

All Forms of Proposals are due by February 25, 2011

Use the Vicksburg Community Schools Proposal Form and the form outline as indicated. This form will be used as your cover sheet. Check each item as you edit or create your final draft.

- Proposal Background & Overview – Write a narrative that includes:
 - Relevant background/history.
 - Problem or other basis for the proposal (i.e. student needs, etc.).
 - Reasons for making the change.
 - Targeted students and District/Building/Curriculum Area Goals.

- Complete Description of Proposed Change(s):
 - List all major changes, components and/or strategies of the proposal.
 - Give rationale for each change (base the rationale on research or best practice information).
 - Include new course/textbook title, course/textbook replaced, credit, and prerequisite(s).
 - Attach the current benchmarks/EPS, course outline, and/or general syllabus (models available upon request – contact curriculum office – VAB)

- Implementation Plan
 - Give a full explanation of the implementation timeline, action items, and responsibilities for implementing.
 - *Itemize, in detail, all proposal costs. Include 1st year costs and a budget to maintain the proposal after implementation. Include resource needed to support change. (texts, soft/hardware, consumables, substitute cost, training, equipment, personnel). Use resource expenditures worksheet to itemize all costs.

- Anticipated/Expected Impact
 - Explain the anticipated proposal outcomes. Describe how the proposal will impact students, staff, and the instructional program. Include expected gains in student success. Include how this proposal articulates with other courses/levels in this subject area & across the curriculum (scope and sequence) and, strategies for coordinating with other departments/levels.

- Proposal Evaluation Plan and Student Achievement
 - Explain the means of assessment & grading (semester project, term paper, objective-based tests, surveys, workshop feedback).
 - Explain how this proposal will be evaluated, the timeline used, what data is to be collected (survey results, district assessments), and how the evaluation will be reported.

Name: Balanced Mathematics Department and Curriculum Area: Elementary Mathematics

Building: IL, SSL, TBY

Principal's Signature: 

Title of Proposal: Balanced Mathematics

Committee Chair: John O'Toole

Committee Members: Chris VanderMei, Cyndi Frakes, Diana Haring, Ginny Ruimveld, Jamie Masco, Jennifer Taylor, Lynn McDaniel, Jill Barton, Karen Chipman, Laura Wilson, Marci Bailey, Martha Flynn, Michelle Wester, Natalie Mason, Renae Cummings, Wendy Rice

Dates of Board Review and Action: 7/11/11

Proposal Background & Overview:

Proposal History and Background.

Each spring, Vicksburg Community Schools assesses all students, grades two through five, in mathematics. Results over the past five years show scores at each grade level increasing, but scores continuing to steadily decline as students move through the grade levels. This is evident in MEAP scores as well, and is consistent throughout the state. The analysis of the data indicates student foundational number sense needs strengthening. In addition, the data consistently shows very little paper to pencil evidence of thinking and problem solving. Students are not carefully reading problems or showing persistence in solving them.

In response to these findings, the District began the process of identifying instructional resources for K-5 mathematics. Two programs were piloted in the fall of 2008. Teachers questioned the effectiveness of the two programs, as both focused on whole-group instruction with minimal support for guiding individual students. This approach ran counter to the effective instructional approach used in literacy. Teachers were trained in Balanced Literacy and have used it for the past eight years. With Balanced Literacy, teachers saw the positive impact on student achievement and wanted similar training in mathematics. The math curriculum review committee decided to hold off on the purchase of textbooks and focus on professional development similar to the Balanced Literacy training.

A mathematics consultant from Madison WI, Sara Cutler, began the Balanced Mathematics training with Vicksburg elementary teachers in the summer of 2009. The approach is similar to Balanced Literacy, with an emphasis on number and operation. In mathematics, teachers use blocks of time within a one hour instructional period to focus on math fact fluency, problem solving, balancing equations, and number works. Using fluency and problem solving assessments, each student's independent math level is identified. Students use the Singapore Mathematics workbooks to practice at their independent levels. There is a large focus on making sure students know and can fluently recall their math facts for addition, subtraction, multiplication, and division. Problem solving and persistence are integral to the Balanced Math approach, and students solve problems each day based on their independent levels. Balanced Mathematics training will continue through the 2011-12 school year.

In June of 2010, the State of Michigan adopted the Common Core State Standards for Mathematics (CCSS). All students will be assessed on the Standards beginning in 2013-14. These Standards define what students should understand and be able to do in their study of mathematics. In response to this major curriculum change, a District group of elementary mathematics leaders re-wrote the standards on the student report cards to align with the CCSS. This group also wrote CCSS common assessments and distributed these to all teachers. With implementation of Balanced Mathematics, K-5 instruction will be aligned with the CCSS, two years before State assessments begin.

To finish this process, this proposal requests the purchase of teaching resources to complete the implementation of Balanced Mathematics in grades K-5.

Complete Description of Proposed Change(s):

Common Core State Standards

In order to improve mathematics achievement in this country, the Standards are substantially more focused and coherent. They address the problem of typical US curriculum that is “a mile wide and an inch deep”. These Standards aim for clarity and specificity. They are not intended to be new names for old ways of doing business. They are a call to take the next step.

Each set of Common Core grade level standards is organized into mathematics strands or “clusters:

- Operations and Algebraic Thinking
- Number and Operations in Base Ten (Grades K-2)
- Number and Operations—Fractions (Grades 3-5)
- Measurement and Data
- Geometry

The Standards stress the understanding of key ideas, and balance this by continually returning to organizing principles such as place value or the properties of operations to structure those ideas. In addition, the “sequence of topics and performances” respect what is known about how students learn. As Confrey (2007) points out, developing “sequenced obstacles and challenges for students...absent the insights about meaning that derive from careful study of learning, would be unfortunate and unwise.” In recognition of this, the development of the Standards began with research-based learning progressions detailing what is known today about how students’ mathematical knowledge, skill, and understanding develop over time. In the Balanced Mathematics training, teachers studied these progressions using Madison Metropolitan School District’s Developmental Guidelines (Madison 2009, Ch.10, p.33), a set of mathematical skills or age-specific tasks that most children can do within a certain age range. Teachers use the Developmental Guidelines as an instructional road map. A focus of the Balanced Mathematics training is to guide teachers in understanding how students are developing mathematically, enabling them to target their instruction with small guided groups.

Common Core Practice Standards

The Common Core Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The eight K-12 practice standards are:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

The Problem Solving Block in Balanced Mathematics

The Practice Standards are strongly emphasized in Balanced Mathematics, particularly during the Problem Solving Block of instruction. Problem solving requires from 30 to 45 minutes of the math hour. Problems in all

content strands are included. They provide a context in which concepts and skills are learned. Through problem solving, students learn to make effective use of their knowledge, which in turn builds competence, a productive belief in their ability to do mathematics, and prepare them for everyday life. During problem solving, students:

- Identify and understand the elements of challenging problems and explore new number relationships.
- Develop reading comprehension strategies required to understand problems or tasks.
- Develop justifications for their solution strategies based on accepted mathematical ideas.
- Increase flexibility, efficiency, and accuracy in computation.
- Communicate solutions orally and in writing so that classmates and teachers can understand various aspects of a solution.
- Learn that perseverance is an important aspect of problem-solving.
- Make sense of mathematics and take intellectual risks by asking questions, discovering generalizations, making conjectures, and contributing to mathematical debate.

The Problem Solving Block enables teachers to gain information about each student's conceptual and procedural knowledge. Written and oral explanations, drawings, and models can provide evidence of students thinking. Teachers must look beyond the answer and assess student reasoning behind the solution. The Problem Solving Block allows teachers to differentiate instruction by choosing or adjusting problems or tasks to fit mathematical learning goals and to establish flexible grouping of students. These adjustments include changing the number size and the problem types (Carpenter, et.al 1999).

The Fluency and Maintenance Block in Balanced Mathematics

Fact Interviews are given to each student three times per year. Students are assessed using a series of fact interview sheets. Within each interview, the individual computations (facts) are organized developmentally from those requiring the least amount of number sense to compute mentally to those requiring the most flexibility in working with numbers. For example, teachers interviewing first grade students use Addition Fact Interview A to record the first stages of fact development. This development begins in kindergarten when students most often count everything, sometimes using fingers to show and count each set, in order to do single-digit calculations. In first grade, they develop counting on strategies. By second grade, most students use strategies based on number relationships. However, there will always be some intermediate students working on 0-20 number relationships, in particular "across ten" facts.

Fluency and maintenance requires 15 minutes of a math hour or is assigned as homework. This work may occur while the teacher is meeting with other small groups during problem solving. Students work on activities/games aligned with their fluency levels, to build fluency or maintain proficiency. Fluency and maintenance activities strengthen concepts and skills, build efficiency and accuracy, and reinforce vocabulary. Fluency and maintenance work should always be at a student's independent level, determined by results of the fact interviews, teacher observations of daily work, informal teacher created assessments, problem-solving interviews, and post-assessments.

The Singapore Primary Mathematics US Edition requested in this proposal will be used during the Fluency and Maintenance Block. Students are assigned a book at their independent level. In a fourth grade classroom, some students may be working in the Primary Mathematics 2A book, while others in the same room work in the 4B book. This is similar to a reading class where students read books written at their independent levels. Each student in a classroom has a learning partner in the same book. The two students work together to communicate their thinking and check for accuracy, periodically checking with teachers, who monitor progress.

The Number Works Block in Balanced Mathematics

Number work activities challenge students to develop a sense of number including how large numbers are in comparison to other numbers, the base-ten system, mental computation, and problem solving without a story context. Number work often involves activities with multiple entry points, accommodating students with a wide range of skills and abilities. It is frequently used as a whole class activity. Teachers encourage diverse responses. Often teachers use the same activity with different number choices to build fluency. They are most effective when they become daily routines. Number work includes such activities as: find different ways to compose or decompose a number, determine a function relating two sets of numbers, numeric patterns, patterns on number charts, estimate before computation, or investigate effective strategies for computations of specific types of numbers (e.g. add numbers ending in 8 or 9 or the many ways to decompose a fraction)

The Inspecting Equations Block in Balanced Mathematics

Inspecting equations activities focus on learning about how the equal sign expresses equality relationships. Students discuss true/false or open number sentences (equations), use number relationships to reason about equality relationships, recognize patterns and make conjectures about number properties, and justify their thinking mathematically. Inspecting equations activities can provide a whole class experience because of many entry points and can be used interchangeably with the Number Work block. It utilizes about 15 minutes of a math block, and occurs as a large or small group activity.

Inspecting equations provides another setting for students to “learn to articulate and justify their own mathematical ideas, reason through their own and others’ mathematical explanations, and provide a rationale for their answers.” (Carpenter, et.al 2003) These skills are essential for success in mathematics and other math related study. Through inspecting equations activities students also begin to recognize reasoning and proof as fundamental to mathematics.

Inspecting equations provides a means for teachers to engage students in learning the big ideas of mathematics. Students learn to make connections between the arithmetic they have learned throughout elementary school to the algebra they will encounter in middle school and beyond.

Differentiation and Balanced Mathematics

Balanced Mathematics allows students to work at their independent levels. In the problem solving block, students choose the number size for the narrative problem to fit their level. Teachers vary the problem types (Carpenter, et.al 1999) to provide levels of difficulty based on the child’s problem solving levels. Students are assessed on a continuum with fluency and maintenance and work on activities aligned with their placement. Placement in Singapore Math books is based on the student’s independent level, derived from results of the Fact Fluency and problem solving assessments.

Geometry and Measurement and Data in Balanced Mathematics

Number and operation is the focus of this proposal. Teachers are reminded to “think literacy” when teaching number and operation. That is, assess often, use the assessment to identify learning targets for individual students, group like students, and allow students to work at their independent level. Geometry, measurement, and data involve more whole-group instruction. Teachers will use existing Investigations in Number, Data, and

Space, 1st Edition, as their main resource for teaching geometry, measurement and data. The teacher leadership group will meet this summer to align the current Investigations books with the CCSS. The publishers of the program will release an alignment document later this fall, showing how their 2nd edition books match the CCSS. When this document is released, the leadership group will decide on specific geometry, measurement, and data analysis books from Investigations and submit to the board in the spring of 2012.

Implementation Plan:

Implementation strategies

Training in Balanced Mathematics has been on-going for the past two years. Teachers attended the following:

June 16 and 17, 2009	Balanced Math Training – Fluency and Maintenance
September 2, 2009	Implementing the Fact Fluency Block
October 29 (K-2) and 30 (3-5), 2009	Activities aligned with Fact Fluency Assessments
February 26, 2010	Organizing Fact Fluency Groups
June 17 and 18, 2010	Implementing the Number Works and Inspecting Equations Groups
September 1, 2010	Strategies for organizing classrooms for Balanced Math instruction
December 14 (K-2) and 15 (3-5), 2010	How does it look in Madison? Video clips and discussions on managing Balanced Mathematics
October 2009 – April, 2011 (multiple meetings)	K-5 math leadership group Aligned elementary report cards with the Common Core State Standards and wrote formative assessments aligned with the standards.
June 14 (K-1), 15 (2-3), and 16 (4-5), 2011	Implementing the Problem Solving block

Future Training Plans

July 11, 2011	Submit Balanced Math proposal to Vicksburg School Board
August 31, 2011	Expectations for using Singapore math books; continue planning for implementing problem solving block; introduction of math instruction rubrics; provide clear expectations for teachers – what is required in each classroom?
June 12 (K-1), 13 (2-3), and 14 (4-5), 2011	Reflecting on 2011-12 full implementation; Using the math instruction rubric; plans for institutionalizing Balanced math with support and clear expectations.
September 2012	Purchase and Implement 2 nd Edition of Investigations in Number, Data, and Space for geometry and data Analysis instructions – proposal to board in spring 2012

Proposal Costs

Primary Mathematics Challenging Word Problems	\$10.00	7		\$70.00
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Primary Mathematics Challenging Word Problems	\$10.00	7		\$70.00
Basic Math Facts for Addition and Subtraction	\$25.00	23		\$575.00
Basic Math Facts - Shipping Cost				\$57.50
*Substitutes for Math interviews	\$87.75	15 days	\$1,316.25	\$1,316.25
*Laminating and Copying at KRESA	\$2,930.15		\$2,930.15	\$2,930.15
Primary Mathematics US Edition 1a	\$9.90	165	\$1,633.50	\$1,633.50
Primary Mathematics US Edition 1b	\$9.90	165	\$1,633.50	\$1,633.50
Primary Mathematics US Edition 2a	\$9.90	125	\$1,237.50	\$1,237.50
Primary Mathematics US Edition 2b	\$9.90	125	\$1,237.50	\$1,237.50
Primary Mathematics US Edition 3a	\$9.90	85	\$841.50	\$841.50
Primary Mathematics US Edition 3b	\$9.90	85	\$841.50	\$841.50
Primary Mathematics US Edition 4a	\$9.90	35	\$346.50	\$346.50
Primary Mathematics US Edition 4b	\$9.90	35	\$346.50	\$346.50
Primary Mathematics US Edition 5a	\$9.90	10	\$99.00	\$99.00
Primary Mathematics US Edition 5b	\$9.90	10	\$99.00	\$99.00
Primary Mathematics Shipping Cost				\$869.60
Total Year 1 Cost				<u>\$14,434.50</u>
Yearly Cost (includes shipping)				<u>\$12,562.40</u>

*Purchase requisitions for KRESA laminating and assessment substitute teachers are not attached.

In 2011-12, teachers are expected to fully implement Balanced Mathematics. The expectations are:

- Individually assess each student (grades 1-5) three times per year using the fact fluency assessments.
- Organize classroom groups for fact fluency/ maintenance and problem solving based on the results of the fact fluency and problem solving assessments.
- Assign student Singapore Math book based on their independent levels.
- Focus on a problem solving centered classroom. Practice identifying “just right” problems for small groups by providing varied number approaches and problem levels.
- Use Number Works and/or Inspecting Equations daily with whole or small groups.
- Focus on the Common Core State Standards as the curriculum.
- Assess students using the District common assessments developed by the leadership group and aligned to the CCSS.

Anticipated/Expected Impact:

Balanced mathematics increases the expectations for math learning and instruction. Students are expected to be persistent, flexible, independent thinkers and problem solvers. They will learn to identify and understand the elements of challenging problems and explore new number relationships. Students will compare solution strategies to build connections between ideas or concepts and use different representations for solutions. They will develop justifications for their solution strategies based on accepted mathematical ideas, and communicate solutions orally and in writing so that classmates and teachers can understand various aspects of a solution. In fluency and maintenance, students will strengthen concepts and skills, and build efficiency and accuracy. They will be challenged to develop a sense of number including how large numbers are in comparison to others, the base-ten system, and mental computation. Teachers will gain information about each student and will differentiate instruction by choosing or adjusting problems or tasks and by flexibly grouping students to meet learning goals. They will establish a problem solving culture in which persistent, flexibility, and accuracy are the standards. Teachers will expect students to be independent thinkers and to clearly communicate their thinking.

Balanced Mathematics provides teachers and students a consistent instructional approach in both mathematics and literacy. It articulates well with elementary instruction in all content areas, instruction based on the individual learning needs of the student.

Proposal Evaluation Plan and Student Achievement:

The impact of Balanced Mathematics is assessed through a variety of measures. Within the program, student progress in Fact Fluency is monitored for individual and group gains. Assessments developed by the elementary math leadership group are required for all teachers in 2011-12. The results of these assessments are monitored in building and District grade level meetings. The common winter and spring District assessments track student progress on specific content and on problem solving. Until the state's new CCSS assessment is implemented in 2013-14, fall MEAP will also measure the impact of Balanced Mathematics.

Student grading will be based on the report card standards, common aligned assessments, Fact Fluency, and problem solving.

Confrey, J., "Tracing the Evolution of Mathematics Content Standards in the United States: Looking Back and Projecting Forward." K12 Mathematics Curriculum Standards conference proceedings, February 5-6, 2007.

"Learning Mathematics in the Primary/Intermediate Grades." Madison Metropolitan School District. May, 2009.

Carpenter, T. P., Franke, M. L. & Levi, L. (2003). Thinking mathematically: Integrating arithmetic and algebra in elementary school. Portsmouth, NH: Heineman.

Carpenter, T. P., Fennema, E., Loef Franke, M., Levi, L. & Empson, S. B. (1999). Children's mathematics: Cognitively guided instruction. Portsmouth, NH: Heinemann.

Van de Walle, J. A. (2001). Elementary and middle school mathematics. New York: Longman.