Dennis-Yarmouth RSD

Instruction Office Newsletter

An Illinois Teacher Improves the Math Homework He Assigns

In this article in *Mathematics Teaching in the Middle School*, Lee Walk (Cumberland Middle School) and Marshall Lassak (Eastern Illinois University/Charleston) bemoan the perennial problem of students handing in homework assignments incomplete, rushing through them, or not doing them at all. "Unfortunately," says Walk, reflecting on his own experience, "many students seemed to think that homework was just another unpleasant task to finish as quickly as possible without thinking deeply about what they were doing." Although studies show that doing homework is correlated with better mathematics grades, there is no relationship between time spent on math homework and student achievement.

Doing further research, Walk realized there are four possible levels of cognitive demand with mathematics tasks:

1. **Memorization;**
2. **Procedures without connections to concepts or meaning;**
3. **Procedures with connection to concepts;**
4. **Doing mathematics.**

Homework assignments at the first **two levels** have little or no cognitive demand and are boring for most students. Homework assignments at the **fourth level**, doing mathematics, require deeper thinking and understanding – too difficult for many students-and

(Continued on page 2)

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IMPORTANT DATES

November 5- Daylight Savings Times ends

November 7- ELL Parent Night @ DYH Library 6-7:30

November 10- No School

November 11- Veterans Day

November 22- No School

November 23- Thanksgiving

November 24- No School

IMPORTANT NOTICE:

Central office is a fragrance-free zone so please be respectful and plan accordingly when you visit.

Due to one of our members at Central Office being highly sensitive to *any type of fragrance*, we ask that staff visiting/meeting at the Administration building refrain from using any scented products. Fragrances from personal care products, air fresheners, laundry and other cleaning products have been associated with adversely affecting a person's health. We ask that we all work together to make the environment a safe and healthy workplace for everyone.

Thank you very much for your cooperation!

(Continued from page 1)

are better suited to in-class work. The sweet spot for homework, say Walk and Lassak, is the **third level.**

Bearing this and other research insights in mind, Walk decided to make several changes in his Illinois eighth graders' homework assignments:

- He assigned fewer problems and geared them to the "just right" level of cognitive demand – procedures with connection to the concepts being taught.
- He gave students the choice of doing homework each day or, if they were busy with other commitments, putting it off – nothing was due till the end of the week

- He experimented with several types of problems: **(a) Find and fix the mistake, which asked students to identify the mistake in an incorrectly solved problem, explain the mistake, and solve the problem correctly; (b) Problem sorts, which asked students to sort equations they'd already solved into two groups with common characteristics; (c) Create your own word problem, which had students write a story that matched a given equation and algebraic expressions – basically, a word problem in reverse; and (d) Justify your reasoning, which had students analyze why linear equations can have one, none, or infinitely many solutions**. (For sample assignments and students' responses, see the full article linked below.)
- Walk told students that there's a difference between getting help wrestling with a problem and copying a classmate's work. He encouraged pairs and small groups of students to collaborate on their math homework.

Walk found these changes brought about a marked improvement in students' attitudes toward homework and the quality of work they did (although there were still a few who didn't hand in assignments). The changes also improved in-class discussions, with students showing more confidence and better use of math vocabulary, and gave Walk important insights on what students did and did not understand, improving his in-class teaching and the quality of the assignments he gave.

"Making Homework Matter to Students" by Lee Walk and Marshall Lassak in *Mathematics Teaching in the Middle School*, May 2017 (Vol. 22, #9, p. 546-553), http://bit.ly/2pZ4NEA; the authors can be reached at lwalk@cumberland.k12.il.us and mblassak@eiu.edu.

When Should Students Be Allowed to Redo Their Work?

In this article in *MiddleWeb*, veteran educator Rick Wormeli says he supports the idea of students being able to do their work again for full credit. "Our world is full of redos," he says. "Pilots can come around for a second attempt at landing. Surgeons can try again to fix something that went badly the first time. Farmers grow and regrow crops until they know all the factors to make them produce abundantly and at the right time of the year. Movie directors? They invented it." But Wormeli believes redos should be used with some key provisos:

- *Redoing is at the teacher's discretion*. Wormeli recommends notifying parents up front about how the process works. Students can redo work only a couple of times a semester, and if students are abusing the privilege (for example, boasting to friends that they'll take the test as a preview and then really study for the redo), don't allow the second chance. Wormeli is

inclined to be merciful and look for underlying causes: "We may need to modify our instruction," he says, "coach the student on time-management skills, confer with the parents, look at the student's schedule outside of school, or get guidance from a school counselor because of a difficult emotional issue the student is experiencing."

➢*Ask parents to sign the original and request a redo*. This prevents students from requesting quickie same-day redos and keeping their parents in the dark.

➢*Have students explain what got better*. They should submit the original attempt stapled to the new one, accompanied by a brief letter comparing the two. This also makes it easier for the teacher to keep track of who's doing what.

➢*Reserve the right to change redo formats*. "Instead of a student redoing a large, complex project on the use of imagery in poetry," says Wormeli, "I might call the student to my desk and ask him or her to find five uses of imagery in each of two different poems, then to explain how the poet uses the imagery to invoke feelings and thoughts in readers' minds… In 10 minutes, I've reassessed my student and I can record the new grade in the grade book."

➢*Plan with students*. It's not productive for students to redo an assignment and get the same grade. Better to sit with the student and make a step-by-step, day-by-day study plan for addressing what caused problems the first time around. "Most students don't have the time-management and task-analysis skills to finish the redo material while keeping up with current work," says Wormeli. "They need adult guidance."

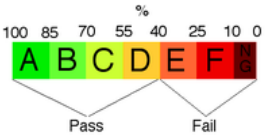
➢*Investigate situations where the redo produces a lower grade*. If this happens, something is wrong, says Wormeli. The first grade may have been a fluke. The instruction may have failed to stick in the student's mind, suggesting a need to change the teaching strategy. Or perhaps the initial grade is a more valid indication of the student's level of mastery. In any case, he advises going with the higher grade and not averaging.

➢*Allow students who get Cs and Bs to do redos*. "Why stand in the way of students who want to achieve excellence?" asks Wormeli.

➢*Don't allow redos during the last week of a grading period*. "This suggestion is completely arbitrary and has no pedagogical basis," says Wormeli. "It just saves teacher sanity." Students are worried about their grades as they come down to the wire, but teachers need guilt-free time to finish grading and prepare report cards.

"The Right Way to Do Redos" by Rick Wormeli in *MiddleWeb*, September 25, 2016 (spotted in *Education Digest*, May 2017), excerpted from Wormeli's book, *Fair Isn't Always Equal* (Stenhouse, 2006).

Douglas Reeves Takes On Five Myths About Grading



In this article in *All Things PLC*, consultant/author Douglas Reeves confronts these widely espoused misconceptions about grading:

- ***Myth #1:*** ***Grades motivate students*. Grades may have motivated teachers and administrators when they were young, but that's not the case with many of their students today. The evidence is right in front of our noses, says Reeves: We've just conducted a decades-long experiment on the efficacy of grades as motivators; if grades were effective motivators, homework completion, classroom engagement, and overall diligence would be sky-high. Not so!**

• Myth #2: *Grading homework and practice improves achievement. There are three problems here, says Reeves. First, for practice to be an effective tool for improvement, students need to be pushing the limits of current performance and getting continuous feedback – very difficult to orchestrate for 30 students working in their bedrooms. Second, as soon as teachers give grades for practice work, the incentive is for students to play it safe and not push into challenging or unknown territory. "No one gets feedback that is meaningful," says Reeves, "because the only feedback that matters is that the work was finished on time and correctly. No one gets feedback to improve specific skills because everyone is doing the same dreary and unchallenging work." And third, it's unfair and demotivating for students to have their final grade pulled down for practice work.*

• Myth #3: *Grades drive future performance. True, there's a correlation between good grades and college success, and between poor grades and dropping out of school, but Reeves questions whether grades cause success and failure. He cites "the 'good girl effect' in which female students are disproportionately rewarded for quiet compliance, behavior that may lead to good grades but does not necessarily correlate to success after secondary school… While it is possible that intelligence and work ethic forge the path from kindergarten to Ivy League and Wall Street, it is also possible that zip code, tutors, and connections – all artifacts of family socioeconomic status – are the underlying causes."*

• Myth #4: *Punishment deters unwanted behavior. This is no more true than the persistent belief that corporal punishment improves behavior (research has shown it actually breeds aggression and antisocial behavior). Teachers giving zeros for missed assignments and refusing to accept late work lets students off the hook – and starts a spiral of doom with their final grades. Averaging grades through a semester punishes students for early failures versus rewarding them for using early problems to improve final performance. "Rather than using the last two months of the semester to build momentum and finish strong," says Reeves, "because of a punitive grading system, they are doomed to failure well before the semester is over. There is nothing left for them to do except cut class, be disruptive, or ultimately, quit school."*

• Myth #5: *It's okay for teachers to have their own grading systems. Reeves has conducted the following experiment with gatherings of educators: A student receives these grades (in this sequence) over a semester: C, C, missed, D, C, B, missed, missed, B, and A. What final grade should the student receive? Audience members come up with final grades ranging from A to F, depending on whether they average grades, count missed assignments as zeros, or consider the last grade as the ultimate attainment and therefore more important than the preceding grades. Is it okay, Reeves asks, for the same student producing the same work to have this range of outcomes depending on which teacher he or she happens to have? Obviously not. Worse still, he says, "grading policies are matters of equity, with disparate impacts on students, particularly based on ethnicity and gender. Boys and minority males receive lower grades just as they are more likely to be more severely disciplined for an infraction. Girls receive higher grades for the same level of proficiency. If racial and gender disparities of this sort took place in any other area of public life, the consequences would be swift and sure."*

What is to be done about these pernicious and

persistent misconceptions? Trying to convince educators with reasoned arguments and book study groups won't work, says Reeves. The myths are too deeply embedded. Instead, he suggests replacing each statement of fact – *Punishment deters unwanted behavior* – with a testable hypothesis – *If I penalize students for late, incomplete, and absent homework, then student achievement will improve* – and conducting real-time experiments within the school. "We can then compare two classes with students of similar backgrounds," he says, "one of which has punitive policies and the other of which engages in in-class gold standard practice and assess the degree of student success at the end of each semester."

Reeves has found that the outcomes of such experiments clearly demonstrate the problems with grading myths and can embolden school leaders to implement more-effective practices. "When we explode grading myths and establish constructive policies," he concludes, "the results are immediate. Reduction in failures, improvements in discipline, high levels of student engagement, and dramatic gains in teacher morale can be observed in months, not years."

"Busting Myths About Grading" by Douglas Reeves in *All Things PLC*, Spring 2017, https://issuu.com/mm905/docs/atplc_magazine__spring_2017_look-in; Reeves can be reached at douglas.reeves@creativeleadership.net.

Key Principles of Student Learning

In this Deans for Impact white paper, education-school leaders summarize insights from cognitive science about optimal student learning in classrooms, with practical implications for day-to-day teaching.

How do students understand new content?

• Students learn new ideas by linking them to ideas they already know.

- A well-thought-out K-12 curriculum sequence builds foundational knowledge.
- Teachers should use analogies to link new learning to past knowledge, making the links explicit.

• To learn and remember important information, students need to transfer it from short-term memory (which has quite limited capacity) to long-term memory.

- Teachers must be careful not to present too much information at once.
- They also need to make content explicit and carefully pace explanations.
- Worked examples are one way to avoid cognitive overload – displaying all the steps of a problem solution.
- Teachers should use multiple modalities to convey an idea – e.g., showing a graphic while verbally describing the idea.

• The mastery of new concepts happens in fits and starts, not through a fixed sequence of age-related stages.

- Teachers shouldn't withhold information from students because it's "developmentally inappropriate;" the most important consideration in deciding if students are ready to learn something is whether they have mastered the prerequisites.

How do students learn and retain new information?

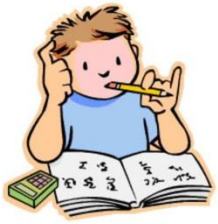
• Information is often retrieved from memory as it was originally remembered, so students should focus on meaning as they learn.

- Teachers should emphasize the meaning of important-to-remember material by having students explain it or organize information in helpful ways.
- Teachers can help students store hard-to-remember content by using stories or mnemonics.

• Practice is important to retaining new material, and some kinds of practice are more effective than others.

- Retrieving information from memory strengthens the memory, which means that low-stakes quizzes and self-tests build long-term retention.
- Interleaving or mixing different types of material strengthens long-term memory – for example, doing addition, subtraction, multiplication, and division problems together.
- Spacing practice over weeks or months improves retention.

How do students solve problems?



• Each subject area has a set of facts that, if committed to long-term memory, aids problem-solving by freeing working memory and illuminating contexts in which existing knowledge and skills can be applied.

- Teachers need to teach different sets of facts at different ages – for example, phonemic awareness and multiplication facts in the elementary grades

• Effective feedback is essential to acquiring new knowledge and skills.

- Good feedback is specific and clear.
- Good feedback is focused on the task rather than the student.
- Good feedback is explanatory and focused on improvement, versus merely verifying performance.

How does learning transfer to new situations inside and outside the classroom?

• To transfer knowledge or skills, students need to understand the problem's context and underlying structure.

- Teachers must ensure that students have sufficient background knowledge to appreciate the context and structure of a problem.

• Examples help us understand new ideas, especially if we see the unifying underlying concepts.

- Teachers can have students compare examples with different surface structures and identify the underlying similarities – for example, finding the area of a table top and a soccer field.
- For multi-step problems, students can be asked to identify and label the steps required.
- Teachers can alternate concrete examples (word problems) and abstract representations (mathematical formulas).

What motivates students to learn?

• Beliefs about intelligence are important predictors of student behavior in school.

- Students are more motivated if they believe intelligence and ability can be improved through effective effort.
- Teachers can shape students' beliefs about ability and intelligence by praising productive effort and strategies and other processes that are under students' control, versus praising for being "smart" or "talented."
- Teachers can prompt students to feel more in control of their learning by encouraging them

to set specific learning improvement goals, versus performance goals.

• Self-determined motivation (intrinsic interest and values) leads to better long-term outcomes than controlled motivation (rewards, punishments, or perceptions of self-worth). Teachers control several factors related to reward and praise:

- Whether a task is one the student is already motivated to perform;
- Whether a reward is verbal or tangible;
- Whether a reward is expected or unexpected;
- Whether praise is offered for effort, completion, or quality of performance;
- Whether praise or reward occurs immediately or after a delay.

• The ability to monitor their own thinking can help students identify what they do and don't know, but people are often not the best judges of their own learning and understanding.

- Teachers can engage students in tasks that allow them to reliably monitor their own learning – e.g., testing, self-testing, and explanation.

• Students will be more motivated and successful in classrooms when they believe that they belong and are accepted.

- Teachers can reassure students that doubts about belonging are common and will diminish over time.
- Teachers can encourage students to see critical feedback as a sign that others believe they are able to meet high standards.

What are common misconceptions about how students think and learn?

• Teachers need to communicate that cognitive science has debunked these erroneous beliefs:

- Students have distinct learning styles.
- People use either the right or the left side of their brains.
- Humans use only 10 percent of their brains.
- Novices and experts think in the same ways.
- Cognitive development progresses in a fixed progression of age-related stages.

"The Science of Learning" by Deans for Impact, 2015; the full report is available at http://deansforimpact.org/wpcontent/uploads/2016/12/The_Science_of_Learning.pdf

Seven Forces That Shaped History

In this Social Studies School Service essay, David Berliner (Arizona State University) says teachers "strive to help students make sense of the complicated mass of information known as history in a way that is coherent yet accessible and useful." He suggests seven "forces of history" as an overarching construct to help students organize information and build their analytic skills as they study historical events. The acronym is

INSPECT:

Ideas,
Natural/Geographic,
Social,
Political,
Economic,
Cultural, and
Technological/Scientific.

Here are short descriptions of each with suggested Essential Questions:

- **Ideas** – The role of beliefs, ideologies, philosophies, ethics, and ultimate purpose. Ideas can inspire revolution, religious fervor, and the pursuit of rights – "the pen is mightier than the sword."
  - What ideas have had the biggest impact on history?
  - What factors lead to the emergence of new ideas?
  - How do ideas shape social change?
  - What causes people to accept new ideas?
  - What ideas contributed to an event we're studying?
  - What ideas form the core of the society we're studying?
- **Natural/Geographic** – The role of environment, ecology, resources, natural disasters, regions, and climate – for example, the California gold rush, the spread of crops (corn, potatoes, and tomatoes) around the world, and climate change.
  - How do people interact with the natural world?
  - How does geography shape history?

  - What natural resources are valued and why?
  - How do natural forces affect migration?
  - How do environmental forces interact with economic and political forces?
  - How does geography differ between two societies we're studying?
  - How did environmental factors shape the country we're studying?
- **Social** – The role of family, gender roles, marriage, class and class conflict, slavery, segregation, education, healthcare, the quest for social justice.
  - How do societies arrange themselves?
  - What is the best way to organize society?
  - What roles do men and women play and why?
  - Why do some people discriminate against others?
  - Why have people had slaves?
  - What influences society more, individuals or groups?
  - Is everyone entitled to social services – for example, education and health care?
  - What causes people to try to change society?
  - How do people pursue social justice?
  - Is equality for all attainable?
- **Political** – The role of government, laws, courts, voting, separation of powers, political systems and parties, the military, foreign policies, and wars. Key issues include finding the balance among rights, order, power, prosperity, and safety.

  - What is the purpose of government?
  - What is the best form of government?
  - Why do we have laws?
  - How do economic and social forces influence politics?
  - What role does culture play in politics?
  - How can we influence political forces?
  - Why do so few people participate in the political process?
  - What is an effective leader?
  - What is power?
  - How have political forces been a source of good – and evil?
- **Economic** – The role of the production of goods and services, consumption, sources of energy, networks of exchange, employment and unemployment, trade, financial systems, taxes, and the

course of money.

- Why do we have money?
- Does money drive the world?
- Is the love of money the root of all evil?
- How have economic factors influenced political decisions?
- How is the world connected economically?
- How do natural forces influence economics?
- What factors are needed to produce economic power?
- Why does economic inequality exist?
- What is worth having?
- Who are the haves and have-nots in our society and the world, and why?

- **Cultural** – The role of the arts, music, architecture, literature, the practice of religion, high culture and pop culture, entertainment, and clothing styles.

- How does religion affect history?
- What role do the arts play in shaping history?
- Are the arts a reflection of society or shapers of society?
- Is it possible for different ethnic groups to be one?
- What does it means to be an American?
- What does it mean to be a global citizen?
- Does culture matter?
- How does pop culture influence economic, social, and political forces?
- How have notions of being "cultured" changed over time?
- Are we what we eat?
- What is globalization doing to culture?

- **Technological/Scientific** – The role of inventions, including vaccines, pesticides, the cotton gin, telephones, computers, automobiles, planes, the machine gun, and atomic weapons.

- What motivates people to pursue scientific knowledge?
- What causes people to be attracted to technology?
- What are the positives and negatives of technology?
- Does technological progress always lead to social progress?

- Why do people seek to create new products?
- How does technology affect our lives?
- How does technology affect the natural world?
- Is technology causing us to be closer to each other or creating more space between us?

"Forces of History" by David Berliner, Social Studies School Service, 2010, no e-link available; Berliner can be reached at berliner@asu.edu.

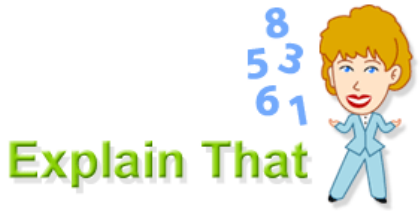
How to Get Students Writing in Math Classes

In this *Teaching Children Mathematics* article, Janine Firmender (Saint Joseph's University), Tutita Casa (University of Connecticut/Storrs), and Madelynn Colonnese (University of North Carolina/Charlotte) suggest ways of getting students to explain and justify mathematical ideas and make their reasoning clear. A report recently suggested that students should do four kinds of math writing:

➢ ***Informative/explanatory*** **– To describe or explain, focusing on higher levels of conceptual understanding, seeing connections, highlighting strategies, observing patterns, and explaining generalizations. Some possible prompts:**

- Define the meaning of the equal sign, giving examples.

- Describe patterns in the hundreds chart.
- Describe the differences and similarities between triangles and triangular prisms.
- What does the remainder in a division problem mean?
- Explain the difference between the "2s" in 1/2 and 2/5.



Prompts can be framed to help students grapple with common misconceptions.

➢ ***Exploratory – To make sense of a problem, situation, or an idea of one's own. An example from a sixth-grade class:***

- How many times would three musical instruments play on the same beat after 1,000 beats? How would you know?

In this kind of writing, students are encouraged to jot ideas as they work on a task and use informal media like sticky notes to keep track of their thoughts.

➢ ***Argumentative – To construct an argument, persuade someone of a point of view, or critique the reasoning of others. Some examples:***

- Explain in two different ways why 35 is less than 53.
- Convince Samantha that all squares are rectangles but not all rectangles are squares.
- Talia says she found three ways to add two numbers that equal ten. Do you agree or disagree that there is more than one way to make ten? Why or why not?
- Niko measured the length of a box with two different sizes of paper clips. Explain why his measurement will be inaccurate.
- Mario says that 1/3 is greater than 1/2 because 3 is greater than 2. Do you agree or disagree? Why?
- Jayleen says that 5 + 4 = 11 – 2 is false. Amelia says it's true. Who do you agree with and why?

Arguments often include a claim and evidence to support it; attending to key mathematical understandings and misconceptions is key.

➢ ***Mathematically creative – To document or elaborate on original ideas, problems, and/or solutions and convey fluency and flexibility in thinking. An example: Miranda claims that all squares are rectangles. Do you agree or disagree? Explain. To elicit creative thinking in math classes, five conditions are important:***

- Students understand that math is more than memorizing concepts and implementing procedures.
- Students have plenty of time to generate multiple ideas.
- Students are encouraged to look at tasks or ideas from various perspectives.
- Students get support to elaborate on ideas and look for patterns and generalizations.
- Students' creative writing is recognized and appreciated.

"Write On" by Janine Firmender, Tutita Casa, and Madelynn Colonnese in *Teaching Children Mathematics*, October 2017 (Vol. 24, #2, p. 84-92), available for purchase at http://bit.ly/2xum6j7; the authors can be reached at Janine.firmender@sju.edu, tutita.casa@uconn.edu, and mcolonn1@uncc.edu.