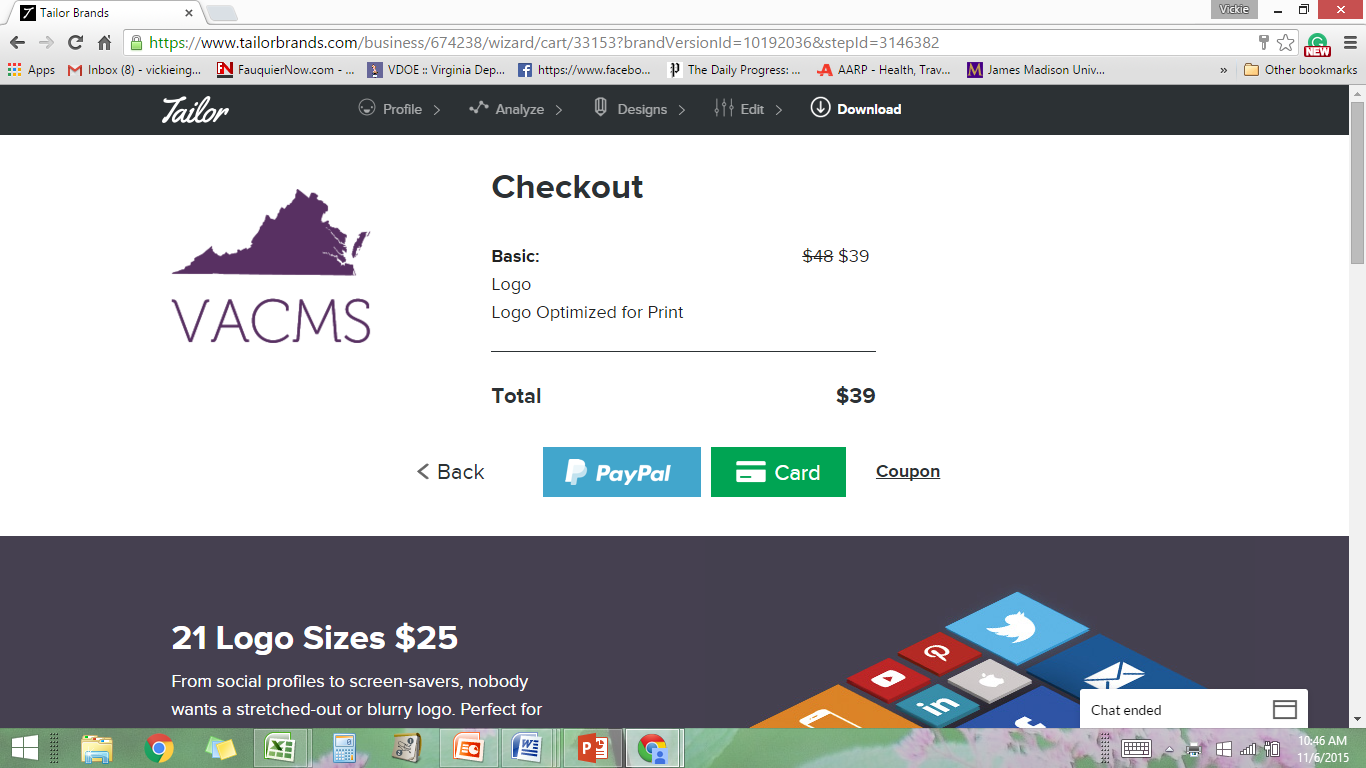
***Virginia Council of Mathematics Specialists***





***Southwest Virginia Outreach Mini-Conference***

***Filling Your Mathematics Leadership Tool Kit***

*March 21, 2016*

*Southwest Higher Education Center*

**Session 1A: 10:00 – 12:00 A.M.**

***Leadership and Coaching for***

***Veteran Mathematics Specialists***

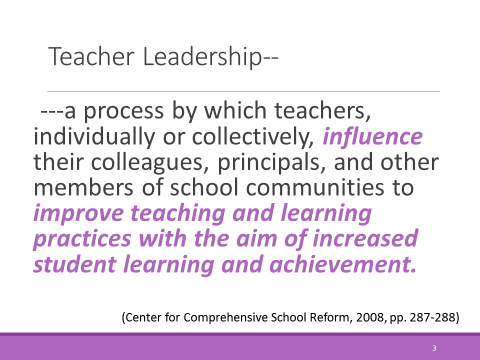
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*This outreach conference is made possible with financial support from the Virginia Council of Mathematics Specialist, logistical support by Virginia Tech at the Southwest Center for Higher Education, and ongoing support from the Virginia Mathematics and Science Coalition.*

**Framing Questions**

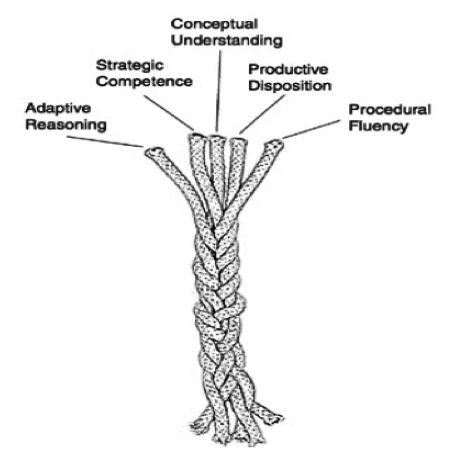
1. What does collaborating with a collegial professional learning team do for me and my work?
2. What do mathematics professional learning teams do?
3. What can I do as a leader to encourage and facilitate a mathematics professional learning team?





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| **How Teach Leaders Influence** | | |
| Maintain a focus on teaching and learning | Establish trusting and constructive relationships | Interact through formal and informal points of influence |

**Strands of Mathematical Proficiency for Learning**



The research-inspired five strands provide a *framework for discussing* the knowledge, skills, abilities, and beliefs that constitute mathematical proficiency. The five strands are interconnected and must all work together for students to be mathematically proficient. Teaching practices must reflect these interrelated components.[[1]](#footnote-1)

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| ***STRANDS*** | ***Examples of what the strand includes or means*** |
| ***Conceptual understanding***  refers to the comprehension of mathematical concepts, operations, and relations; it is the functional grasp of mathematical ideas, it enables students to learn new ideas by connecting to ideas they already know. | * Understanding the mean as a balance point and as a fair share. * Making connections among concrete, pictorial, and symbolic (algorithmic) processes. * Understanding slope as a proportional relationship, a rate of change, and as a measure, degrees from the horizontal. |
| ***Procedural fluency (computing)*** –  is defined as skill in carrying out procedures flexibly, accurately, efficiently, **and** appropriately. | * Knowing a procedure for calculating or solving that is efficient, accurate, and appropriate. * Computing mentally, with paper and pencil, and with technology as appropriate for the situation. * Knowing how to model algorithms with pictorial or concrete representations. * Being able to find a correct solution in a reasonable amount of time. |
| ***Strategic competence ( applying)* –**  is the ability to formulate, represent, and solve mathematical problems. | * Expressing or communicating a mathematical problem when given a problem in contextual situations * Solving routine and non-routine problems. * Representing a problem in words, symbols, graphs, tables, and pictures as appropriate. * Being able to find a solution. |
| ***Adaptive reasoning* –**  refers to the capacity for logical thought, reflection, explanation, and justification. | * Being able to explain one’s thinking in a way that someone else understands. * Being able to justify and explain why you think your response or solution is correct. |
| ***Productive disposition (engaging)* -** is habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy. | * Seeing mathematics as important. * Believing mathematics can make sense if one works hard and sticks with it, able to persevere. * Believing that you can learn mathematics even if you have to work hard and sometimes make mistakes. |

**Mathematics Standards of Learning for Virginia Public Schools**

**February 2009,**

**Process Goals Page iv. – v.**

**Goals**

Students today require more rigorous mathematical knowledge and skills to pursue higher education, to compete in a technologically sophisticated work force, and to be informed citizens. Students must gain an understanding of fundamental ideas in arithmetic, measurement, geometry, probability, data analysis and statistics, and algebra and functions, and they must develop proficiency in mathematical skills. In addition, students must learn to use a variety of methods and tools to compute, including paper and pencil, mental arithmetic, estimation, and calculators. Graphing utilities, spreadsheets, calculators, computers, and other forms of electronic information technology are now standard tools for mathematical problem solving in science, engineering, business and industry, government, and practical affairs. Hence, the use of technology must be an integral part of teaching, learning, and assessment. However, facility in the use of technology shall not be regarded as a substitute for a student’s understanding of quantitative concepts and relationships or for proficiency in basic computations. The teaching of computer/technology skills should be the shared responsibility of teachers of all disciplines.

The content of the mathematics standards is intended to support the following five goals for students: becoming mathematical problem solvers, communicating mathematically, reasoning mathematically, making mathematical connections, and using mathematical representations to model and interpret practical situations.

**Mathematical Problem Solving**

Students will apply mathematical concepts and skills and the relationships among them to solve problem situations of varying complexities. Students also will recognize and create problems from real-life data and situations within and outside mathematics and then apply appropriate strategies to find acceptable solutions. To accomplish this goal, students will need to develop a repertoire of skills and strategies for solving a variety of problem types. A major goal of the mathematics program is to help students become competent mathematical problem solvers.

**Mathematical Communication**

Students will use the language of mathematics, including specialized vocabulary and symbols, to express mathematical ideas precisely. Representing, discussing, reading, writing, and listening to mathematics will help students to clarify their thinking and deepen their understanding of the mathematics being studied.

**Mathematical Reasoning**

Students will recognize reasoning and proof as fundamental aspects of mathematics. Students will learn and apply inductive and deductive reasoning skills to make, test, and evaluate mathematical statements and to justify steps in mathematical procedures. Students will use logical reasoning to analyze an argument and to determine whether conclusions are valid. In addition, students will learn to apply proportional and spatial reasoning and to reason from a variety of representations such as graphs, tables, and charts.

**Mathematical Connections**

Students will relate concepts and procedures from different topics in mathematics to one another and see mathematics as an integrated field of study. Through the application of content and process skills, students will make connections between different areas of mathematics and between mathematics and other disciplines, especially science. Science and mathematics teachers and curriculum writers are encouraged to develop mathematics and science curricula that reinforce each other.

**Mathematical Representations**

Students will represent and describe mathematical ideas, generalizations, and relationships with a variety of methods. Students will understand that representations of mathematical ideas are an essential part of learning, doing, and communicating mathematics. Students should move easily among different representations⎯graphical, numerical, algebraic, verbal, and physical⎯and recognize that representation is both a process and a product.

**Characteristics of Children as Learners vs. Adult as Learners**

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| **Children--** | **Adults--** |
| - depend upon adults for direction, material support and life management. | - depend upon themselves for material support and life management. They are largely self-directed. |
| - perceive one of their major roles in life as a learner. | - perceive themselves to be doers; using previous learning to achieve success as workers, learners, etc. |
| - learn what they are told to learn. | - learn best when they perceive the outcomes of the learning process as valuable to their own development, work success, etc. |
| - view the established learning content as important because adults tell them it is important. | - often have different ideas about what is important to learn. |
| - They're approximately the same age and have had similar learning experiences, etc. | - are likely to be composed of persons of many different ages, backgrounds, education levels, etc. |
| - actually perceive time differently than older people | - have many commitments and are more concerned about the effective use of time. |
| - have a limited experience base. | - have a broad experience base to relate to new learning. |
| - generally learn quickly. | -learn more slowly than children, but they learn just as well. |
| - are open to new information and will readily adjust their views. | - are much more likely to reject or explain away new information that contradicts their beliefs. |
| -readiness to learn is linked to both academic development and biological development. | - readiness to learn is more directly linked to needs related to fulfilling their roles as workers and community members |
| - learn because learning will be of use in the future. | - are concerned about the immediate use of learning. |
| - are often externally motivated by the promise of good grades, praise from teachers and parents. | - are more often internally motivated (by the potential for feelings of worth, self-esteem, achievement, etc.) |
| - Their "filter" of past experience is smaller than that of adults. | - have well-formed expectations, which, unfortunately, are sometimes negative due to past learning experiences. |

Adapted by V. Inge from a review of literature on adult learners.

***Looking at Teacher Needs***

Could working in professional learning team(s) in your school, department, and/or grade level

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| **Directions:** Think about your school as you read the statements at the right. Which of these statements describes the needs of teachers at your school?    **Reflect:** How could regularly working together help us address these needs? | **Look at Teacher Needs** |
| * We need a way to increase student achievement. |
| * We need a way to increase our own knowledge and expertise. |
| * We need to strengthen professional relationships and become less isolated from one another in our work. |
| * We need a way to systematically examine whether our teaching is making a difference. |
| * We need support in refining or changing the way we teach over the long-term. |
| * We need to develop our own leadership capacity. |
| * We need an effective way of mentoring new teachers. |
| * We need a flexible professional development or learning process. |
| * We need an efficient way to share ideas. |
| * We need to be regarded as valuable professionals. |
| * We need cost-effective way to engage in professional development and continual learning. |
| * We need a practical way to implement a new initiative. |
|  |
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provide support for you and your colleagues as professional mathematics educators?

Adapted from SERVE Center, University of North Carolina at Greensboro: [***A Facilitator's Guide to Professional Learning Teams***](http://www.serve.org/uploads/files/Facilitator's_Guide_PLTs.pdf). Retrieved at <http://www.serve.org/Professional-Learning-Teams.aspx>.

 What can a mathematics leader do to encourage and facilitate a mathematics professional learning team?

Is there at least one other person who is interested in joining with you to form a team in the following.

* Regularly engage in reflective dialogue about student learning, instruction, and how to accomplish needed results.
* During learning team meetings teachers share perspectives and expertise, and develop a feeling of mutual support and shared responsibility for effective instruction
* Team members share the results of changes in their practice to celebrate successes and to analyze and address problems
* “Teach out loud." Open the door on teaching practices in various ways.
* Team members may visit one other's classrooms, act as peer coaches and mentors, and problem-solve together.

**First Steps**

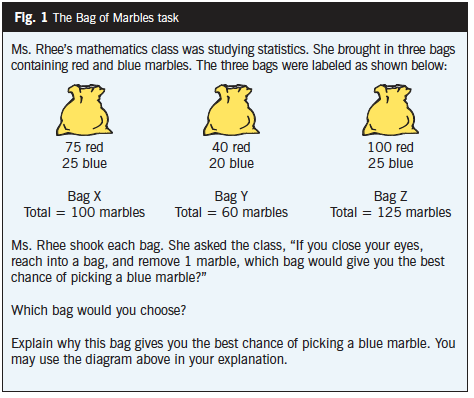
* Focus collectively on student learning.
* Establish shared norms and values that set out the expectations for how the team will work together.
* Identify the teams core beliefs:
  + What mathematics do students need to know and be able to do well?
  + What attributes characterize the mathematics learning of successful students throughout their life and for successful citizens.

**What kind of *normal classroom activities* provide a context for mathematics learning teams collaboration?**

* **Planning and implementing new strategies,**
* **Designing common lessons,**
* **Designing common assessments,**
* **Examining student work,**
* **Working together to modify strategies, and**
* **Documenting the results of the team's work.**
* ***Studying and discussing information about research-proven effective mathematics practices*.**

**The Bag of Marbles Task**

**Ms. Rhee’s 6th Grade Class**



Mathematics Learning Team Doing Math and Planning Together

1. Consider individually at least two ways to solve the problem. Record your thinking/strategies.

a. look for as many ways as possible to solve the task

b. Identify common errors students might make and the misunderstanding behind each error.

c. Think about questions that you might ask students along the way.

2. Share your solutions at your Learning Team.

3. Order the Learning Team solutions in a mathematical progression from solutions using less sophisticated mathematical ideas to more sophisticated ideas. Consider the range of where students might be on the mathematics progression.

Task taken from: Smith, M.S., Bill, V., & Hughes, E.K. (2008). Thinking through a lesson: Successfully implementing high level tasks. *Mathematics Teaching in the Middle School, 14(*3), pp. *132-138.*

**Looking at Student Work (LASW) together is one of the naturally occurring classroom activities that allows for collaboration in a mathematics learning team that has also proven to be effective in increasing student achievement.**

**Standards-based Protocol for Looking at Student Work**

**Why use protocols?**

* Have built-in constraints. Under the right circumstances, constraints are liberating.
* Set up a process for how to give and receive safe and honest feedback
* Provides suggestions for how to analyze complex problems carefully and without rushing to judgment
* Provides a situation to ground interpretations of complex texts (e.g., student work or school data) in close “readings” of the texts or student work.”

This standards-based protocol can be used by two to four teachers to look at the relationship between student work and standards. The purpose of a standards-based approach to analyzing student work with colleagues is to help teachers:

* Uncover what students know and can do
* Analyze student learning in direct relation to standards
* Assess assignments and whether they are structured to produce the desired results
* Provide suggestions for improving instruction and curriculum

**THE PROTOCOL**

**Preparing to analyze student work. Person A’s Problem or Task**

1. Teacher A shares a copy of their task with everyone before looking at the student work. Individual reviewers read the directions and works the task based on their interpretation of the directions.
2. Then then everyone discusses the task and possible solution methods**. -- 10 minutes**

* Which content standards or curriculum expectations are being addressed?
* What is considered to be a proficient response on this problem/task? Exactly what do students need to say or write for you to consider their work proficient? (Do not make modifications to expectations for any student at this time.)
* Did the problem/task provide students a good opportunity to demonstrate what is necessary to satisfy the criteria for proficiency?

**Diagnosing Student Strengths and Needs** -- **5 minutes**

**Examine the work of the three students**

* Discuss and identify the prerequisite knowledge that students demonstrated that they knew.
* Discuss and identify the degree to which the student met the criteria for proficiency in knowledge and skills described in the standing (beyond proficient, proficient, or below proficient)
* If below proficient, describe misconceptions, wrong information, and what students did not demonstrate that was expected.

**Identifying Instructional Next Steps-- 5 minutes**

* Discuss the learning needs of each student.
* What are some recommended instructional next steps for each student?

**Adapted from the Standards Protocol retrieved from http://www.ccebos.org/pdf/LASW.pdf.**

**GENERAL PROTOCOL FOR LOOKING AT STUDENT WORK (LASW)**

**This protocol can be used efficiently in any size group with up to three presenting teachers sharing three student work samples each. Each round of the process has a presenting teachers and reviewers, teachers who are helping the presenting teacher think about her/her students’ work. Each round will take about**

**Step 1: Task Presentation (3 minutes)**

Presenting teacher shares a copy of the task, as it was given to students, with the reviewers. State the grade level of the class, the unit of the student, and what standard(s) in terms of mathematics content and skills the math problem or task addressed. If there are more than two problems on the paper, limit the analysis to two of the assigned problems.

The presenter should limit his/her description to only what the students were asked to do and *avoid explaining what he or she hoped to see*. Do not give any background about the students or the students’ work. In particular, the presenter should avoid any statements about whether these are strong or weak students or whether these are particularly good or poor pieces of work from this students.

**Step 2: Making Sense of the Task (8 minutes)**

Work the problem or task that the students were given. Try to complete the task using two or three different solution methods (different mathematics concepts or different representations). Think about the efficiency of each solution method and the supporting mathematics concepts for each solution method.

**Step 3: Describe Student Work (5-10 minutes of individual reviewer analysis and then 3-5 minutes per reviewer to share)**

Presenter shares the copies of three students work (cover the students’ names).

* Individual reviewers, ***What do you see?* (5-10 minutes of individual review)**
* Group reviewers then describe by stating facts from the student’s paper about **(3-5 minutes per reviewer)** what they see in the students’ work, avoiding judgments about quality or interpretations about what the student was doing. You may wish to list the group comments on chart paper. *Save discussion and interpretations for the next step!*

**Step 4: Interpreting Student Work (10 minutes per reviewer)**

Use the analysis of the student work to better understand:

1. From the student’s perspective, what was he or she working on? Your job is to see what the student did and what they were seeing.

* Try to make sense of what the student was doing and why. Try to find as many different interpretations as possible and evaluate them against the kind and quality of evidence.
* What was the student thinking and why? What does the student understand and not understand? What was the student most interested in and how did the student interpret the assignment?
* As you listen to each other’s interpretations, ask questions that help you better understand each other’s perspectives.

2. What is your analysis of the conceptual understanding and procedural skill for each student’s paper that you reviewed?

* Use the template below to comment on the strengths, confusions, representations, and next instructional steps.

**Step 5: Implications for Classroom Practice (3-5 minutes per reviewer)**

* Were there patterns or similarities that you noticed between the student’s work?
* What are the implications of this work for teaching and assessment?
* Based on the group’s observations and interpretations, discuss any implications this work might have for teaching and assessment in the classroom.

*Consider:*

* What next steps could the teacher take with the class, these students?
* What teaching strategies might be most effective?
* What else would you like to see in the student work? What kinds of assignments or assessments would provide this information?
* What does this conversation make you think about in terms of your own practice?
* About teaching and learning in general?

**Step 6: Reflection (5 minutes per partner)**

The presenting teacher thanks the group for their help and shares back what he or she learned about the student, the work, and what he or she is now thinking.

**Go to the Next Round with a different teacher sharing.**

**Protocol for Critiquing Student Work:**

Comment on the conceptual understanding and procedural skill for each student’s paper.

|  |  |  |  |
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|  | **Student A** | **Student B** | **Student C** |
| **Mathematics and representations used** |  |  |  |
| **Strengths** |  |  |  |
| **Confusions** |  |  |  |
| **Next Instructional Steps** |  |  |  |

**Classroom Practices Continuum**

Mark on each continuum where your school/department/grade level falls.

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| ***Same instruction for all*** | | | |  |  |  | ***Differentiated instruction*** |
|  | * Students are engaged in the same tasks/activities * Predominately whole group format | | |  |  |  | * Tasks/activities are selected based on students’ need * Students reach same learning outcomes through different means * All students have access and are engaged in task/activity |
|  | |  |
| ***Students work individually*** | | | |  |  |  | ***Students work as a learning community*** |
|  | * Students receive feedback from the teacher * Quiet setting; little interaction | | |  |  |  | * Students are engaged in productive math talk (speaking & listening) * Students openly share their reasoning; receive feedback from peers and the teacher |
|  | |  |
| ***Mathematical authority comes from the teacher or textbook*** | | | | |  |  | ***Mathematical authority comes from student reasoning*** |
|  | * Students are reliant on the teacher for feedback * Responses are deemed right/wrong * Discussion is centered on solution (what), not the math process | | |  |  |  | * Students reason and think through solutions together * Students are asked to consider the reasonableness of their solutions * Discussion is centered on math process (how, why) and self‐reflection |
|  | |  |
| ***Teacher demonstrates*** | | | |  | ***Teacher establishes expectations; students engage in problem solving*** | | |
|  | * The way to solve is modeled by the teacher * Teacher leads the lesson * Students practice after they are shown how to solve * Mostly teacher talk | | |  |  |  | * Learning goals are established and communicated * Teacher guides the lesson * Students engage in task; teacher probes to help provide structure or guidance * Mostly student talk |
|  | |  |
| ***Content is taught in isolation*** | | | |  |  |  | ***Content is connected to prior knowledge*** |
|  | * Topics are not presented in a connected format * Previously taught/learned content is not referenced | | |  |  |  | * Established learning targets help make connections explicit * Discussion and structure of lessons help students make connections among mathematical ideas |
|  | |  |
| ***Mathematics is made easy for students*** | | | |  |  |  | ***Students are engaged in productive struggle*** |
|  | * Content is presented in small sequenced chunks * Teacher is readily available to provide hints to help student * Students reach solutions to low‐level tasks quickly | | |  |  |  | * High‐level tasks or challenges are posed by the teacher * Multiple attempts are encouraged; perseverance is valued * Pre‐planned teacher questions help probe student thinking and facilitate learning |

**PRODUCTIVE MATH TALK: What, Why, and How**

**The 5 Talk Moves**

Adapted from: Chapin, S., C., O’Conner, and N. Anderson. (2003). *Classroom discussions: Using math talk to help students learn*. Sausalito, CA: Marilyn Burns.

**The goal is to increase the amount of *“High-Quality”* classroom talk.**

**Not just the AMOUNT of talk.**

Why Students Should be Encouraged to Talk and Listen to Others Talk-

* Clarifies for students what they do, and do not understand.
* Brings gaps in student understanding to the surface.
* Helps teachers identify and address misconceptions in student thinking.

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| **WHAT**  **The Talk Move** | **WHY**  **The Learning Purpose** | **HOW**  **Classroom Examples** |
| **TEACHER REVOICING**  When a teacher restates or rephrases a student’s contribution. | Full revoicing occurs when the teacher checks back with the original speaker and offers an explicit opportunity for students to respond to questions such as “Did I get that right?" | S: Adding A and B together gives you a bigger angle.  T: So you're saying that by adding the measures of angles A and B, we get a sum of measures that is greater than the measure of angle C? Is that right? |
| **STUDENT REVOICING**  Asking a student to restate another student’s ideas. | Students are asked to restate what another student just said.  It requires that students listen to understand each other and gives them opportunities to revoice ideas in their own words. | S1: I think if roll a number cube I could get a 6.  T: What do you think that S! just said or what she meant S2?  S2: What S1 said means to me is that the since the number cube has six sides and different numbers on each side her chances are just as good of getting a 6 as any other number. |
| **REASONING**  Asking a student to explain another student’s idea. | Requires students to actively listen to each other to understand and explain what another student’s idea means or whether they agree or disagree and why.  Another form of calling for reasoning might be to ask students to add on to or revise another student’s explanation or conjecture.  Effective use of this discourse move could be enhanced by the prerequisite use of other discourse moves. | T: Do you agree or disagree with what S3 just explained and why?  T: How is Mary's thinking similar to or different than Juan's?  A teacher might ask the class to use a particular student’s strategy to solve a similar problem or to agree or disagree with a solution. |
| **ELABORATING**  Inviting one student to add onto or elaborate on what another student contributed. | Solicit multiple solution processes or strategies for the same answer.  Solicit additional information or a different interpretation about an idea.  Others goals could be more social, such as including multiple students in the discussion. | T: Marco, I see that you did the problem a different way. Please show and explain to the class what you did.  T: Who can add on to what Hannah just said.  T: Who can tell us more about the relationship between the sides and angles of a right triangle. |
| **WAITING**  The teacher uses wait time after posing a question.  Students working in small groups give each other wait time. | Provides students with time to process teacher questions and  think about their responses.  Minimizes students’ tendencies to reason hastily.  Allows students’ responses to become more complex and students may be more likely to respond to their peers  contributions  Increases opportunities for equitable participation. | T: I am going to ask a question and I want you to put thumbs up in front of your heart when you are ready with a response.  T: I want you to think/work individual first. I will let you know when you can turn and talk to a partner.  T: While someone is talking do not interrupt, if you want to add to or ask about something they said wait until I say, does anyone want to add to the conversation. |

When teachers model the talk moves in whole class discussions and teach students the five talk moves students can use the same talk moves during small group work. Some teachers create a poster of the moves to hang in the room so that she and the students can reference a move as needed.

**TALK FORMATS:**

**Whole-Class Discussion**

* Teacher is a facilitator and guide.
* Teacher focuses on student thinking and ideas.
* Provides a space for students to practice so they become confident math thinkers.
* Teacher does not reject incorrect reasoning, but uses these mishaps as a way to discover.

**Small-Group Discussion**

* Teacher gives a question/problem for a group to discuss. •
* Teacher circulates as groups discuss and doesn’t control the discussions but observes and interjects.

**Partner Talk**

* Teacher asks a question and then gives students a short time, perhaps a minute or two at the most, to put their thoughts into words with their nearest neighbor.
* Initiate by “Turn and talk about this with the person next to you”.

**GETTING STARTED AND STAYING THE COURSE**

* Building towards a learning community using math talk is a process. The development of the community may take several months.
* Building a math talk rich environment takes time, but is well worth the effort.
* In the beginning, the teacher models math talk for students and elicits responses.
* The teacher waits patiently and refrains from intervening to correct children’s errors in order to create space and support for children’s voices to emerge.
* The Teacher guides students from the side or back of the classroom so that children can sense that their questions, ideas, and discoveries are the focal point of the instruction.

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| **Rubric**   1. **No evidence of this element in the task, and/or the task does not lend itself to having this element built into it.** 2. **This element is included in minor ways, or it appears that incorporating this element is possible.** 3. **This element is evident in this task and is important to the success of the lesson.** 4. **This element is central to the task or explicit in the design of the lesson.**   Adapted from the 2010 NCTM Research Brief: Why is Teaching with Problem Solving Important to Student Learning, Retrieved at http://www.nctm.org/Research-and-Advocacy/research-brief-and-clips/Problem-Solving/  The criteria is aligned with the Virginia Process Goals. | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Worthwhile Mathematical Problems/Tasks** | **Rubric Score** | | | | **Comments Explaining the Rating** | | The Problem/Task… |  |  |  |  |  | | 1. Is problematic or engaging aspect of the problem is due to the math the students are to learn. | 1 | 2 | 3 | 4 |  | | 1. Requires higher-level thinking and **problem solving** | 1 | 2 | 3 | 4 |  | | 1. Contributes to the conceptual development of students | 1 | 2 | 3 | 4 |  | | 1. Provides an opportunity for the teacher to assess what the students; what they are learning and where they are experiencing difficulty. | 1 | 2 | 3 | 4 |  | | And… |  |  |  |  |  | | 1. Takes into account current understanding of students to allow for multiple entry points and solution strategies. | 1 | 2 | 3 | 4 |  | | 1. Problem allows for **mathematical reasoning**; justifying and explanations different solutions and methods. | 1 | 2 | 3 | 4 |  | | 1. Encourages student engagement and discourse; **communication**. | 1 | 2 | 3 | 4 |  | | 1. **Connects** to other important mathematical ideas. | 1 | 2 | 3 | 4 |  | | 1. Promotes the skillful use of mathematics | 1 | 2 | 3 | 4 |  | | 1. Provides an opportunity to practice important skills | 1 | 2 | 3 | 4 |  | | 1. Provides for the opportunity to use **multiple representations.** | 1 | 2 | 3 | 4 |  | | 1. Promotes the development of all students’ disposition to do mathematics | 1 | 2 | 3 | 4 |  | |

**Evaluating a Problem or Task for a Level of Rigor**

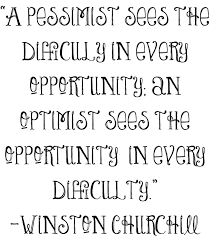
**HAVING HOPE IS A**



**SKILL NOT A TALENT**

Some people seem to have naturally perky spirits and see the glass as half-full rather than half empty. Nothing keeps them down for long. Positivity can seem inspiring or mildly obnoxious depending on whether or not you're an optimist or a pessimist yourself. But optimists seem to have a hidden power beyond mere resilience. They lead and learn better too. In studies where I.Q. tests and S.A.T. scores were held constant optimists consistently outperformed pessimists. The power lies in their *explanatory style*.

|  |  |
| --- | --- |
| **PESSIMISTS** | |
| **Explain adversity with the 3 P's of pessimism:**  "It's all my fault."  "It'll never get better."  "It messes up everything." | **See adversity as:**  Personal  Permanent  Pervasive |
| **OPTIMISTS** | |
| **Explain adversity with the three O's of optimism:**  "This is something I can change or survive."  "It won't last forever."  "It's no big deal. | **See adversity as:**  Out there  Over quickly  Organized locally--  It doesn't effect everything I do. |
| **Optimists win the debate with pessimists three ways:**  They feel happier.  They experience more success—realize more of their potential.  Optimism can be learned. You can change your explanatory style and win the benefits of one and two. In other words, your explanatory style is a skill. | |



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| **Sources of free Video for Professional Learning** | |
| **Live URL Links** | **Brief Description** |
| [Annenberg Media](http://www.learner.org/resources/discipline-math.html) | Links to high-quality educational video programs with coordinated Web and print materials for the professional development of K-12 teachers. |
| [Marilyn Burns](https://mathreasoninginventory.com/Home/VideoLibrary) | The video library contains 80 short video clips of students answering interview questions based on the Mathematics Reasoning Inventory (MRI) interview questions. Videos clips can be accessed by mathematics topics related to K-8. |
| [Virginia Department of Education](http://www.doe.virginia.gov/instruction/mathematics/resources/videos/index.shtml) | The K-8 instructional videos are provided as support for the implementation of particular topics from the 2009 Mathematics Standards of Learning (SOL). |
| [The Teaching Channel](https://www.teachingchannel.org/) | Videos of exemplary K-12 lessons being taught using the mathematical practices and specific Common Core Content Standards at a variety of grade levels. Aligns well with Virginia Standards of Learning. The mathematical practices align with Virginia's Process Goals. |
| [Inside Math Project](http://www.insidemathematics.org/) | Videos of K-12 exemplary lessons being taught using the 8 mathematical practices spelled out in the Common Core State Standards as well as specific content standards at a variety of grade levels. Aligns well with Virginia Standards of Learning content and Virginia's Process Goals. |
| [The Mathematics Assessment Project](http://map.mathshell.org/materials/pd.php) | A collection of K-12 Professional Development Modules designed to help teachers with practical and pedagogical challenges Each module includes a PD session guide and handouts for teachers, as well as sample classroom materials and suggested lesson plans. Also included are videos of real teachers trying these techniques with their own classes, often for the first time, and discussing the results. |
| [TIMSS Video](http://www.timssvideo.com/videos/Mathematics) | The teachers filmed in this set of grades 8 lessons volunteered to have their lessons included in the TIMSS 1999 Video Study Public Release collection. This collection of lessons was videotaped for the specific purpose of education research. Therefore, the videotaping technique used was designed to minimize classroom disruption, and editing of the lessons was minimal. Free registration to view video. |
| [University of Wisconsin](http://uwm.edu/education/community/professional-development/urban-spec-ed-teacher-prep/promising-practices-videos/building-conceptual-understanding-fractions/) | Leah Schlichtholz works with 4th and 5th graders in a resource setting, helping them build conceptual understanding of fractions. In this lesson, she works towards this conceptual understanding through decomposing and recomposing groups. |
| [Second Grade Number Talk](https://www.youtube.com/watch?v=3UaYTTP5_qU) YouTube | Second grade number talk (13.59 minutes) shows how the teacher introduces number talks and then uses two-color dot cards in a number talk with 2nd grade students to work on finding combinations using number facts. Strategies include counting all, counting on, and recall. |
| [Jo Boaler: Inquiry Math Lesson](http://www.youtube.com/watch?v=Ien-86bXCrI) | A video clip of **Jo Boaler** modeling an inquiry math lesson in a secondary school in England: |
| [The Bowlands Maths Professional Development](http://www.bowlandmaths.org.uk/pd/) | **The Bowland Maths Professional Development** package has seven modules that cover the main pedagogical challenges in handling activities in the classroom that are involved in investigative, non-routine problem solving.  The modules are activity-based; they are built around specific problems of the kinds found in the Case Studies, but short enough to fit into a single lesson. The activities are designed for teachers working in groups, but teachers working alone can view extra videos of teachers discussing the issues and trying the activities with their classes. |
| [Constance Kamii](https://sites.google.com/site/constancekamii/videos) | Constance Kamii made some [videos of children finding methods for doing double-digit arithmetic](https://sites.google.com/site/constancekamii/videos) based on reasoning and their understanding of number. |
| [Deborah Ball (Seminal Video)](http://deepblue.lib.umich.edu/handle/2027.42/65013) | Video of third graders engaged in a discussion of even and odd numbers. Includes lesson introduction and transcript. |
| [West Virginia Department of Education](http://wvde.state.wv.us/professional-development/model-classrooms/math.html) | Video clips that demonstrate quality mathematics classrooms within a 21st century context. The video clips are accompanied by a lesson plan and commentary from the featured teacher that targets the various strategies implemented as well as the integration of identified 21st century skills. |
| [West Virginia Department of Education: Elementary Math](http://wvde.state.wv.us/professional-development/model-classrooms/elementary-math.html) | Videos standards based mathematics instruction in grades K-5.  These mathematics lessons focus on specific strands. |

**References and Resources**

Unless noted resources other than published books have free access. In some cases, you may be asked to sign up to use the site.

**Resources to Support Using *Principals to Actions: Mathematical Success for All***

* *Supporting the Mathematics Process Goals through Research-based Teaching Practices: Part I* is a PowerPoint presentation developed by the Virginia Department of Education. The slides point out how the ideas in *Principles to Actions* support implementation of Virginia's Process Goals. Retrieve at http://www.doe.virginia.gov/instruction/virginia\_tiered\_system\_supports/training/cohort/2015/jan/supporting\_the\_mathematics\_process\_goals\_through\_research-based\_teaching\_practices\_part1.pdf
* National Council of Teachers of Mathematics: Principals to Actions Toolkit contains materials such as video, tasks, and presentation material for each of the 8 teaching practices. (NCTM Member Access) Retrieve at http://www.nctm.org/PtAToolkit/.
* *Using Principles to Actions as a Professional Development Practice* is a 9-page document with specific suggestions for ways to actively engage with the information in the book. Developed by National Council of Teachers of Mathematics (NCTM). Retrieve at http://maine.gov/doe/schoolreportcards/resources/documents/Principles%20to%20Action%20Reflection%20Guide[1].pdf
* Association of Teachers of Mathematics of Maine posted web-slides with activities and prompts that can be useful for teams who are seeking ideas for engaging in a discussion of the ideas in *Principles to Actions*. Retrieved at https://atomim.wildapricot.org/Principles-to-Actions-Book-Study

**Resources for Mathematics Collegial Professional Teams working on Instruction and Learning**

* Mathematics Assessment Project: Tasks, Assessments & Lesson Collection has a wealth of resources including lesson plans, samples of student work, rich task, and video. Materials are high quality and well vetted. Retrieve at http://map.mathshell.org.
* Merritt, E. G., Rimm-Kaufman, S. E., Berry III, R. Q., Walkowiak, T. A., & McCracken, E. R. (2010). A Reflection Framework for Teaching Mathematics. *Teaching Children Mathematics*, 17(4), 238-248. This is an excellent article that presents a framework, Mathematics Scan (M-Scan) for examining classroom instruction. The dimensions and criteria are aligned with Virginia Process Goals and the eight teaching practices in *Principles to Actions.*
* McDonald, Mohr, Dichter & McDonald (2013). *The Power of Protocols: An Educator’s Guide to Better Practice, Third Edition.*
* Protocols: A collection of over 50 free protocols for a variety of purposes. The site has a part that is free to the public and a site for members only. Retrieved at http://www.nsrfharmony.org/free-resources/protocols/a-z
* Smith, M., & Stein, M. K. (2011). *Five practices for orchestrating productive mathematics discussions*. Thousand Oaks, CA: Corwin Press.

**Professional Learning Communities**

* DuFour, R., DuFour, R., & Eaker, R. (2008). Revisiting professional learning communities at work™: New insights for improving schools. Bloomington, IN: Solution Tree.
* Hord, S. M., & Sommers, W. A. (2008). Leading professional learning communities: Voices from research and practice. Thousand Oaks, CA: Corwin Press.
* Huffman, J. B., & Hipp, K. K. (2003). Reculturing schools as professional learning communities. Lanham, MD: Rowman & Littlefield.
* Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. Teaching and Teacher Education, 24(1), 80–91.

1. Kirkpatrick, J. & Swafford, J. (Eds.) (2001). *Helping children learn mathematics.* Washington, D.C.: National Academies Press. Retrieved from http://www.nap.edu/catalog/10434/helping-children-learn-mathematics. [↑](#footnote-ref-1)