learning (4th edition). Thousand Oaks, CA: Corwin.

Peters, R. & Buckmiller, T. (2014). Our grades were broken: Overcoming barriers and challenges to implementing standards-based grading. Journal of Educational Leadership in Action, 2(2).

Schimmer, T., Hillman, G., & Stalets, M. (2018). Standards-based learning in action: Moving from theory to practice. Bloomington, IN: Solution Tree.

Shippy, N., Washer, B., & Perrin, B. (2013). Teaching with the end in mind: The role of standards-based grading. Journal Of Family & Consumer Sciences, 105(2), 14-16.

St. Pierre, N. A., & Wuttke, B. C. (2017). Standards-based grading practices among practicing music educators: Prevalence and rationale. Update: Applications of Research in Music Education, 35(2), 30-37.

Townsley, M. (2018). Mastery-minded grading in secondary schools. School Administrator, 75(2), 16-21.

Townsley, M., Buckmiller, T., & Cooper, R. (2019). Anticipating a second wave of standards- based grading implementation and understanding the potential barriers: Perceptions of high school principals. NASSP Bulletin, 103(4), 281-299.

Vatterott, C. (2011). Making homework central to learning. Educational Leadership, 69(3), 60-64.

Wilcox, J. (2011). Holding ourselves to a higher standard: Using standards-based grading in science as a means to improve teaching and learning. Iowa Science Teachers Journal, 38(3), 4-11.

About the Author

Matt Townsley is an assistant professor of educational leadership at the University of Northern Iowa where he teaches and mentors aspiring school leaders. Through conferences, professional development and workshops, Dr. Townsley has consulted with thousands of teachers and administrators across the country on the topics of assessment and standards-based grading. You may reach Matt via email at matt.townsley@uni.edu or via Twitter at @mctownsley.

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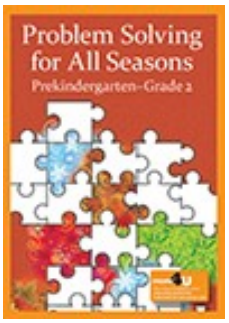
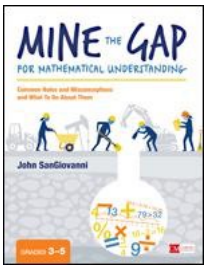
Books of Interest

Markworth, K., McCool, J., & Kosiak, J. (2015). *Problem Solving in all Seasons.* Reston, VA: NCTM.*



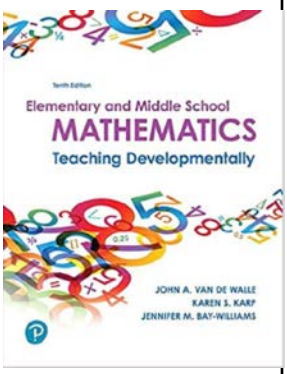
Problem Solving in All Seasons has both a grades PreK-2 and 3-5 versions. http://www.nctm.org/Store/Pten-roducts/Problem-Solving-in-All-Seasons-PreK-2/

SanGiovanni, J. (2016). *Mine the Gap for Mathematical Understanding.* Thousand Oaks, CA: Corwin. Three books for three gradebands: K-2, 3-5, and 6-8 at Corwin Press.



https://us.corwin.com/en-us/nam/pten-roduct/mine%20the%20Gap%20for%20mathematical%20understanding%202016

Elementary and Middle School Mathematics: Teaching Developmentally (10th Edition) 10th Edition by John A. Van de Walle (Author), Karen S. Karp (Author), Jennifer M. Bay-Williams



https://www.pearson.com/us/higher-education/program/Van-de-Walle-Elementary-and-Middle-School-Mathematics-Teaching-Developmentally-plus-My-Lab-Education-with-Enhanced-Pearson-e-Text-Access-Card-Package-10th-Edition/PGM2359265.html

Mathematics from the Community College Perspective: Interviewing David Usinski

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Abstract

The theory of emotion (Ortony et al. 1988) is one of the most popular and at the same time difficult theories to get through in the realm of psychology. As an introduction to this paper we provide a short CV of the interviewee, a SUNY Erie Associate Professor. Then an enlightening interview ensues, where we administer an interpretation of his answers based on the main concepts that the theory of emotion encapsulates. We strategically put the theory at the end of our article to provide our potential reader with the necessary material that corresponds to the quiddity of the theory of emotion, after being instantiated by an appropriate remark in the end of each separate answer.

A short CV of David Usinski

David M. Usinski holds a B.S. in Meteorology and Mathematics from the State University of New York College at Brockport. He also possesses a M.S in

Meteorology from the Pennsylvania State University and a M.A in Mathematics from the State University of the New York College at Brockport.

He has taught several years on the secondary level in the States of Pennsylvania and New York. Since 2007, he has been an Associate Professor of Mathematics at SUNY Erie Community College, Buffalo NY, where he is currently the Head of the Mathematics Department in its city campus. He has made numerous presentations and has participated in workshops in the State of New York. He is the coauthor of a publication in Monthly Weather Review.

The questionnaire

Question 1. What is the role of mathematics in a Community College curriculum?

Traditionally, the role of mathematics in a CC is usually separated along the students' chosen profession: STEM vs nonSTEM. However, I would like to suggest another two-fold role: the haves and the have nots.

The Haves
Students with the appropriate background and mindset are light-years ahead of the have nots. These students recognize that success comes from hard work, tenacity, grit, and self-reflection. Professors need to keep these students' love of learning mathematics and dreams alive. We need to make our personal beliefs contagious by sharing our excitement, enthusiasm, and love of mathematics at every opportunity.

The Have Nots
Students entering an open access institution are often not equipped with the basic mathematic and problem-solving skills needed to pursue highly technical, science degrees where the employment opportunities abound. The CC math department needs to meet the students where they are mentally and academically and foster a supportive environment for those fragile students to make up for lost time on a journey to the STEM degrees. Often our students with minimal backgrounds in mathematics suffer from lack of self-efficacy, low intrinsic motivation or grit, and a sense of "I just can't learn math". We first need to perform the delicate transformation from "I can't" to "I can't, yet" and to change the paradigm that

failure is terminal to failure is an opportunity. Math professors need to take on roles of nurturer and coach to help morph a student's fixed mindset to a growth mindset. Once these students developed the characteristics of "the haves", see the paragraph above as to how to proceed.

Remark 1

Even the first categorization to have and have nots is clearly associated to the first variable according to Ortony and Clore, (2015), i.e. goals. Herein the predominant vocabulary is the bipolarity *pleased* and *displeased*. The instructor would be enthusiastic –but he is not- if all or at least the majority of his students belonged to the have ones, in other words if the majority of his students had already been familiarized with the basic mathematical skills and dexterities to comfortably pursue a degree in STEM. Let us here notice the paralleled demeanor of the students around these two basic words *pleased* and *displeased*. Those students in the have nots, being equipped with minimal backgrounds in Mathematics, as our interviewee clearly enunciates, tend to live their students' lives by a simple creed "I just can't learn math". A similar feeling of lack of pleasure manifests itself on their behalf.

This mutual lack of pleasure on both human components of a class, namely the instructor and the students, can be proven to be beneficial to the teaching process. A beneficial temporal component is added that seems to emanate from the passion that should characterize any teacher. A passion that emanates from a deep-rooted conviction that "I just can't" can and should be transformed to "I just can't yet". The addition of a time adverb *yet* is of considerable gravity to the transformation of a negative attitude toward mathematics to a positive one. It is a praiseworthy effort on behalf of the teacher, who seems to acknowledge that and exhort his own students to face it that way. But praiseworthiness refers, according to Ortony and Clore (2015), to the second pillar of emotion, standards. It is the actions of the agent, the teacher, to inculcate into his students *excitement, enthusiasm and love of mathematics at every opportunity.* A verbatim presentation of the interviewee's parlance is deemed necessary to demonstrate the gravity of language in the teaching process, another corroboration of the importance ascribed to language in the sociocultural theory of learning (Vygotsky, 1978).

Question 2. How could you characterize your students' stance, during your so many years of teaching experience, toward mathematics? I would like you to focus on the feeling you receive from them

When I was teaching at the high school level, grades 9 through 12, I perceived varying perceptions. These student attitudes spanned the range from abhorrence to apathy to excitement.

Since I taught at all levels, I would say lower level math courses brought the most abhorrence and maybe even anxious feelings of the topics. I suspect this stemmed from missing important concepts along their continuum, becoming frustrated, and falling further behind their peers. They were identified as "slow" learners and placed into non-Regents courses.

At the Regents' level, most students were required to take that specific course to receive an advanced Regents' diploma. Most of these students showed tempered excitement although some showed apathy and some disgust since they were not taking the course by choice.

When I taught Advanced Placement Statistics and Computer Programming, students were excited to expand their mathematical knowledge. These students were eager to learn the next topic. Furthermore, these students demonstrated the grit, motivation, and exceptional problem solving necessary to be successful in the course and to earn Advanced Placement college credit.

Moving to the college level, I found these students to espouse a variety of attitudes and emotions. Again, some were resentful that they were required to enroll in a math course in order to earn a degree while others were thankful for the opportunity. Typically, non-traditional students begin the semester with a lot of anxiety but once they realize they can learn mathematics under the right conditions, they begin to become confident. Often, I have had students say they have finally learned mathematics and have verbally thanked me. Most of my college students are from an urban setting with many never finish high school. Several students are older and, dare I say, wiser and are ready to learn. I have found that even though the effort expended to teach these students even the most basic concepts is enormous, the reward from seeing students grow is well worth it.

Remark 2

The second answer embodies the third pillar of emotion, the tastes. Phrases like *abhorrence to apathy to excitement* converge to the like/dislike model that characterizes the realm of tastes, whereas words like *showed apathy*, *disgust* and *tempered excitemen*t reveal the co- occurrence or, for lack of a better word, the symbiosis of goals and tastes.

Especially on the tertiary level, in which we are by nature more interested, the standards component makes its appearance again. Praiseworthiness is the focal word of this component, as articulated by the interviewee *Often, I have had students say they have finally learned mathematics and have verbally thanked me.*

What we encounter here is a mutual acknowledgement of praiseworthiness by both the students and the instructors.

The answer to the second question ends with a self-rewarding, self- gratifying answer on behalf of the instructor, having to do again with an emanating pleasure, a feeling that belongs to the goals realm. Notwithstanding the extent to which the effort of educating older age students materializes, the concomitant reward justifies the means, justifies the sacrifice.

Question 3. I suppose your college awards an A.S. in Mathematics (or in Science, Education etc.). Do you urge students to continue in a 4-year college? How can you describe their tendency to doing so?

Most of my students have returned to college to earn a degree so that they may have a better life. I strongly encourage my students to continue onto to a 4 year institution and I hope I instill in them the self-efficacy and grit required to be successful. In my classroom, we treat mistake and failures as opportunities to learn. Students are given multiple attempts on homework questions, and two attempts on quizzes and tests. These are additional attempts are opportunities for students to learn from their mistakes. In addition, many students transition from the fixed-mindset that they were not born with the "math gene" to a growth-mindset that through hard work, practice, and persistence they can learn just about anything.

Remark 3

The third answer encapsulates the concatenation of the emotion representing constituents, namely, goals, standards and tastes. Students' returning to college for a better life, which we always have to bear in mind. We teach not only for self-gratification, but also to make our students envision a better life, a life filled with the promise of opportunity, the promise of adding pleasure to their lives. How they really respond to homework and certain types of exams raises the question to whom they attribute their unsuccessful attempts.

Attribution is another factor here, whose gravity can shape attitudes toward Mathematics. Students can equally ascribe potential failure to the teacher as well as to themselves. By

considering their prerogative for a second or third attempt to an already mistaken answer, we adopt a stance, which is certainly approved by us and by them. Moreover by doing so, we facilitate a transition from a demeanor negative toward Mathematics to a more positive one. We sort of dissuade them from disliking Mathematics, a taste that might have been inculcated into them at a younger age, to a more positive stance. We tell them that *hard work, practice* and *persistence,* using verbatim our interviewee's vocabulary, are methods of labor, whose fruits will be seen by them and can alter their "taste" of Mathematics to the "like" mode.

Question 4. Anything else you deem important for the place of mathematics in the community college ambience.

Throughout my answers above, the theme is scaffolding and supporting a fragile, fledging student until they can stand, and even run, on their own. Community College math professors need to be the nurturing math teachers that were absent throughout many of students' lives. We need to help instill the habits necessary for our students to succeed such as grit, a growth mindset, and persistence in problem solving. Community college may be the last opportunity to affect the behavior positively of students who are the have nots.

Remark 4

The final answer is an amalgamation of what was enunciated before pertaining to the role of the teacher and his stance in the classroom. Mathematics teaching is viewed as a continuous process of teaching episodes starting from the primary school and ending at the college level or whatever above. Any blameworthy episode, any blameworthy instance, if we are allowed to say, in that process, can be proven to be detrimental to the evolution of a person's stance toward Mathematics. A math teacher should be deemed as a *nurturing* subject, who will make the effort to fill in the void created in previous years. A math teacher on the college level may be seen as the last refuge to turn adversity into advocacy. The last refuge where the hitherto blameworthiness can be turned into praiseworthiness

The theoretical model

What a community college generally is and where it stands in the American educational landscape is already known. What we try to present here is the presentation of the role that mathematics education plays in a community college ambience by interviewing a pioneer in the field and under the psychological clout of the theory of emotion by Ortony and Clore (2015). We tend to believe that this article will be useful not only to those who teach mathematics on this college level, but also to educators in the antecedents of a community college, i.e. primary and secondary education, as well as its sometimes aftermath, a four-year college.

By referring briefly to the theory of emotion, we state here the underlying pillars of the emotion itself, which is *goals*, *standards* and *tastes* (Ortony & Clore, 2015). These three values, namely goals, standards and tastes, are quintessential of the emotion theory, whose repercussions will be tracked down in our interviewee's answers. Notwithstanding the fact that someone might have proceeded to the analysis of the interview relying on the etymology per se of the above mentioned values, we would like to instantiate and reified them by stating the next paragraph

Appraisals can therefore concern the *outcomes of events* evaluated as *desirable* (or not) in terms of goals, the *actions of agents* evaluated as *praiseworthy* or *blameworth*y relative to one or another kind of standard, or *the attributes of objects* evaluated as *appealing* (or not) as a function of one's tastes. These three sources of evaluation yield three kinds of affect that contribute to the distinctiveness of various

classes of emotion, namely, being *pleased* or *displeased* about event outcomes, *approving* or *disapproving* of the actions of agents, and *liking* or *disliking* (the attributes of) objects. (Ortony & Clore, 2015, p.310)

Ortony et al (1988) in a worthy effort to cognitively analyze emotion emphasize on the three aforementioned pillars, goals, standards and tastes, using respectively the concepts *events (goals)*, *agents* (**standards**) and *objects (tastes)*.

When one focuses on events one does so because one is interested in their consequences, when one focuses on agents, one does so because of their actions, and when one focuses on objects, one is interested in certain aspects or imputed properties of them *qua* objects. (Ortony et al, 1988, p.18)

To finally dilute any misgivings about the concepts discussed above (Ortony et al, 1988) we state a paragraph taken from a mathematical article exemplifying them:

> *Objects*. Emotions resulting from reactions to objects 'qua' objects (attraction emotions) are all variations of the affective reactions of liking and disliking (typical examples are love and hate)
>
> *Events*. This is the class of affective reactions of being pleased and displeased. These affective reactions arise when a person construes the consequences of an event as being desirable or undesirable (typical emotions are joy, hope , fear)
> • *Agents.* Affective reactions of approving and disapproving (typical emotions are pride, shame, admiration, reproach). (DiMartino and Zan, 2011, p. 474*)*

Remark

The author feels obliged to thank Professor Robert Rogers for a fruitful discussion on this article and his enlightening comments that led to the herein presentation of our work.

References

DiMartino, P. & Zan, R. (2011). Attitude towards mathematics: a bridge between beliefs and emotions. *ZDM Mathematics Education*. 43, 471-482. DOI 10.1007/s11858-011-0309-6.

Ortony, A., Clore. G.L. & Collins, A. (1988). The cognitive structure of emotions. Cambridge: Cambridge University Press.

Ortony, A. & Clore, G.L. (2015). Can an appraisal model be compatible with psychological constructionism? In L. F. Barrett & J. R. Russell (Eds.), *The Psychological Construction of Emotion.* (pp 305-333). New York: Guilford Press.

Vygotsky, L., (1978). *Mind in Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

The **Palace of the Grand Master of the Knights of Rhodes**, also known as the **Kastello** (Greek: Καστέλο, from Italian: *Castello*, "castle"), is a medieval castle in the city of Rhodes, on the island of Rhodes in Greece. It is one of the few examples of Gothic architecture in Greece.

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INTEGRATED STUDIES

Learning Math by Seeing It as a Story

An English teacher co teaching trigonometry asked students to explain an equation to a child and to turn discrete problems into a story.

By Amy Schwartzbach-Kang

March 26, 2019

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I had always hated math. Now I suddenly found myself teaching trigonometry. I was an English teacher in Chicago Public Schools with certification in special education, and when my school was facing a shortage of certified special education teachers, I was pulled in mid-year to co-teach a junior-level trigonometry class with the math teacher.

My students struggled with the calculations, thinking they just weren't good at math. Like me, they hated it. What was the point in working and reworking these calculations? What were we trying to figure out anyway? And I originally agreed with them.

Yet trig slowly became my favorite class of the day. After spending years teaching English and reading, I was being challenged to move beyond what I had always been doing. When you're new to something, you have a fresh perspective. You're willing to take risks. You're willing to try anything because you don't know how something should be done.

I worked with my co-teacher to create a series of supplementary lessons through a different lens to let students experience personal meaning and creativity in their math.

EXPLAINING IT TO A BABY

I found that many students felt frustrated with math because they needed to come to one single correct answer. This was especially hard with my diverse learners, who struggled with multistep equations. Instead of focusing on coming to the correct answer, my students and I focused on the process of getting there.

I brought in some books from Chris Ferrie's Baby University series—books like *General Relativity for Babies* and *Optical Physics for Babies*. The idea is that you don't fully know something unless you can break it down so simply that you can explain it to a young child.

That's the task I gave my students. We started by reading Ferrie's board books to see how simple language and illustrations could be used to explain complex subjects. Next, students chose a multistep equation they had initially struggled with. Working in pairs or small groups, they talked through their thinking and the steps needed to solve the equation. Their partners were encouraged to ask questions and get clarification so the ideas were explained at the simplest level.

Using the books as models, students revised and wrote down their explanations to make them so simple that they could be explained to a young child. After they wrote out their explanations, my co-teacher and I challenged them to create short books using card stock and colored pencils. Students worked with their small groups to talk through ideas and illustrate their books. If they struggled, they

were able to pair with another student to create a book together.

Sharing with other students helped them explain ideas in new ways, which helped them develop a deeper understanding. Students were pushed to think metacognitively in order to explain their thinking and their process to others, and the class as a whole gained access to varying perspectives in math by hearing their peers' thought processes. And they were all excited to see how they could use writing and art skills in an authentic way in math class.

PUTTING THE 'STORY' IN 'STORY PROBLEM'

The interesting thing often overlooked in math class is that it already includes stories and real-life connections, in the form of story problems. But the story problems are generally discrete—each is an individual unit, and they don't tell a larger story.

Another issue is that the real-life elements usually don't relate to things that are real issues in students' lives. They might include calculating area so that someone can buy new carpet for their home. Or a story problem might be about landscapers planting a new tree, and needing to calculate the length of wire required to support the tree. These might be things the students will do later as adults, but they're not current issues in the teens' experience.

I used story problems as an opportunity to connect math to students' lives by creating fictional math-based stories. First, students would work in small groups to go through the chapter in their math textbook and collect the story problems, writing them on index cards. Next, students would lay out the cards to see the questions as a whole: Out of 10 or more story problems in the chapter, were there five similar ones they could group together? What problem-solving skills were called for to work on these problems?

Looking at these five unconnected stories, students thought why they needed to solve them, and used their reasons to come up with some type of connected ideas. They created backstories for the names in the problems, in the process turning them into more developed characters. They identified challenges or reasons why the characters needed to solve the problem.

Finally, they combined the story problems they had created and developed a longer narrative to connect these scenarios, an overarching story rooted in authentic math story problems. Survival was a common theme: One group wrote about a zombie apocalypse and another imagined an alien invasion, situations in which characters needed to solve the problems and employ skills that would help them survive. It's true that these stories were not rooted in students' actual lives, but they were more engaging than rug purchases or landscaping.

When they used creative writing skills to develop math story problems about things they were interested in, students became more engaged. They wanted to read the other groups' stories and work on the math in them because they had a real investment in the outcome. The stories helped students find motivation because they created an answer to the question "Why do we need to learn this?"

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Eight Effective Mathematics Teaching Practices

Principles to Actions

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support pten-roductive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in pten-roductive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

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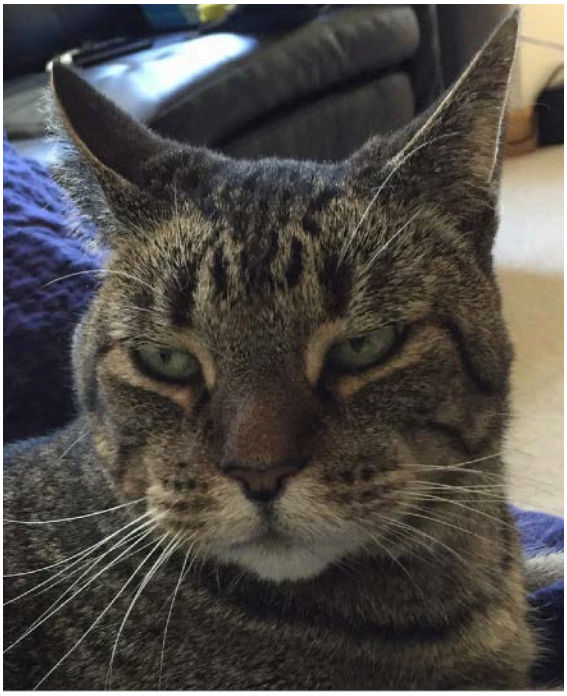

Does your pet show symmetric reflection?

Place Value in Base 10 - Story of a 4th Grade Explorer

Teresa M. Finken

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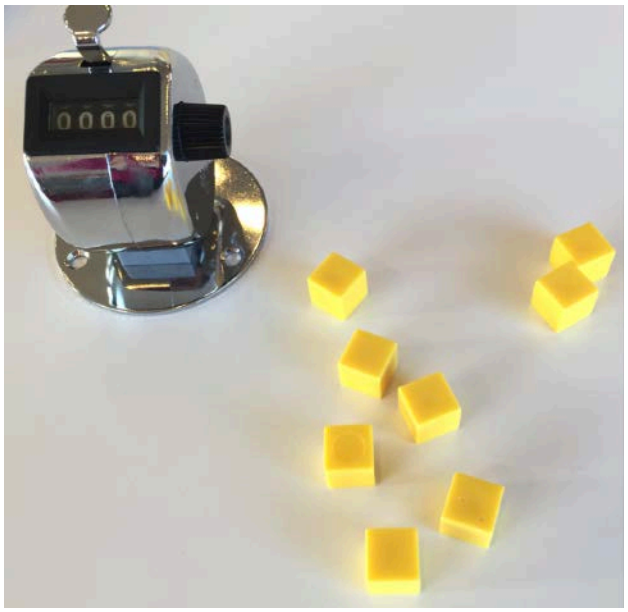
Recently I began to work with a charming 4th grader I'll call Zola who was struggling with subtraction using 3 digits and regrouping. As we talked about a problem from the page she had, it became clear that the words 'ones,' 'tens,' and 'hundreds' were meaningless to Zola. So we got out a set of base ten blocks.

Zola said she had seen these blocks before, so I asked her to talk about the blocks. A trace of unease came to her face, and while she could use the words 'yellow' and 'plastic,' she knew those were not sufficient, but she could not correctly identify any of them as ones, tens, or hundreds. We pushed the blocks to the side.

To set up further appropriate inquiry, I asked Zola a broader open question, "Why do you think we write big numbers like we do?" [**Establish mathematics goals to focus learning** (*Principles to Actions*, 2014) . Zola needed to focus on how base ten works.]
"I don't kn-ow," she replied slowly, seeming relieved to leave subtraction, but cognizant of the non-textbook question.

"Let's do some exploring!" I suggested as I picked up a small shiny metal mechanical clicker counter, one shown below. I gave it to her to to look over, and she clicked the lever a few times, turned the counter over, and then wound the reset knob. While she was busy, I gathered a pile of the ones cubes, and set some of the tens ten-rods nearby.

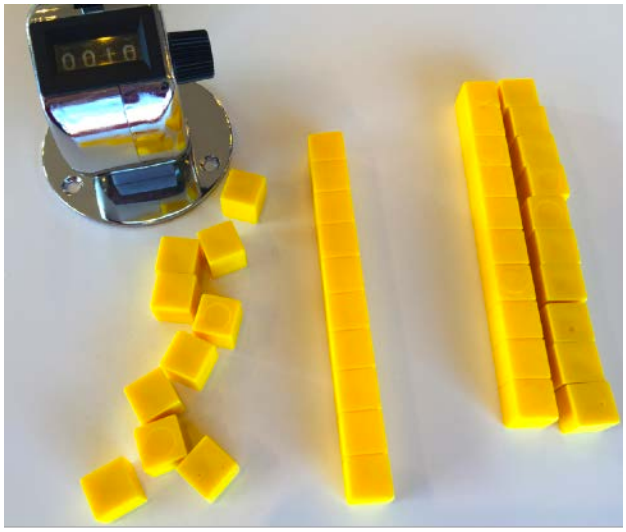


"Let's see how it works to count?" I invited her, and she agreed. "Each time you *click, say* the number you see, and I'll *move one cube* into your pile," I said, turning the counter back to 0. Slowly, she clicked once, said 'One,' and I pushed one cube to her. We continued one by one to 7, when I asked, "What could happen when we get to ten?" She stopped to consider, asking, "Will it look like ten?" What a great question, I thought. "Let's find out!" I replied, and we continued carefully, pausing at 9 again, before clicking to 10. She is quiet, but fully attentive, and her eyes widen as she clicks to see the '10.'

"Oh," I observe, "now there are two numerals instead of just the one numeral we've been seeing. How does this make sense?" She's puzzled, but thinking, and looking at her cubes with some apparent cognitive dissonance. After a bit, I ask, "What could that '1' mean?" She's

thinking and looking at the piles of base 10 blocks nearby, and she yawns a few times, which is a clear sign to me that her brain is seeking more oxygen tfor thinking.

I nudge, “Do you have ten cubes?” She counts them, saying yes, and we agree that she clicked the clicker correctly, so it must be right. I silently hand her a ten-rod. She begins to line up the cubes along the ten-rod, noticing that the cubes align with the ten-rod. We have a discussion about her ten cubes being *the same amount of ‘stuff’* as the ten-rod. I ask again, “How does this make sense with the ‘10’ we see on the counter?,” and soon, “Could we actually trade the ten cubes for the ten-rod?”



She’s not sure this is OK, but agrees that the ten cubes and the ten-rod have the same ‘amount,’ so we separate the 10 cubes far away from the ten-rod. I point to the ten-rod, and ask, “How is the clicker showing us this ten-rod?” The light has not dawned, so I clarify, “Since this ten-rod has all ten cubes all glued together, how many single separate cubes do you now have?” She seemed to realize now that the 10 cubes she had amassed earlier were now transformed into the ten-rod, and she cautiously asked, “None?”

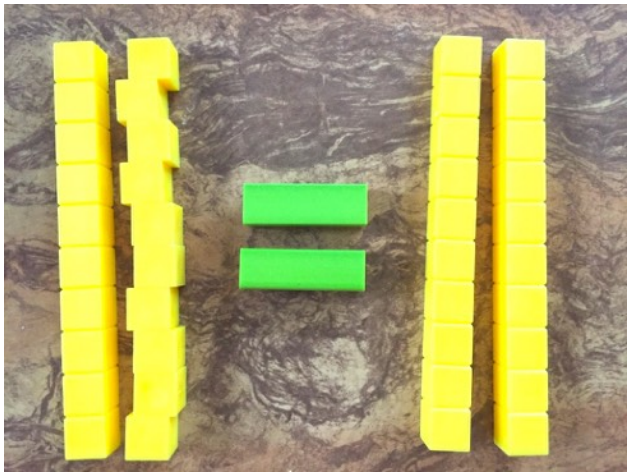
We agreed again that the 10 single cubes were traded for the single ten-rod, and again we focus on the clicker’s display of ‘10.’ I ask, quietly and gently, “So, what might that ‘1’ in the clicker mean? Before that understanding occurs, Zola connects the ‘no cubes’ to the ‘0’ on the clicker. Soon, she’s guessing that the ‘1’ means the one ten-rod. We are both excited!!!!

We continue, as I hand her one cube, she says ‘eleven’ and clicks to show ‘11’. I ask her how that makes sense. She tells me that the ‘1’ (on the right) is the cube, and the other ‘1’ is the ten-rod. Yes. I hand her one cube, she says ‘twelve,’ and clicks to show ‘12’ and tells me its meaning, one ten-rod and two cubes. I ask her what will the next click show? With only a bit of deliberation, she suggests ‘thirteen’ showing as ‘13’, and is proved correct as I give her the cube and she clicks. We continue through 18, and I ask her to predict the 19, and she does, saying one ten-rod and 9 cubes, and clicks it in confirmation. [**Pose purposeful questions**. (*Principles to Actions*, 2014) The questions in these paragraphs above and below focus the student on connections among representations toward meaning and sense-making.]

We pause with some drama, and I ask her to predict the next number. The BIG question is - what will it *look* like? She knows twenty comes after nineteen, and as I give a cube, says twenty as she clicks. Think drumroll in the background as the gears were turning inside her head to figure out that she needs to trade in the ten cubes for a ten-rod, to match the ‘20’ she sees on the clicker.

Soon, she’s made a decision, and pushes the ten cubes to me as she tentatively takes a ten-rod from the pile nearby. She asks if she’s right. I ask her - does the clicker match what she’s made in blocks. She says, “Yes, two ten-rods and no cubes,” and I observe supportively that math has to make sense. [**Implement tasks that promote reasoning and problem solving**. (*Principles to Actions*, 2014) The clicker and

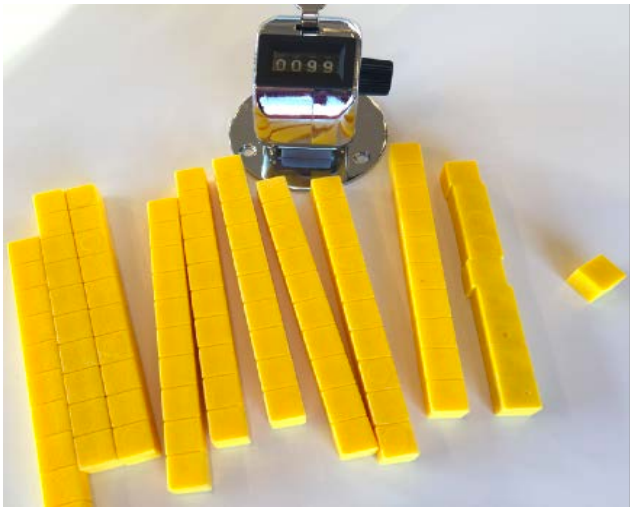
cubes were attractive and approachable, providing concrete representations and experiences to develop reasoning.]



Every time we get close to the end of the decade with 29, 39, 49, etc., I ask her to predict what the next number will be. She loves clicking to verify her prediction (I choose *not* to be the authority for truth). As we finished the forties, she confidently grabbed the ten cubes herself and traded them in for a ten-rod. [**Facilitate meaningful mathematical discourse**. (*Principles to Actions*, 2014) Use of correct terminology in dialogue, celebrating her willingness to engage, wonder, and reason, emphasis on sense-making.]

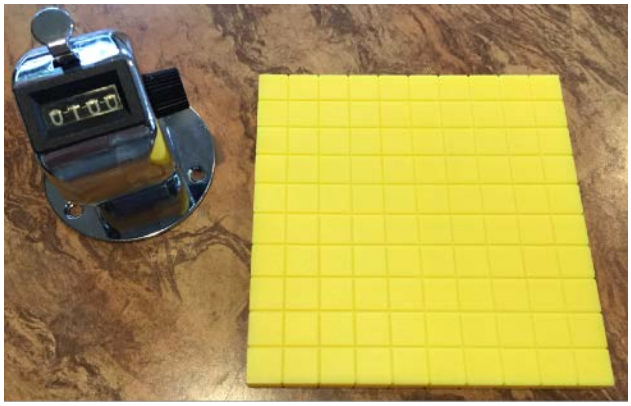
I”m reeling with the thought that Zola has gotten to 4th grade with no understanding of place value, and thinking how awful she must feel about herself and math. As we count through the 20s on through to the 80s, still one cube at a time and predicting at the 9s, trading at the tens, establishing the patterns, she’s solidifying her comprehension of the grouping of ten ones into a ten, along with the place values for ones and tens. The message is getting more ingrained within her with every decade of the count.

We got to about 50-something, and Zola started to wonder aloud about the number 100 (Yes!!! Curiosity!!), so we kept going, happily, one block and click at a time (perseverance), pausing to predict the next number at all 9's, and verifying all tens, to 99. This is a big leap!



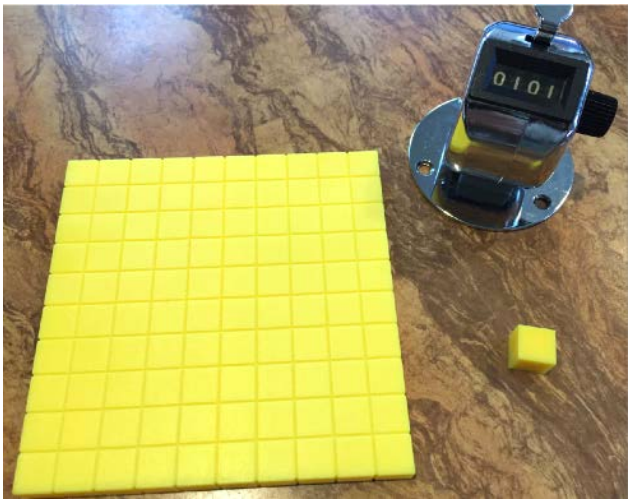
I ask her to predict as I hand over a cube, and she says ‘100,’ then clicks. I”m quiet as she looks at the ‘100’ on the clicker, then at the 9 ten-rods and 10 cubes on the table. She trades the cubes for a ten-rod, and I ask her to tell me what she has. She says ten ten-rods (true). I ask how that make sense with what the clicker has. She’s puzzling for a couple of moments, then glances over to the pile of base 10 blocks, notices the square hundred flat, takes a deep breath, grabs it, and starts to figure out how to make sense of what she has (I am thrilled that she does NOT look at me to tell her what to do). [**Use and connect mathematical representation** *Principles to Actions*, 2014). We connected oral counting, use of clickers and base ten blocks, and base ten place value columns.]

I am so excited for her, but I remain patiently quiet as she thinks. She lays the hundred flat next to the ten rods, but then seems stymied, so I suggest that she put the ten-rods on top of the hundred flat. Carefully she does, and soon she's



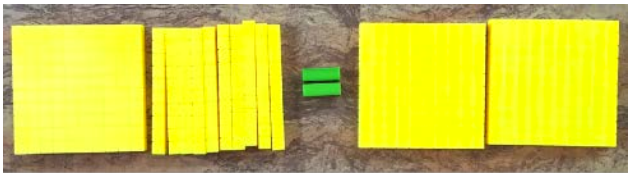
saying that ten rods make the hundred, and once she's traded them, she tells me with growing confidence that the clicker is showing one hundred flat, and no ten-rods, and no cubes. We pause and savor the moment! [**Support productive struggle in learning mathematics** *Principles to Actions*, 2014). Many times I have resisted simply telling her what to do in favor of asking questions to promote her own agency, thinking and sense-making.]

Zola's not ready to stop (evidence that she's still building understanding), so I ask her to predict what the addition of one more cube will look like. She's not sure, so she clicks (yes - she uses the tool appropriately to confirm or deny a



thought), frowns a moment, developing the idea that one more is tallied in the ones column. She tells me about the hundred flat and the one cube. I agree, then ask about tens. She looks at the blocks and she's thrilled to say *there aren't any tens*, that's why there's a '0' in the middle of'101'!!! Yea!!!!

We keep going, one cube at a time, again scooping up ten cubes to trade for a ten-rod, and she's moving faster now, as if it were purposeful play, not looking at me as she speaks appropriately about her actions. As we start the 140s, I start to wonder when she'll tire of it and want to stop. Soon she looked up at me, and she volunteered, "Maybe we should stop when we get to 200." I agree and we continued through, and she was so happy to be certain about trading in the second set of ten-rods for the second hundred. Such a wonderful expression of accomplishment on her face!!



Later that visit, she initiated a count of 100's, due to some word problem values she had. I was impressed that she wanted to try it! We used the hundreds flats to count. Again, similar to the move from 90s to 100, counting 900 to ten hundred and re-forming into 1,000 was new for her, however she kept sharing her thinking and reflecting, and she proposed the word 'thousand' as what the ten hundreds might be, with a tone of voice indicating that mysterious word 'thousand' now had a place to fit.

Moving on, I added one more cube. Zola notices that there are no ten-rods, and no separate hundreds flats, and comments that "one thousand one would have 2 zero's between two ones!"

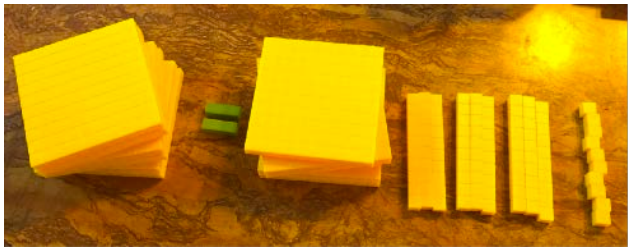
1001

I was delighted to agree!

I showed her another stack of 10 hundreds in a clear plastic cube, suggesting we think about thousands, but she was ready to settle into what she had developed that day, and save working on the thousands for another day. [**Elicit and use evidence of student thinking** (*Principles to Actions*, 2014). I used the evidence of how she developed the value of 100 to believe that I could let her go to 200, to see what makes even more sense at that point, and later to support her own inquiry into counting by 100s to 1000, then to form 1001. with place value meaning.**]**

We returned to the page of 3-digit subtraction problems. Now, Zola understands the rotational grouping of tens and hundreds. We used the base ten blocks to model and talk through many problems like 600 - 358.

I find these whole hundreds, like 600, easier to start with than items like 643 - 358, as there are no existing tens and ones to consider, and one *must* break up one hundred into tens and ones to start; **600 = 5 hundreds + 9 tens + 10 ones.**



When a student struggles to make sense of this even after s/he has correctly regrouped 600 to 500 with 9 tens and 10 ones, ask the student to re-form the 600 by trading back the ten ones for a ten-rod, then trading the now ten ten-rods for a hundred flat, forming 6 hundred flats again. I pushed Zola to use the terminology of ones tens hundreds (no unclear pronouns!) as she picked up blocks, so the words got associated with the blocks, and the **'story'** she was telling about her work process would make sense (so she can extend her work to 4 or more places).

After talking through and working several problems, she was able to explain to another patient and listening adult the story of how to regroup to solve such problems. I complimented her on her perseverance, curiosity, and willingness to work with me. [**Build procedural fluency from conceptual understanding** *Principles to Actions*, 2014). A few days later I again worked with Zola, noting that she was able to tackle 3 digit subtraction with regrouping.].

Aa couple of weeks later, Zola and I were again working together, and she was confidently doing 3 digit subtraction with regrouping. I noticed a completed item on her page like 1000 - 206, with many erasures and regrouping markings. I left her to get the base ten blocks, and a clear cubic liter block (containing 1,000 cm^3 in the form of 9 hundreds flats, 9 tens rods, and 10 ones cubes), and set the big cube and a stack of 10 hundreds flats near her, making no comment.

Zola finished her page and handed it to me to check. She noticed the stack of hundreds flats, thought for a few seconds, then grabbed them toward her, counting them. I smiled and continued to check her paper. Soon I pointed to the 1000 - 206 item, and offered to work that type with her and the blocks. We first discussed the stack of 10 hundreds, and then how the oral sequence 7 hundred, 8 hundred, 9 hundred, 10 hundred made sense as she counted the hundreds flats. We then noted that the 10 hundreds could also appear in the written

pattern **7**00, **8**00, **9**00, **10**00, and that 10 hundred is also known as 1 thousand.

I again asked her about tackling the 1000 - 206 item, using blocks, and she was very willing. I was impressed that she was using the language of "trading" as she traded the top 100 flat for 10 ten-rods, then traded one ten-rod for 10 ones cubes. We talked about what she had now, and she arranged the blocks and told me she had 9 hundreds, 9 tens, and 10 ones. She understands that she is taking away 2 hundreds flats, 0 ten-rods, and 6 ones cubes from that deconstructed 1000. Zola then completed the subtraction correctly.

For struggling 3rd or 4th graders, it may be that they have not yet fully understood how the base 10 system works, that we gather up groups of ten in a column and mark by groups in the next column. One common example is the odometer on a car. I ask students to observe how an odometer counts tenths of a mile, groups ten tenths to one mile, augments the mile counter, and then counts the next ten tenths.

Sadly, I have seen students as old as 16 who subtract in rote manner, do not understand that the digits have values as tens and hundreds, and that a person cannot simply borrow a 'one' from the hundreds to use in the ones place. Using base ten blocks to model the work seems to work well, and provides a memorable activity on which to base further reasoning.

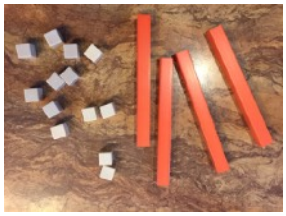
It has been my experience that when students are pushed to use the correct vocabulary, refer to things by name rather than vague pronouns, form their own sentences and thoughts to talk through the working of problems out loud, and share their thinking in pairs, they become more able to learn, confident, curious, and independent.

Reference

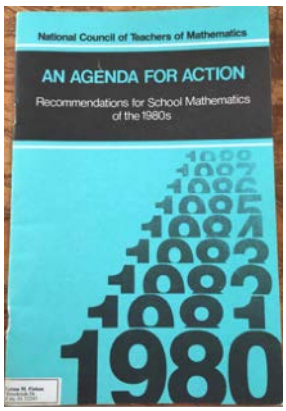
National Council of Teachers of Mathematics. (2014). *Principles to Actions; Ensuring Mathematical Success for All.* Reston, VA: Author.

Author's note:
After completing the task of writing up my experience with Zola, I considered where to place it in this edition of the ICTM Journal. On an existing page, I noticed the table of eight effective teaching practices from *Principles to Actions*, published after I had retired. A couple practices caught my eye as relating to my article. I decided to include them, soon realizing they all had been to some degree instantiated within the work with Zola.

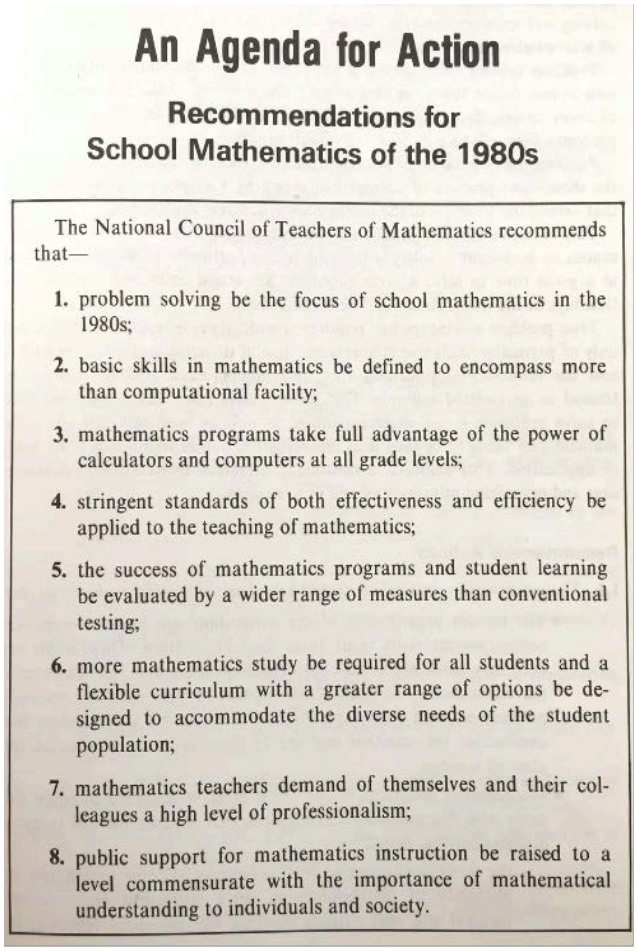
Author's Note:
Cuisennaire ten-rods could be used for ones and tens, with ten 10-ten-rods taped together to form a 100-flat.



About the author:
Dr. Finken has taught every age from 1st to 3rd grades at a two-room country school house through doctoral courses at the University of Iowa. She credits her formation of learning to teach mathematics to the *Agenda for Action: Recommendations for School Mathematics* published by NCTM in 1980 (see the 8 recommendations above), and her students at Solon Junior High



School, Solon, Iowa, where she was the *only* junior high math teacher for 19 years, 1977 - 1996.



An Agenda for Action

Recommendations for School Mathematics of the 1980s

The National Council of Teachers of Mathematics recommends that—

1. problem solving be the focus of school mathematics in the 1980s;
2. basic skills in mathematics be defined to encompass more than computational facility;
3. mathematics programs take full advantage of the power of calculators and computers at all grade levels;
4. stringent standards of both effectiveness and efficiency be applied to the teaching of mathematics;
5. the success of mathematics programs and student learning be evaluated by a wider range of measures than conventional testing;
6. more mathematics study be required for all students and a flexible curriculum with a greater range of options be designed to accommodate the diverse needs of the student population;
7. mathematics teachers demand of themselves and their colleagues a high level of professionalism;
8. public support for mathematics instruction be raised to a level commensurate with the importance of mathematical understanding to individuals and society.

Currently, Dr. Finken supervises secondary mathematics preservice teachers for the University of Iowa.

Dr. Finken has worked with students and instructors at the *Mathnasium in Coralville since 2014.*

MATHNASIUM
The Math Learning Center

[https://www.mathnasium.com/].

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SKY MATH

AKA

Math by a Higher Plane

Challenge your students to approximate these algebraic curves and geometric lines!!

By Teresa Finken

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Implementing *DreamBox Learning* Technology

Sara Pibal

East Sac County Elementary School Principal

spibal@eastsac.k12.ia.us

Trying to find ways to meet students' needs in math and keep them engaged?

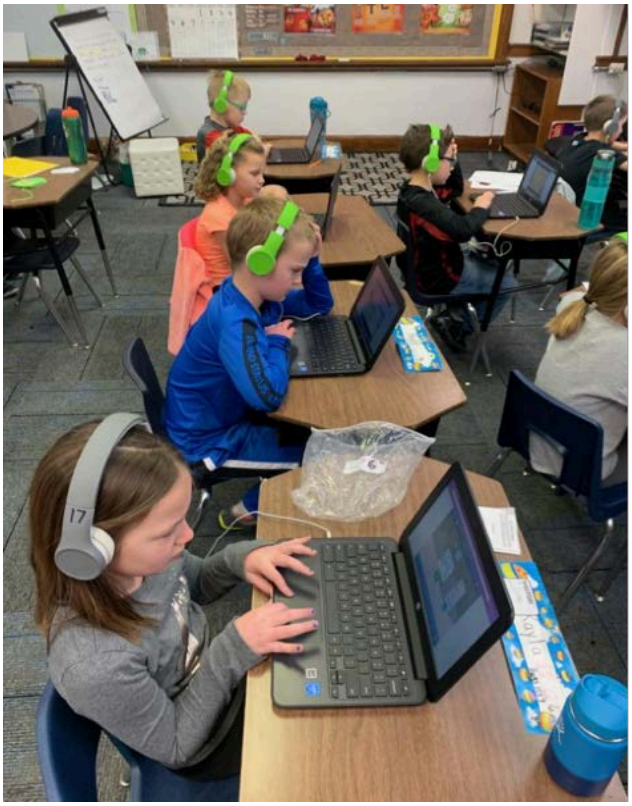
Trying to find a way to track student progress in math?

Trying to create small group stations that are engaging and standards aligned to use during math instruction?

East Sac County (ESC) Elementary Schools have been experimenting with these topics by implementing DreamBox Learning as a supplement to their curriculum and universal instruction. ESC is a small, rural district in Northwest Iowa with a total of approximately 330 students in Preschool-4th grades. There are eighteen classroom teachers with one math interventionist. Last spring, ESC created an action plan with specific steps to increase student achievement in math, and one of those action steps included the use of technology, specifically, DreamBox Learning.

Purpose

DreamBox Learning is an online software program that is focused on mathematics. It is an adaptive online software that adjusts the challenge of problems as students engage in the lessons. Depending on student performance, the program adjusts the difficulty of the problems and even includes scaffolding problems when students are struggling. The purposes of making the decision to purchase this online technology were many; to support students in practicing Iowa Core Mathematics Standards, to use data to make instructional decisions, to engage students when in small groups, and to monitor student progress.



2nd grade students working hard and engaged during DreamBox Learning time.

Decision-Making Process

To make this decision, a team of East Sac County teachers first compared this product with other similar online programs, some of which were free, but nothing that provided teachers with individualized data. The biggest perk of this product was that it is an adaptive technology, meeting students' needs at their individual level, adjusting as students engage in answering math problems. In addition, the data gathered is very specific to the Iowa Core Standards so that lessons can be assigned.

"I like how Dreambox gives teachers a researched based option for one of their math stations. They can set an AssignFocus Lesson based on Common Core Standards. It could be a standard a student needs more practice with, or

a standard that is coming up in the current unit of instruction. Or the teacher can just let the student work on the standards the computer has set for him/her. The program is adaptive so it supports the child where they are in need of practice," says Trish Frier, Math Interventionist.

Next, teachers considered the research to support DreamBox Learning. To spend the amount of money this program costs, the East Sac County District wanted to ensure that the spending was going to be beneficial for student learning. The comparison results were shared with the principal and superintendent to help make a decision with purchasing. Articles used are listed in the bibliography.

In addition, teachers reached out to neighboring districts that have utilized DreamBox Learning to gather opinions from peers. The principal also visited a neighboring district to observe students engaged with the program and what types of ways the teachers utilized the data. Overall, the opinions were in favor of this technology, with the one barrier identified as having the time to analyze the data. **Lastly, writing a grant through the Iowa Council of Teachers of Mathematics was the last step in making a final decision on the purchase of the product. Once notified of the grant acceptance, East Sac County decided to purchase the online product.**

Implementation

Once the commitment was made to purchase the DreamBox Learning technology, teachers were ready to jump in. Student information was uploaded by the technology coordinator and teachers were assigned administrators of the program. The math interventionist really dove into learning about the program. She led the staff through the steps for students to log on and demonstrated the basics of the program. For the first six weeks, teachers were expected to have students learn to log onto the program and experiment with playing the math games so they would become familiar with the program and teachers could gather questions.

DreamBox Learning then hosted a professional development session during a September in-service where teachers could ask questions, look at preliminary data, and get to know the program a bit more in depth. As a staff, a goal was also set at this point to create consistency. It was decided to utilize the math technology at least 60 minutes per week and for students to complete 5-8 lessons per week (each lesson takes approximately 8-12 minutes if students are on task). Teachers could choose how they would implement the technology time.

Some teachers wanted to utilize small groups after whole group instruction. One group was with the teacher, one group playing a math game, and one group worked on DreamBox Learning (using either an iPad or Chromebook). Some teachers had the whole group lesson and then had the whole group work on DreamBox Learning at the same time. This offered the teacher a chance to monitor and support students while they were working on the program.

Teachers can have students work in small groups, with DreamBox Learning as a station. Or teachers can have the whole class work at the same time.

November in-service offered time to look at usage data to ensure teachers were meeting the minimum number of minutes and lessons that were set as an expectation. Active time working on the program was also gathered and provided to ensure students were on task if used during small group time. In addition, information such as the math standards that students were working on were tracked. It also showed if students were struggling in a particular area and included supplementary videos so the student and teacher could watch them together to support the student in learning that particular math concept. **"I was so excited to get a video showing how to solve math problems on my lessons," says Quinten B.**

As mentioned, students can be assigned particular standards to focus on during their DreamBox time. 3rd grade teacher, Allison Schroeder, appreciates this aspect of the program. "I was so excited to learn about and use an online math program in my classroom that engages students with technology. My favorite feature is being able to assign focus assignments that align with my teaching in the classroom."

Students enjoy the game style learning to practice their mathematics skills.

A couple teachers have been working closely to link MAP (Measures of Academic Process) math data to the DreamBox Learning to assign lessons aligned to standards. This work has just begun now that teachers are becoming more familiar with the program. **"I like that I can assign a focus for my students if as a group they need more work on something," commented Mrs. Reiff, 3rd grade teacher.**

Future plans are to utilize the program for progress monitoring. By assigning students a certain math standard, teachers can watch the progress of the student learning. As ESC becomes more and more familiar with the technology, this is the next step in the use of the data.

Students enjoy the DreamBox Learning technology because it is a game-based math program where students perform math tasks and in turn earn tokens to virtually purchase items. Here are some comments from the students. "I like dream box because if you get it wrong, it helps you get to the right answer," shares Aiden L. "It helps me with different strategies." "DreamBox helps me learn more math," Katelyn declares. "I like that at different times it will let us rate it- I think they care if we like it or not."

Conclusion

At the conclusion of the school year, the plan is for teachers to evaluate the outcome of the technology to determine effectiveness. They will look at the usage in terms of time and how often students and teachers utilized the technology. They will also look at the data that the technology provides to help observe student progress. With all these factors, the East Sac County Elementary Schools will determine if they will continue to purchase and utilize DreamBox Learning. This technology, coupled with planning for strong universal instruction creates conditions for students' mathematical success.

I like that once you pass and get done with something it gives you a game."

References

Evidence for ESSA. (2019, December 10). Retrieved from https://www.evidenceforessa.org/programs/math/elementary/dreambox-learning.

DreamBox Learning - Product Reviews. (n.d.). Retrieved December 5, 2019, from https://www.edsurge.com/pten-roduct-reviews/dreambox-learning.

Online Math Learning. (n.d.). Retrieved from https://www.dreambox.com/.

U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse. (2013, December). *Elementary School Mathematics intervention report: DreamBox Learning*. Retrieved from http://whatworks.ed.gov

NOTE: Sara Pibal is Principal at two elementary schools in her district, and wrote grants for each of them to initiate Dreambox technology. ICTM funded both requests.

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Have an idea or experience you feel other Iowa teachers may want to know about?

The ICTM Journal editors encourage you to consider writing for this publication as well.

Perhaps you've tried a new classroom technique? A new manipulative item, or a familiar one in a new manner? Implemented a grant? How are you doing with a new text series? A new technological item?

Perhaps one or more of your students did something interesting you've never seen before?

You may want to write a shorter piece for ICTM to try your hand at writing, because NCTM does not consider manuscripts submitted to other publications.

As a classroom teacher, math coach, AEA consultant, or member of higher education, you have valuable insight and experience others would appreciate and find beneficial.

The ICTM Journal is looking for submissions ranging from teachers in their first year advising other new teachers, through educators reflecting on years of practice.

The editors at ICTM are willing to work with you to prepare your writing to publish in our Journal. The requirements are less stringent than NCTM, and with an annual publication we have a longer time line to assist authors. We look forward to receiving your submission or inquiry about composing a piece.

For further writing detail, please see page 3 of the ICTM Journal.

Deidra Baker and Teresa Finken

ictmjournaled@gmail.com

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Books of Interest

Access & Equity: Promoting High-Quality Mathematics

Book Review

By

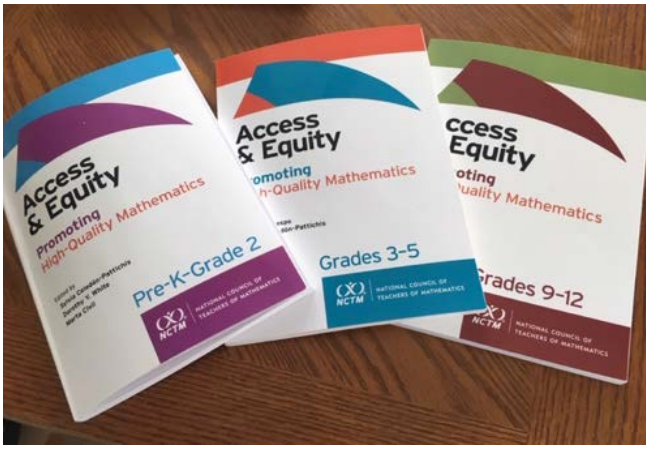
Dr. Comfort Akwaji-Anderson

akwajic@waterlooschools.org

There are many resources and materials out there for addressing equity in mathematics education. Among those are books designed to *promote high-quality mathematics by* offering mathematics educators with strategies and to put NCTM's Equity Principle/Access and Equity Principle from NCTM's *Principles to Actions: Ensuring Mathematical Success for All* (2014) into practice. **The 4 part book series titled "*Access and Equity*" (Grades Pre-K-Grade 2, Grades 3-5, Grades 6-8 and Grades 9-12)** is one that I have been reading and have begun incorporating into my work. Available at the NCTM bookstore .

If you are looking for a book study for a district wide PLC, I recommend this series because the ideas across the books are the same. They tackle the same idea in a progressive manner. The books in the series aim to support teachers in:

- Expanding their thinking about access and equity in mathematics teaching and learning;
- Understanding and addressing the obstacles to achieving access and equity;
- Exploring productive and unproductive beliefs in relation to access and equity;



- Examining the role of expectations in relation to access and equity;
- Using mathematically rigorous and challenging tasks with a focus on access and equity;
- Learning how to adapt mathematics curriculum material so that they meet the Access and Equity Principle; and
- Developing and sustaining school and community partnerships as fundamentals to a commitment to access and equity.
  (*From: Access and Equity: Promoting High Quality Mathematics in Grades Pre-K-Grades 2, Grades 3-5, Grades 6-8, Grades 9-12, pg. vii,. NCTM: 2018).*

We hope to do a Twitter book Chat in the later in the year. Watch for details on the Iowa Mathematics Leaderships website. Details will be available at Iowamath.org as well.

You may wish to hear this WEBINAR:
Access and Equity: Promoting High-Quality Mathematics Pre-K–12 January 31, 2018 | Speakers: Marta Civil, Sylvia Celedón-Pattichis, Sandra Crespo, Anthony Fernandes, and Dorothy Y. White

Commentary

Ongoing conversations among ICTM members should include what our equity related issues are and which to tackle first. Which will make the biggest impact? There is no right or wrong

answer. Depending on your local context, some equity related topics may be more of a priority than others. For example, there may be a shortage of qualified applicants for open positions, perhaps parents resist their students taking "hard" math classes, maybe students are tracked based on factors other than acceleration readiness.

On a larger scope/scale, should we count the number of teachers of mathematics who are also teachers of color in our state as a baseline to help us plan next steps for recruiting or growing our own? Is or will that address all or most of our equity needs? Or, should we rather be student-centered and revisit the student demographic data which reinforces what we already know which is that our demographics are changing across our state and begs for the question "how are we ensuring access to, and opportunity for meaningful mathematics learning for each and every student?

And, how are we intentional about the learning and achievement of those students who are not native speakers of English when compared to their peers? To what extent do our practices align with what is known about, or strategies for equitable mathematics teaching? To what extent are we purposefully looking at our student data through an equity lens?

Our state's equity work is complex and loaded with unintended/implicit biases. There is no denying that we WE ALL have biases. The question becomes what can we do differently given this awareness? In an effort to build our capacity for equity and excellence in mathematics education, ICTM along with the State Mathematics Leadership team continue to work on strategically bringing mathematicians and mathematics educators engaged in equity work across the country to work with us as we continue on this journey!

Citations

Celedon-Pattichis, S., White, D.Y., & Civil, M. (2017). Access and Equity: Promoting High Quality Mathematics in Grades Pre-K-Grade 2. Reston, VA: National Council of Teachers of Mathematics. *Cont.*

Crespo, S., Celedon-Pattichis, S., Civil, M. (2018). Access and Equity: Promoting High Quality Mathematics in Grades 3-5. Reston, VA: National Council of Teachers of Mathematics.

Fernandez, A., Crespo, S., Civil, M. (2017). Access and Equity: Promoting High Quality Mathematics in Grades 6-8. Reston, VA: National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics. (2014). *Principles to action: Ensuring mathematical success for all.* Reston, VA: Author.

White, D.Y., Fernandez, A., Civil, M. (2018). Access and Equity: Promoting High Quality Mathematics in Grades 9-12. Reston, VA: National Council of Teachers of Mathematics.

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Consider the following article in The Atlantic, about Maxwell King's book about Fred Rogers' life and work.

"Mr. Rogers Had a Simple Set of Rules for Talking to Children

The TV legend possessed an extraordinary understanding of how kids make sense of language." From The Atlantic

|By Maxwell King, author of The Good Neighbor: The Life and Work of Fred Rogers,

Fred Rogers created the TV show Mister Rogers Neighborhood close to 50 years ago. He was very careful about his use of language that would not relate to some children or could cause confusion or fear in children watching his show.

The article offers a set of 9 steps to use in revising initial language to rephrase into the simple but carefully considered language Mr. Rogers used in speaking with children.

https://getpocket.com/explore/item/mr-rogers-had-a-simple-set-of-rules-for-talking-to-children?fbclid=IwAR0QEkPA0vEFgRDvK5ZjRUKi52KI9IObCHvTJgSqy8F-cszgqhswSQ4wPB8

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Free eBooks by Bob Albrecht

Play Together, Learn Together: Factor Monster

Bob Albrecht & George Firedrake
bob@geekclan.com

http://i-a-e.org/downloads/cat_view/86-free-ebooks-by-bob-albrecht.html

Factor Monster is our name for a classic game about natural numbers, composite numbers, prime numbers, factors and proper factors. The original game is called The Factor Game - you can find it on the Internet.

We have gone way beyond The Factor Game and built a system of games, including

Factor Monster Try for High Games

Factor Monster Go for Low Games

Factor Monster Tie Quest Games

Factor Monster Symmetric Games

Designing strategies for playing Factor Monster Games

This eBook also contains much ado about sequences, series and sums of consecutive natural numbers (triangular numbers).

Factor Monster is a never-ending source of enquiries yet to be done!

We recommend ***Mathemagical Black Hole 123*** to amaze and amuse students from **FIRST GRADE through HIGH SCHOOL**. It requires only **counting and catenating** (putting together).

Mathemagical Black Hole 123 is one of a bunch of mathemagical black holes described in our **free** 96-page eBook *Mathemagical Black Holes*, one of 13 **free** math & science eBooks you can download as a PDF file or Word file at

http://i-a-e.org/downloads/cat_view/86-free-ebooks-by-bob-albrecht

[Scroll down to *Mathemagical Black Holes*.]

Bob Albrecht & George Firedrake

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Veggie Math

What do you notice?

What spirals can you identify?
Can you locate angles on the pumpkin's top?
Find the 'hat size' of the pumpkin, perhaps a 7" pie?
Squash symmetries?

See also Fractal Cauliflower, at iowamath.org page 26, ICTM Journal Vol. 39

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Steam: Science, Technology, Engineering, Arts, Mathematics

Iowa STEM Program Update: The M in STEM

Lindy Ibeling

Communications Manager

Iowa Governor's STEM Advisory Council

ibeling@IowaSTEM.gov

2019-2020 and beyond is about ramping up support for the M in STEM, given the emphasis on mathematics in America's Strategy for STEM Education. The Iowa Governor's STEM Advisory Council recognizes that a strong foundation in mathematics is critical to achieving our mission of increasing interest and achievement in STEM (science, technology, engineering and mathematics) studies and careers through partnerships engaging preK-12 students, parents, educators, employers, non-profits, policy leaders and others.

The STEM Council provides the following opportunities to mathematics and teachers and other STEM educators to help inspire Iowa's young people to become innovative, enterprising contributors to our future workforce and the quality of life in our communities.

STEM Scale Up Program

Mathematics education took center stage this summer in a special Scale-Up Program sequence to bolster the STEM Council's support of the M in STEM. Three programs were identified to scale in 2019-2020 across Iowa in addition to the ten high-quality STEM programs selected last April to "scale- up" in Iowa's PreK-12 schools, after-school programs and other educational settings. Iowa's regional STEM managers, guided by their regional STEM advisory boards, selected recipients throughout the state based on need, student diversity, geographic distribution, capacity to sustain and other factors.

The mathematics Scale-Up Program awards were delivered to nearly 700 educators in addition to 1,200 Iowa educators awarded standard STEM Scale-Up Programs for implementation in the 2019-2020 academic year. The Scale-Up Program is expected to impact an estimated 19,000 students in 2019-2020.

Since 2012, funding from the Iowa legislature has enabled more than 500,000 PreK-12 Iowans to take part in these proven learning models.

A special mathematics Scale-Up Program menu was offered to help increase understanding, reasoning and interest in mathematics among students in Iowa. Support was provided for the mathematics menu through an additional investment made during the Iowa legislative session.

A complete list of 2019-2020 STEM Scale-Up Program awards and more information about the Scale-Up Program can be found at www.IowaSTEM.gov/Scale-Up.

STEM BEST Program

Mathematics teachers and students are often contributors and participants in STEM BEST partnerships. The STEM Council recently awarded 13 new STEM BEST (Businesses Engaging Students and Teachers) Programs to school districts across Iowa. A total of 63 STEM BEST® Programs have been awarded throughout Iowa over the past six years. These programs are providing meaningful work-based learning experiences and activities in the K-12 educational arena.

Some of the models focused their efforts on facilitating work- based learning experiences for a specific age group while others provided for a cross-section of students. While this time is spent on program planning and facilitating partnerships, the STEM BEST partners still manage to facilitate true work-based learning experiences for their students. Of the recently awarded STEM BEST Programs, approximately 5,000 students are expected to participate or be impacted by taking on a community project, business partner meetings and pitches or recruitment of peers.

For more information about the STEM BEST Program, visit

www.IowaSTEM.gov/STEMBEST.

STEM Teacher Externship Program

Mathematics teachers make great externs and the world of industry very much values their contributions. It was a record-setting tenth year of STEM Teacher Externships. Ten years ago, ten Iowa workplaces took a leap of faith, inviting high school STEM teachers into shops, plants, labs, worksites and offices for six-week externships. Powered by an exploratory grant from Iowa's Economic Development Authority to the STEM Council's precursor the *Iowa Mathematics and Science Education Partnership*, employers helped forge a potent model for teacher professional development through the immersion of STEM educators in workplace settings.

The National Science Foundation invested $1.2 million in the concept to expand and research its impact from 2011 to 2014, when evidence compelled the STEM Council to pick it up as a public-private partnership. Today, participation by the business sector and educator applications are at all-time highs thanks to ever-increasing private sector cost-sharing. In 2019, 83 educators were placed at 58 workplaces.

Iowa's model has been exported to numerous states, including Florida, Oklahoma, Idaho and Virginia. Of the nearly 600 Iowa teachers who have taken part, more than 90 percent consider it their most powerful professional development experience. Over 90 percent of workplace hosts benefited from the teachers' contributions.

Additional information about the program participants, projects and impact may be found at www.iowastem.gov/externships.

I.O.W.A. STEM Teacher Award

Mathematics teachers are often nominated for, and frequently recognized by the I.O.W.A. STEM Teacher Award. Each year, the STEM Council, in partnership with Kemin Industries, shines a light on six educators doing amazing work in STEM fields each year. In its sixth year, the award recognizes one full-time, licensed PreK-12 teacher from each of the state's six STEM regions for being:

> **I**nnovative in their methods,
>
> **O**utstanding in their passion for education,
>
> **W**orldly in how they help students see that STEM is all around them, and
>
> **A**cademic through engaging students in the classroom
> to prepare them for higher education and high- demand careers.

Each of the six teachers selected will receive an award of $1,500 for personal use, and an additional $1,500 for his/her classroom. For more information about the I.O.W.A. STEM Teacher Award, visit
www.IowaSTEM.gov/teacheraward.

Computer Science is Elementary Project

With mathematics and computational skills closely interwoven, the STEM Council recently partnered to support twelve elementary schools receiving $50,000 grants each to transform into models of innovative computer science instruction through a joint Computer Science is Elementary project of the Iowa Department of Education and the STEM Council. All 12 schools will start their programs by 2020-21. For additional information about the Computer Science is Elementary project, visit www.IowaSTEM.gov/cselementary.

These efforts and more are made possible through the leadership of the STEM Council Co-Chairs Governor Kim Reynolds and Accumold President and CEO Roger Hargens, along with additional Council members, Iowa's six regional STEM managers and their advisory boards and bipartisan support from the Iowa Legislature. For more information about the STEM Council, visit www.IowaSTEM.gov

Lindy Ibeling

ΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩ

Web Bytes

MathScienceMusic.org is a free toolkit for teachers, bringing together the best resources in math, science and music.

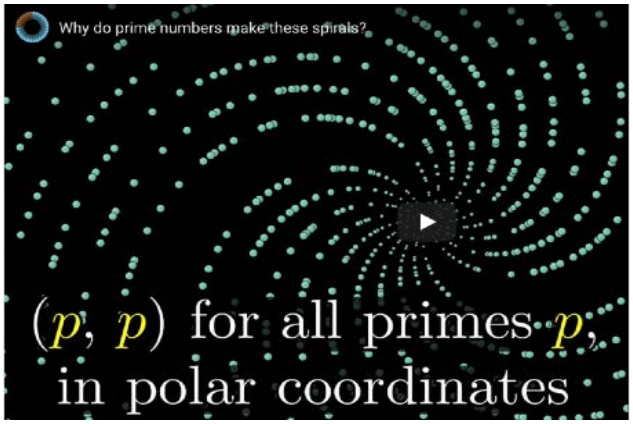
Designed for students, kindergarten through college.

https://mathsciencemusic.org/?fbclid=IwAR2XegaHOUzbrHVwRd3PhZgBgfsxNHpEC4CKQ6SdMZ44s4kt74bRMYwSHbk#/

<><><><><><><>

Animated Math - math with a visual approach by Grant Sanderson

https://www.3blue1brown.com/



Fantastic videos , podcasts, interactive videos, and more on topics of Geometry, "Why Pi?," Calculus, Linear Algebra, Differential Equations, and Physics.

ΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩΩ

Did you know that **April is Mathematics and Statistics Awareness Month**? The Joint Policy Board for Mathematics (JPBM) is a collaborative effort of these four groups:

Find Mathematics and Statistics Awareness Month events and poster at **http://www.mathaware.org/index.html**.

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Do you teach undergraduates?

The Mathematical Association of America (MAA) has developed an **Instructional Practices Guide** that details their values, stating, "Effective teaching and deep learning require student engagement with content both inside and outside the classroom (site below)."

The work is available as downloadable PDF, as an open access publication through Creative Commons Attribution Non /commercial license.

The MAA focuses on three main arenas of Classroom Practices, Assessment Practices, and Design Practices. They include illustrations, vignettes, flipped classroom, universal design for learning, and more. Also explained are the cross-cutting themes of technology and equity in practice.

SEE: https://www.maa.org/programs-and-communities/curriculum%20resources/instructional-practices-guide

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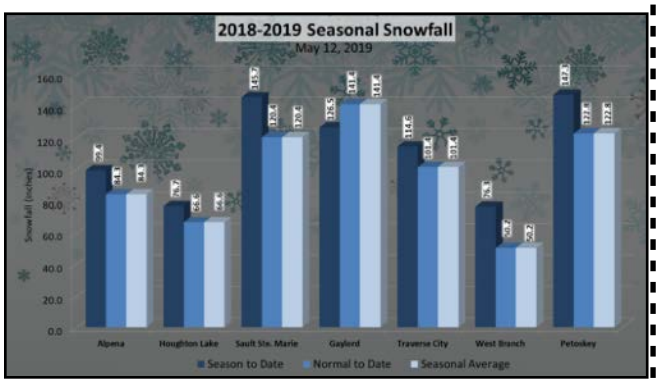


Are you a middle or high school teacher looking for peer-reviewed lesson plans on statistics?

Check these out!

Statistics Education Web (STEW), an online journal of K-12 statistics lessons http://www.amstat.org/education/stew and

Project-SET (Statistics Education for Teachers) http://project-set.com/.

Find out where math is used by checking out the **American Mathematical Society**'s (AMS's) "AMS for Students" page:

http://www.ams.org/programs/students/students.

There you can find podcasts and posters for your classroom as well as what careers use mathematics. The "Mathematics Matters" series of posters explores the math behind many everyday and technology experiences—a great way to spread the word about what math is good for!

ΩΩΩΩΩΩΩΩΩ

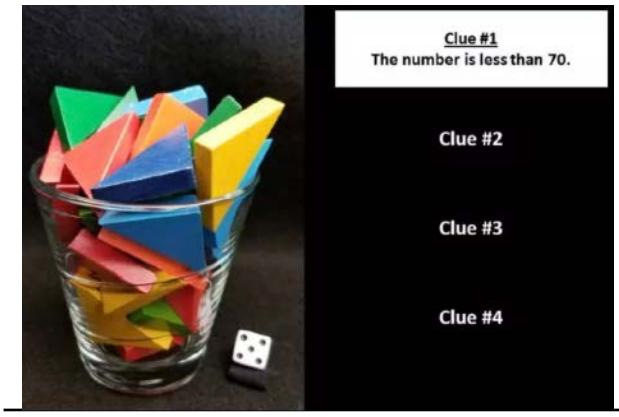
Steve Wyborney

https://stevewyborney.com/

51 Brand New Esti-Mysteries! 4 Challenge Levels! All New Images!

If you've used the Esti-Mysteries from **the original Esti-Mysteries blog post**, or the 15 additional Esti-Mysteries that I wrote for **20 Days of Number Sense and Rich Math Talk,** you'll really enjoy this new set!

My goal was to write and post 51 brand new Esti-Mysteries between September and December.



Our students are amazing learners, and these resources are designed to give them opportunities to richly and deeply experience number sense and math discourse. I hope you like them!

https://stevewyborney.com/2019/09/51-esti-mysteries/

See Steve's Dot Cards on next page

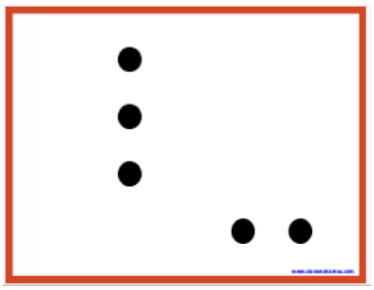
Dot Cards and Challenge Patterns

Steve Wyborney

https://www.stevewyborney.com/

100 Subitizing Slides & 10 Challenge Patterns

With a click, a pattern of dots appears on your screen. Instantly your students tell how many. They don't count the dots. Instead they simply know the total at a glance.



Subitizing – when a person looks at a small set of objects and instantly detects the total without counting. It's a powerful process and a truly remarkable one.

I have a new resource for you. 100 Subitizing Slides & 10 Challenge Patterns.

There are 10 sets, and each set includes 10 subitizing slides and 1 challenge pattern. In between each slide, I've placed a blank slide. As you click through the slides the effect will be that the slides are appearing and disappearing – at the rate that you choose. The blank slide will also allow you to toggle back and forth to an image or simply move forward to the next image.

Then, after 10 quick subitizing experiences, you'll see one challenge image which will be duplicated several times on the screen.

Download the sets, try it out in your classroom, and let me know how it goes!

Downloadable Sets

Subitizing Set 1 with a Challenge Image

Subitizing Set 2 with a Challenge Image

Subitizing Set 3 with a Challenge Image

Subitizing Set 4 with a Challenge Image

Subitizing Set 5 with a Challenge Image

Subitizing Set 6 with a Challenge Image

Subitizing Set 7 with a Challenge Image

Subitizing Set 8 with a Challenge Image

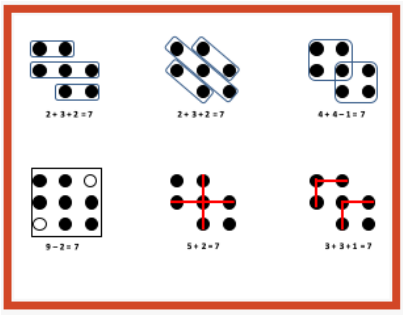
Subitizing Set 9 with a Challenge Image

Subitizing Set 10 with a Challenge Image

If you want a tool to create your own challenge patterns, take a look at

How to Create 9 Identical Dot Patterns in 10 Seconds or Less.

Steve shares a sample slide showing a number of ways to "see" 7. Number talks!!



Editor's Note:
Subitizing slides work well with students who are not ready to use numerals. Students can gain the idea of 1:1 counting, learn to add/subtract ,and increase fluency using the cards, which are more iconic than counting cubes or bears, and more comfortable for older students. Students gain confidence in their mathematical power and can more easily move into numerals when ready.

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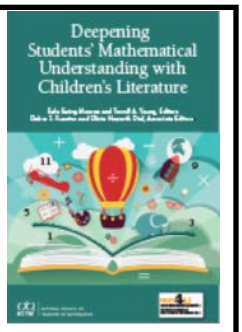
A Math Trail to Every Classroom By Jan Cohen, Founder, UrbanMathTrails



https://trailtoeveryclassroom.blogspot.com/2019/12/a-math-trail-to-every-classroom-by-jan.html?fbclid=IwAR1ZHrbXB6Kq8zWdYJTUNqaQ7BMgjWzS4pEQXHvcjm2xtzkJYIUIA2ts_5k

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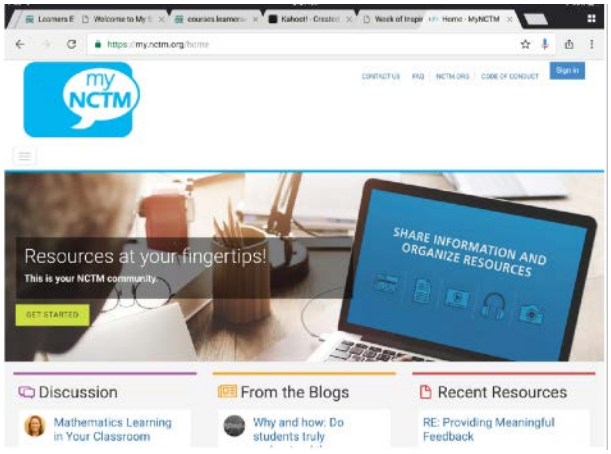


Deepening Students' Mathematical Understanding with Children's Literature

The Hunt Institute VIDEOS

NCTM and The Hunt Institute have produced a series of videos to enhance understanding of the mathematics that students need to succeed in college, life, and careers.

Beginning in the primary grades, the videos address the importance of developing a solid foundation in algebra, as well as laying the groundwork for calculus and other postsecondary mathematics coursework.

- Building Conceptual Understanding for Mathematics
- Mathematics in the Early Grades
- Developing Mathematical Skills in Upper Elementary Grades
- Mathematical Foundations for Success in Algebra
- Preparation for Higher Level Mathematics
- Standards for Mathematical Practice
- Parents Supporting Mathematics Learning
- Conversations about K-12 Mathematics Education (Five-Part Series)

The series also covers the Standards for Mathematical Practice elaborated in the Common Core State Standards for Mathematics and examines why developing conceptual understanding requires a different approach to teaching and learning.

http://www.nctm.org/standards-and-positions/common-core-state-standards/teaching-and-learning-mathematics-with-the-common-core/

Favorites

Bedtime Math:http://bedtimemath.org/

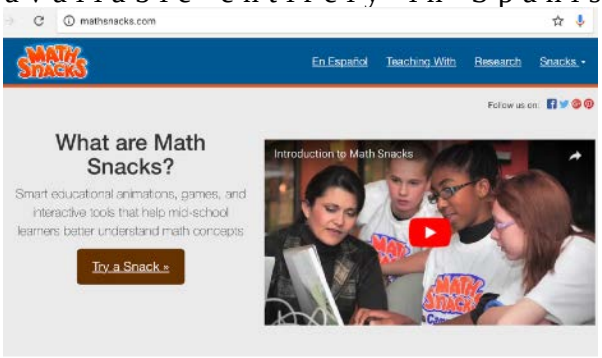
Edutopia: http://www.edutopia.org/blogs/tag/stem

National PTA: http://www.pta.org/

Numberphile: http://www.numberphile.com/

Looking for online conceptual activities for grades 4-8?

MATH SNACKS contains content on number sense, ratio, proportion, measurement, scale factor, and pre-algebra. All activities are aligned with the Common Core, and there are teacher and learner guides, and printable Comic Book Transcripts for each animation (helpful for those ELLs who need Spanish forms). The site is also available entirely in Spanish.



I enjoyed the SNACK about using proportional reasoning to fix a problem with two different measurement systems that do not match up, a concept difficult for many students.
http://mathsnacks.com/teaching-with.html

T. Finken

ICTM AWARDS

Pam Swan

The Lifetime Achievement Award

Pam Swan graduated from UNI with a BS degree and later earned a Master's in School Mathematics. P taught high school and dual credit mathematics for 36 years, 34 of those at Humboldt High School. Teaching with student discovery, Pam inspired thousands of students, several student teachers, and countless math teachers. Pam implemented *Discovery Geometry* curriculum early on. Pam spent her last two professional years as the TLC Math Coach for high school and middle school teachers, giving guidance and researching effective constructivist methods for teachers, such as Number Talks, estimation activities, and Three Act Tasks. Pam was a finalist for the Presidential Award, and was honored with many Champion for Children Awards from Humboldt Schools. Pam also joined the effort to align high school courses to college standards at the Precalculus workshop at ISU.

Pam also served actively on the ICTM Executive Board for 8 years. As she retired, Pam offered her thoughts, "although math is not ever student's favorite course, I have had the privilege of teaching math to many doctors, lawyers, engineers and other extremely gifted students. However, my love is teaching the students that math doesn't come easy for, the ones where you could see the light bulbs lighting up, the ones who tried hard for their eared grade." ICTM is pleased to honor and thank Pam for her wonderful service to students, and for her furthering of mathematics education in the State of Iowa.

The Lifetime Achievement Award honors an individual who has made significant contributions to mathematics education during her or his lifetime. ICTM Executive Board members nominate individuals for this award. The recipient is determined by vote during the Executive Board meeting. The Lifetime Achievement Award is presented to the recipient at the ICTM Annual Conference. The award recipient receives a wooden plaque with a metal plate inscribed with the ICTM logo, the award, and the name of the recipient.

^^^^^^^^^^^^^^^^^^

Lonna Anderson

State Friend of Mathematics Award

Lonna started her career as a Social studies teacher in Mission, Texas, moved to Iowa as Principal and Athletic Director for Muscatine, then became Director of Instruction and Curriculum at Oskaloosa. Her next position took her out of state as Assistant Superintendent of Curriculum and Instruction for Dunlap

Community Unit School District #323. In 2014, she returned to Iowa as Director of Instructional Services at Great Prairie AEA, and most recently accepted the position as Director of Elementary Education in Ottumwa.

While at GPAEA she supported the math team, and later the entire state group of AEA math consultants. Her efforts expanded to other education stakeholders from school administrators to Department of Education members. She worked to understand the needs of students and teachers as they modernized mathematics teaching and learning. For example, she was instrumental in securing group pricing for the state for FastBridge math screening, to enable all schools to do math screening with their students. Lonna embraced NCTM's *Principles to Action: Ensuring Mathematica Success for All*, and has been a great supporter of the vision for reform in mathematics education in Iowa.

State Friend of Mathematics Award

The State Friend of Mathematics Award honors an individual who has made significant contributions to mathematics education in the state of Iowa. Regional Directors are responsible for submitting the names of potential nominees. These names are presented at the June Executive Board meeting. The Executive Board is responsible for nominating and awarding the State Friend of Mathematics through a vote. The State Friend of Mathematics Award is presented at the ICTM Annual Conference. Awardees are given a wooden plaque with a metal plate inscribed with the ICTM logo, the award. and the name of the recipient.

We are looking for other members to Spotlight. If you or someone you work with is doing something interesting or extraordinary, or has been honored recently, please share this information so we can include him or her in a future spotlight.

More reasons to be a member of NCTM!

Get Support!

Use the Justification Toolkit to communicate conference benefits to your district, supervisor, and colleagues.

Justification Toolkit (PDF)

Are you fully utilizing all of the benefits NCTM provides to mathematics educators?

With the new NCTM benefits, as a member you are now able to sign for ***My NCTM,*** which is an open sharing community you may wish to join for current postings, ask questions, search for others' postings on your interest area. https://my.nctm.org/home

NCTM Launches New Publication for Educators Available to Members January 2020 - Mathematics Teacher: Learning and Teaching PK-12 Dec 18, 2019

The Journal for Research in Mathematics Education **provides a forum for research in the teaching and learning of all levels of education.**

Members also receive a discount on resources from their online store http://www.nctm.org/store/, and have discounted admission to conferences and the national convention. Even if you choose not to join NCTM, many resources are available free to everyone.

NCTM Centennial Conference

April 1-4, 2020 Chicago McCormick Place

https://www.nctm.org/100/#intro

GRANT OPPORTUNITIES

- *Got a new idea you would like to try in your classroom?*
- *Thinking about going back to school?*
- *Interested in professional development?*
- *Thought about attending an NCTM Conference?*
- *Want to try an after school student activity?*

There are opportunities available to help members of ICTM fund all of these professional engagements!

ICTM Conference Grant - *New!*

Five grants of up to $200 each are offered every year to encourage and support a certified mathematics teacher in attending the ICTM Annual Conference.

Conference Travel

ICTM offers two grants each year of up to $800 each to encourage and support a certified mathematics teacher in attending an NCTM regional or national conference. Conference Grant Application due June 30th.

Advanced Tuition

ICTM offers two grants of up to $500 each to support an ICTM member who is pursuing education related to mathematics education and/or mathematics teaching. Advanced Tuition Grant Application due June 30th .

Curriculum Grants

ICTM offers three grants of up to $500 each year to encourage and support the efforts of individual or teams of certified mathematics teaching staff in the development and implementation of innovative teaching strategies or projects in the field of mathematics. Curriculum Grant Application due June 30th.

See Page 30 - how a district used this grant!

Extracurricular Mathematics Grant

ICTM offers four grants of up to $250 each to encourage extracurricular mathematics involvement for students. Extracurricular Mathematics Grant Application due June 30th.

By supporting our members, ICTM is contributing to the mathematics education of Iowa students; help us invest in the future by applying for one of these grants.
Watch for next year's grant opportunities available on-line at www.iowamath.org

ICTM is here for YOU!

Join the Iowa Council of Teachers of Mathematics

Why Join ICTM?

Being a member of the Iowa Council of Teachers of Mathematics (ICTM) means you are a member of a professional organization that is working to promote and improve mathematics education in Iowa. Benefits include:

- Annual ICTM conference discount
- ICTM yearly journal
- Discount on NCTM publications
- Grant opportunities
- Networking with other mathematics educators across the state
- Professional development component for Iowa Teaching Standards

Visit our Website and Social Media:

Website: www.iowamath.org
Twitter: @iowamathteach #iowamath
Instagram: @iowamathteach
Facebook: Iowa Council of Teachers of Mathematics
Blog/Shorts: iowamath.org submit a blog
Email is iowamath@gmail.com

List of Executive Board Members:
Visit: www.iowamath.org/about/board.

Learn More about ICTM

Grant Opportunities:
www.iowamath.org/grants

1. Curriculum Grant: $500 grant to support innovative teaching
2. Conference Travel Grant: $800 grant to attend NCTM Regional or National Conferences
3. Advanced Tuition Grant: $500 grant to support advanced coursework in mathematics education
4. Extracurricular Mathematics Grant: $250 grant to encourage extracurricular mathematics involvement for students.
5. ICTM Conference Grant: $200 grant to support a certified mathematics teacher in attending the ICTM Annual Conference.

Membership Form

Name _____

Home Address _____

Home City _____ State _____ Zip _____

Home Phone _____

E-Mail Address _____

AEA # _____ School Name _____

School District _____

Check your main interest:

- ❑ Grades K-2
- ❑ Grades 3-5
- ❑ Grades 6-8
- ❑ Grades 9-12
- ❑ Post Secondary
- ❑ Special Education
- ❑ Library/Media
- ❑ Supervisory/Admin

Annual Membership Fees:

- ❑ Regular $25 1 year
- ❑ Regular $45 2 years
- ❑ Regular $60 3 years
- ❑ Student $5
- ❑ Retired $5 ($0 if member for past 5yrs)
- ❑ Institutional $50 (elem. schools only – see iowamath.org for more info.)

Amount enclosed: $ _____

Send membership form and registration fee to:
ICTM
2382 Iowa Highway 24

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