

INTERCHANGE

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From the Regional Math & Science
Center at Grand Valley State University

*Our Vision: Math and Science: Excitement in
Learning for Success in Living*

*Our Mission: Provide and coordinate
leadership, programs and services to achieve
excellence for all in the teaching, learning and
application of mathematics and science.*

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Algebra Course Offered for Teachers

Designed to assist middle school teachers both in meeting NCLB highly qualified teacher requirements and delivering effective classroom instruction, this algebra course includes problem solving, problem posing, representing and analyzing mathematical situations and structures using algebraic symbols, using mathematical models to represent and understand quantitative relationships, and analyzing change in various contexts through the study of patterns, relations, and functions. The course, taught by GVSU faculty member Char Beckmann, will also consider research in how middle school students learn algebra, applications in the school curriculum, and connections among content areas.

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At the recent Fall Math & Science Update, Mary Ann Sheline, director of the RMSC, received an award for her 20th year of leadership in improving Math and Science education.

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Number & Operations for Teachers

Michigan's new Grade Level Content Expectations (GLCE) document has raised the bar as to what students are expected to know and to do in mathematics. This series is designed to give elementary teachers the content knowledge they need to effectively teach number and operations as related to whole numbers. During this five-session workshop, taught by GVSU faculty member, Pam Wells, participants will focus on the concepts addressed in the Number and Operations strand of the GLCE's through interactive learning situations. For this strand, the following domains will be addressed with respect to whole numbers:

- Number and Operations Goals (GLCE)
- Meaning, notation, place value, and comparisons
- Number relationships and meaning of operations
- Fluency with operations and estimation.

see "Operations" on page 2

Algebra

continued from page 1

This three-credit course/content workshop series will meet on a series of Thursday evenings and Saturdays from January through April. A complete list of dates is available on the RMSC website at www.gvsu.edu/rmsc. Course assessments will assist teachers in developing portfolio items required for them to be considered highly qualified under the federal regulations described in the No Child Left Behind legislation. Teachers will complete task-based interviews with individual middle school students as part of their work in the course.

Algebra for Middle School Teachers may be taken as a 3 credit graduate course or as a 45-hour, semester-long workshop. Fees will depend on which option is chosen. For more information contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

INTERCHANGE

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These materials were developed under a grant awarded by the Michigan State Board of Education.

Operations

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Elementary teachers taking *Number and Operations: Whole Numbers* will be equipped to give their students the tools they need to build understanding from experience with concrete objects and pictorial representations, make appropriate estimations with whole numbers using mental math strategies, and solve applied problems using the four basic arithmetic operations.

This five-session series will meet from 4:30 – 8:00 p.m. on February 10 & 17, March 10 & 29, and April 14, 2005 on the GVSU Allendale Campus. The cost for the series is \$125, which includes a light supper and all materials. One graduate credit is available for the series (5 sessions) with additional tuition fees. The registration form may be downloaded from the RMSC website, www.gvsu.edu/rmsc. The registration deadline is January 21, 2005. For more information contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

Physical & Chemical Science Workshops

Join us during February, March, and April 2005, at the Regional Math and Science Center, Grand Valley State University for these specialty workshops in physical and chemical science geared toward the middle school teacher. These sessions are part of the ongoing Building Confidence through Content Series for teachers. The purpose of this series is for teachers to develop a deeper understanding of matter, its composition, properties, and behavior, including energy transformations and real-world applications. This experience will enrich teachers' abilities to make useful connections between content knowledge and pedagogy,

improving classroom environments and student achievement.

A team of chemistry professors from Grand Valley State University will be teaching this series. The five sessions will run from 4:30 to 8:00 p.m. The sessions will be on February 16, March 2, 23 and 30, and April 13.

Each session is designed to:

- Provide science content that is the foundation for the benchmarks of the Michigan Curriculum Framework.
- Include hands-on, inquiry-based activities that can be adapted for classroom use.
- Include discussion and techniques for connecting hands-on experiences with conceptual understanding.
- Provide strategies for teaching vocabulary, motivating students, focusing instruction, and dealing with misconceptions.

Sessions will be held on the Allendale campus in 303 Henry Hall. Cost of the series is \$120. One graduate college credit is available when registering for all five sessions; additional tuition fees apply. To qualify for graduate credit, a homework assignment and attendance at all five sessions will be required. A light supper and all materials are provided.

To receive more information or a registration brochure, contact the Regional Math and Science Center at (616) 331-2267, or you can download the brochure from the website at www.gvsu.edu/rmsc.



Celebrating 20 years of Science Education

The Fall Science Update Seminar sponsored by the Regional Math and Science Center at Grand Valley State University was a huge success! This year's program was held on Wednesday, November 17, and, thanks to the support of 29 presenters from universities, local school districts, and organizations, 146 teachers enjoyed an evening of collegiality and exploration into the scientific changes and spectacular gains in science education over the past 20 years.

The theme for the 20th year of celebrating science was "Changes in Science Education: Developing a Passion for Science." Higher education professors from GVSU and the Kalamazoo Area Math and Science Center, along with local teachers and administrators from Wyoming, Calvin Christian, and the Grand Rapids Public Schools, came together with presenters from several non-profit organizations and institutions to provide the very best in learning opportunities for local teachers. Presenters shared their many years of expertise and also offered plenty of materials and resources to use in the classroom.

Pre-service and current teachers enjoyed sessions in biology, physical science, and earth science along with opportunities to explore meaningful field trip experiences for teachers and students alike. Sessions featured topics such as: environmental education opportunities through the GLOBE Program; inquiry lesson sessions on light, solar system science, the motion of cells, isolation of DNA; and the latest technology in forensic science. Teachers enjoyed an update on the current on-going research in hydrogen fuel cell technology, air pollution, and high school research opportunities for students.

The highlight of the evening was a fun-filled science show featuring GVSU faculty Larry Fegel, Ross Reynolds, and Gary Tomlinson. These "Three Wise Science Guys" entertained the crowd with unique, fun-filled, and "don't try this at home" events. The RMSC Director, Mary Ann Sheline, was honored for her passion for science education and her role in establishing and nurturing the Fall Science Update Seminar during its 20 year existence. Take a look at the evening's photos and plan on joining us next year!



Plan on Math In Action

This February's annual Math In Action conference will present a lively, informative discussion of current issues in mathematics education centered around the theme "Assessment Through Algebra and Number: Utilizing Multiple Benchmarks." Math In Action brings together the community of mathematics educators in West Michigan—from practicing K-12 teachers to university faculty to future teachers—and provides the opportunity for all to grow through the sharing of ideas and resources.

This year's plenary speaker is Dr. Edward Roeber of the Michigan Department of Education. In his presentation, Dr. Roeber will focus on impending changes in the MEAP program, the MI Access program for the assessment of students with disabilities, and school accountability through such programs as No Child Left Behind and Michigan's Education YES! Dr. Roeber will also offer a question-and-answer session to address specific concerns that participants may have.

Four concurrent sessions, to be held throughout the day, will feature presentations loosely centered around the theme "Assessment Through Algebra and Number" throughout the K-12 curriculum. As these sessions will typically be interactive and feature work in small groups, participants will have the chance to experience an active learning environment. In particular, many of the presentations will demonstrate sample lessons that address a big mathematical idea and that incorporate more than one benchmark or standard. Presentations include: "Algebra in the Elementary Grades—What are the Big Ideas?"; "Making Secondary Mathematics Visual Using Algebra Tiles"; and "Child's Play for Middle School Mathematics Students."

Mark your calendars! Math In Action will be held on Thursday, February 24, 2005, from 8:30 a.m. - 3:00 p.m., at the Eberhard Center on the Robert C. Pew Campus of Grand Valley State University. A brochure providing details of the conference, including the schedule and registration information, will be mailed to area teachers and teacher educators in early January. It will also be posted online: www.gvsu.edu/math/MathInAction/.

SCIENCE AND MATH UPDATE


It came from below

Al Steinman, Director, Annis Water Resources Institute


Protecting the water quality of the Great Lakes is an activity that almost all residents in the Basin agree is important. With the passage of the Clean Water Act (CWA) in 1972, the water quality of many of our surface waters in the United States has improved dramatically. The CWA required most of the discharges coming from “any discrete or confined conveyance” to be treated before it was released into our waterways. Pipes discharging into rivers are a common example. The current water quality problem in our streams and lakes is nonpoint source pollution. Nonpoint source pollutants come from diffuse sources and are varied in content. They include fertilizers or pesticides applied to lawns or agricultural fields, petroleum products from urban runoff, and sediment from improperly maintained construction activity.

A considerable amount of effort is going into trying to control nonpoint source pollution. Development and implementation of best management practices (BMPs) is a growing field. The installation of vegetated buffer strips along riparian corridors to capture nutrients and sediment before they reach the waterways is a key BMP that helps reduce nutrient concentrations. However, years of nutrient runoff have resulted in a very large reservoir of phosphorus or nitrogen in the sediments of some water bodies. Is this a problem? It can be, depending upon the prevailing physical and chemical conditions.

The process of nutrient release from the sediments in a water body is called internal loading, which differentiates it from the process of external loading, where the nutrients enter from the watershed or atmosphere. We have been investigating the importance of internal phosphorus loading in Spring Lake, MI. For these studies, we carefully collect sediment cores from the lake and incubate them in the laboratory, to measure the amount



50% of the total phosphorus entering the water column on an annual basis comes from the sediments



of phosphorus they release under controlled conditions. Phosphorus release is affected by the dissolved oxygen concentration in the water; under normal oxygen concentrations, the phosphorus remains bound to iron and is unavailable to the algae in the water. However, under low or no-oxygen conditions (anaerobic), the iron changes its redox state, going from Fe^{3+} to Fe^{2+} , and releasing the phosphorus. This soluble phosphorus can diffuse out of the sediment and becomes available to algae for growth. Why do lakes sometimes go anaerobic? During summer months, many lakes thermally stratify, forming a warmer top layer and a cooler bottom layer. Oxygen from the atmosphere can no longer diffuse down to the bottom layer because

this temperature gradient creates a physical barrier preventing the two layers from mixing. As the organisms in the bottom layer (such as bacteria and invertebrates) continue to respire, they slowly suck the dissolved oxygen out of the water creating the right conditions for phosphorus release.

In Spring Lake, our studies have shown that over 50% of the total phosphorus entering the water column on an annual basis comes from the sediments. Hence, any long-term solution to the problem of excess phosphorus in Spring Lake must look at both internal and external loading. Can you imagine what might happen if internal loading was overlooked in a watershed like this? A large amount of money might be spent on BMPs in the watershed, with the expectation that reduced phosphorus would result in reduced algal blooms. However, since the watershed accounts for less than half the phosphorus problem, the phosphorus from internal loading would certainly continue to fuel algal blooms into the future. This, in turn, would result in frustration on the part of the residents and a loss of credibility in the resource managers. The residents in Spring Lake are now looking at applying aluminum sulfate (alum) to their lake—the alum would bind the phosphorus to aluminum, rendering it unavailable to the algae. This solution is expensive and its length of effectiveness is uncertain. One thing is clear, though—the more the external phosphorus is controlled, the sooner the internal phosphorus problem will go away.

The problem with probability

Paul Stephenson, Department of Statistics

Many people casually encounter applications of probability throughout the day. Examples include:

- A meteorologist might indicate that there is a 50% chance of rain tomorrow.
- You might discuss the probability that a particular tree will live through the winter.
- One of your kids might ask the likelihood of rolling a “Yahtzee” on his next turn.

These three applications represent the three very distinct interpretations of probability. Determining empirical probabilities (as is done in meteorological predictions) begins by defining a process that can be identically repeated a large number of times. Then the probability of an outcome is determined by repeatedly observing the process and dividing the number of times the outcome occurs by the total number of times the process was observed. Determining a subjective probability simply assigns a probability value to an outcome (like the tree living through the winter) that reflects the individual’s opinion of the likelihood of that outcome. Finally, determining theoretical probabilities (like in the game of Yahtzee) begins by defining the possible outcomes for an experiment.

James Albert (2003) examined the perceptions that college freshmen have regarding probability. Freshmen students were given probability problems and,

for each problem, were asked to (1) make an intelligent guess at the probability and (2) explain how they obtained their results. Three of the major findings in Albert’s paper are:

1. Students seemed very comfortable with stylized probability problems involving experiments that could be examined using either the computation of theoretical or empirical probabilities (for example: flipping coins or rolling die).

Students were reluctant to use their personal opinion to assign a probability value

2. Students were inclined to assume that outcomes in an empirical process are equally likely, even when it was clearly inappropriate to do so. Students were asked to guess the probability that they would graduate from college in four years. If the respondent believes they are a typical college student then it might be reasonable to estimate their likelihood of graduating in four years by using the proportion of students in the past that have graduated in four years. This approach employs the empirical probability perspective. The respondent might also assign a subjective probability value that incorporates their assessment of a number of factors (including: major or expected work schedule). Unfortunately, a significant

number of students attempted to answer this problem using some type of theoretical computation such as: “either I will graduate or I won’t, so that’s 50% – right?”

3. Students were reluctant to use their personal opinion to assign a probability value. Instead, the respondents had a tendency to use a computation to come up with a value. One problem asked the respondents to estimate the probability that they will get married before age 25. Explanations of probability computations that were given included:

“I have 6 years before I turn 25 – so my probability is 24%.”

“There are 24 numbers before 25, so you have a 1 in 24 chance to get married.”

“I took my age and divided it by 25. This gave me a 72% chance that I will marry before 25.”

Albert concluded that students did not have a good understanding of how to use either empirical evidence or subjective reasoning to estimate probabilities. He proposed four ways we can improve the teaching of probability:

- Spend less time on the classical notions of theoretical probability.
- Spend more time on estimating probabilities using empirical evidence.
- Discuss situations where the theoretical rules of probability do not apply.
- Expose students to situations where they can express the likelihood of an outcome using subjective probabilities.

Reference: James H. Albert (2003). “College Students’ Conceptions of Probability”, *The American Statistician*, 57, p. 37 – 45. *These pages are produced by faculty from GVSU.*

MCTM a Success

The 2004 Michigan Council of Teachers of Mathematics Conference, Renaissance Visions: Connecting Mathematics was held October 28-30, 2004 at the Detroit Renaissance Center. Over 1200 mathematics teachers, college and university faculty members, and K-12 school administrators from around the state participated. Information about the conference is online at www.mictm.org. GVSU was a major presence at the conference. Faculty members that spoke at the conference were: Pam Wells, Esther Billings, Karen Novotny, Steve Schlicker, Matt Boelkins, Akalu Tefera, John Golden, John Gabrosek, Phyllis Curtiss, Will Dickinson, Jonathon Hodge, Marge Friar, Paul Yu, Steven Blair, Mary Richardson, Sango Otieno, Rebecca Walker, Matt Wyneken, Karen Meyers, and Char Beckmann. These faculty members represented the Mathematics Department, the Statistics Department, and the Regional Mathematics Science Center (RMSC). Faculty members that served on the conference planning and site committees are: John Golden and Dave Coffey (technology), Phyllis Curtiss and John Gabrosek (statistics poster contest), Char Beckmann (conference chair). Current and former students that spoke at the conference included: Jessica Roy, Rachel Lewis, Tiffany Stob, Nick Counts, Jennie Reigle, Natalie Beyer, Kristine Denton, and Tara Maynard. In addition, GVSU generously contributed many items to the MCTM Scholarship Endowment Fund Silent Auction that was held in conjunction with the conference. Several GVSU students have received MCTM Scholarships over the 15 years that the scholarships have been awarded. Plan to attend next year's conference in Grand Rapids on October 13-15, 2005.

Enter the Statistics Poster Competition

Even though the February 25th entry deadline for the 2005 Michigan Statistics Poster Competition (MSPC) is quickly approaching, there is still time to make and submit an award-winning poster. The 2005 MSPC is sponsored by the Department of Statistics and the Regional Math and Science Center at Grand Valley State University and the Michigan Council of Teachers of Mathematics. The competition is open to all K-12 Michigan students. Awards are given in four grade level categories: K-3, 4-6, 7-9, and 10-12. The competition website is www.gvsu.edu/stat/statposter. Included on the website is an on-line registration form. Contact John Gabrosek at (616) 331-3691 or via email at gabrosej@gvsu.edu if you have any questions.

New Coordinator for Michigan's BaP

David Bydlowski, a science consultant at the Wayne County Math and Science Center at Wayne RESA, has been appointed as Michigan's State Coordinator for the Building a Presence for Science (BaP) network. David has taken on this task because of his belief in its importance, citing the fact that no other content area has a national leadership network. David plans on sending out electronic messages to Michigan teachers on the 2nd and 4th Thursday of each month. NSTA sends out a national message on the 3rd Thursday of the month. With David, we would like to sincerely thank David Larwa for all of the work he has done in leading BaP over the past two years. David Bydlowski can be reached at bydlowd@resa.net and looks forward to your input.

Connected Mathematics Phase II

The 8th Annual CMP Users' Conference will take place February 18 and 19, 2005 at Michigan State University. It will feature updated information about the Connected Mathematics curriculum from the authors, staff, publisher, experienced teachers, and administrators. The conference is for all CMP users, those currently using it as well as those who expect to purchase it in the future. For more information and registration forms, see the CMP website at www.math.msu.edu/cmp/Conferences/National.htm. If you have questions, you may also email Judith Miller at miller@math.msu.edu or call (517) 432-3635.

BaP Update Meeting

On January 12, 2005, the RMSC at GVSU is hosting an update meeting for Key Leaders and Points of Contact involved in the Building a Presence (BaP) electronic network in Kent, Montcalm, and Ottawa counties. The meeting will held in the Pere Marquette room of Kirkhof Center on the Allendale campus. Tentative time is from 4:30 to 7:00 p.m. Light refreshments will be served.

Topics include: BaP for Science update, leadership, website, level of participation, science grade span content expectations, Highly Qualified update, MEAP update, and a report from MSTA by President Robby Cramer

Your presence is very important. Registration information will be posted at www.gvsu.edu/rmssc. Information will also be sent via email. RSVP at (616) 331-2267 or email michos@gvsu.edu if you plan to attend so we can arrange refreshments, handouts, and seating. Mark your calendars!

CALENDAR *OF* EVENTS

JANUARY

1 Saturday

Kent County **Christmas Bird Count**. 7:30 a.m. to 5:00 p.m., Kent County Conservation League, 8461 Conservation NE, Ada, MI. Birders of all skills are needed to cover a 15-mile circle. Contact Ranger Steve at (616) 877-1852, or stevemueller@kentisd.org.

13 Thursday

Algebra for Middle School Teachers begins. See details in this issue or contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

27 Thursday

Criminalistics Teacher Workshop
Series for middle and high school science teachers at the Kent ISD Educational Service Center, 2930 Knapp NE, Grand Rapids, from 4:00-6:00 p.m. Workshop continues on February 10, March 3, 10, and 24. Contact Carol Goodrich at (616) 365-2339 or carolgoodrich@kentisd.org.

(February)

10 Thursday

Criminalistics Teacher Workshop
Series for middle and high school science teachers at the Kent ISD Educational Service Center, 2930 Knapp NE, Grand Rapids, from 4:00-6:00 p.m. Workshop continues on March 3, 10, and 24. Contact Carol Goodrich at (616) 365-2339 or carolgoodrich@kentisd.org.

10 Thursday

Content series on **Number & Operations: Whole Numbers Series** for Elementary Teachers begins. 4:30-8:00 p.m. on the GVSU Allendale Campus. For more information visit www.gvsu.edu/rmsc or contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

FEBRUARY

16 Wednesday

Building Confidence through Content Series: **Physical and Chemical Changes in Matter and Energy** for the Middle School Classroom begins at GVSU Allendale campus from 4:30 to 8:00 p.m. For more information contact the RMSC at (616) 331-2267, or visit www.gvsu.edu/rmsc.

18-19 Friday Saturday

Connected Mathematics Phase II **CMP Users' Conference** at Michigan State University. For more visit www.math.msu.edu/cmp/Conferences/National.htm or contact Judith Miller at miller@math.msu.edu or call (517)432-3635.

17 Thursday

Content series on **Number & Operations: Whole Numbers Series** for Elementary Teachers continues. 4:30-8:00 p.m. on the GVSU Allendale Campus. For more information visit www.gvsu.edu/rmsc or contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

24 Thursday

Math In Action conference from 8:30 a.m. - 3:00 p.m. at the Eberhard Center on the Robert C. Pew Campus of Grand Valley State University. For more information visit www.gvsu.edu/math/MathInAction/.

25 Friday

Deadline for poster submission to **Sixth Annual Michigan Statistics Poster Competition** for K-12. For details see www.gvsu.edu/state/statposter.

MARCH

2 Wednesday

Building Confidence through Content Series: **Physical and Chemical Changes in Matter and Energy** for the Middle School Classroom continues at GVSU Allendale campus from 4:30 to 8:00 p.m. For more information contact the RMSC at (616) 331-2267, or visit <http://www.gvsu.edu/rmsc>.

3 Thursday

Criminalistics Teacher Workshop
Series for middle and high school science teachers at the Kent ISD Educational Service Center, 2930 Knapp NE, Grand Rapids, from 4:00-6:00 p.m. Workshop continues on March 10, and 24. Contact Carol Goodrich at (616) 365-2339 or carolgoodrich@kentisd.org.

10 Thursday

Criminalistics Teacher Workshop
Series for middle and high school science teachers at the Kent ISD Educational Service Center, 2930 Knapp NE, Grand Rapids, from 4:00-6:00 p.m. Workshop continues on March 24. Contact Carol Goodrich at (616) 365-2339 or carolgoodrich@kentisd.org.

10 Thursday

Content series on **Number & Operations: Whole Numbers Series** for Elementary Teachers continues. 4:30-8:00 p.m. on the GVSU Allendale Campus. For more information visit www.gvsu.edu/rmsc or contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

23 Wednesday

Building Confidence through Content Series: **Physical and Chemical Changes in Matter and Energy** for the Middle School Classroom continues at GVSU Allendale campus from 4:30 to 8:00 p.m. For more information contact the RMSC at (616) 331-2267, or visit <http://www.gvsu.edu/rmsc>.

24 Thursday

Criminalistics Teacher Workshop

Series for middle and high school science teachers concludes at the Kent ISD Educational Service Center, 2930 Knapp NE, Grand Rapids, from 4:00-6:00 p.m. Contact Carol Goodrich at (616) 365-2339 or carolgoodrich@kentisd.org.

29 Tuesday

Content series on **Number & Operations: Whole Numbers Series** for Elementary Teachers continues. 4:30–8:00 p.m. on the GVSU Allendale Campus. For more information visit www.gvsu.edu/rmsc or contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

30 Wednesday

Building Confidence through Content Series: **Physical and Chemical Changes in Matter and Energy** for the Middle School Classroom continues at GVSU Allendale campus from 4:30 to 8:00 p.m. For more information contact the RMSC at (616) 331-2267, or visit www.gvsu.edu/rmsc.

A P R I L

13 Wednesday

Building Confidence through Content Series: **Physical and Chemical Changes in Matter and Energy** for the Middle School Classroom ends at GVSU Allendale campus from 4:30 to 8:00 p.m. For more information contact the RMSC at (616) 331-2267, or visit www.gvsu.edu/rmsc.

14 Thursday

Content series on **Number & Operations: Whole Numbers Series** for Elementary Teachers concludes. 4:30–8:00 p.m. on the GVSU Allendale Campus. For more information visit www.gvsu.edu/rmsc or contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

Crime for Secondary Teachers

A Criminalistics Teacher Workshop Series for middle and high school science teachers is being offered by the Kent ISD with Brian Bollone of Northview Public Schools. This workshop focuses on content/course adoption, curricular materials and classroom investigations for integrating forensic science into current curriculum and/or as a course in itself. The workshop will be held at the Kent ISD Educational Service Center, 2930 Knapp NE, Grand Rapids, from 4:00-6:00 p.m. on Thursdays, January 27, February 10, March 3, 10, & 24. Fee: \$80 Kent ISD Educators, \$100 all others. (Includes workshop materials and after school snacks.) Register by January 13th. Contact Carol Goodrich at (616) 365-2339 or carolgoodrich@kentisd.org.



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