



WCER RESEARCH highlights

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Teacher Compensation Remains a Challenge

Between 50 and 75 percent of a district's education budget is spent on teacher compensation. It makes sense for states and districts to ask how teacher pay can be leveraged to increase the excellence of instructional practice and deliver on our commitments to improved student achievement.

Well, how much is a teacher worth? It depends on what you mean by "a teacher."

Do you mean an eighth-grade science teacher with a master's degree and 5 years' experience teaching in a low-income neighborhood where many students have special needs?

Do you mean a 12th-grade language arts teacher with 20 years' experience in an isolated rural district, and with lots of continuing education credits, who has taught summer school for the past five years?

Should these teachers be compensated according to their longevity and highest degree attained, or by market value of their subject specialty? Or should they be compensated based on how well their students perform on standardized assessments?

Figuring out the best way to compensate K-12 teachers has occupied the best minds in education research for a long time. The system of paying teachers simply according to how long they've been on the job does not account for how effective they are, that is to say, how well their students achieve.

Each teacher is unique, and his or her strengths should be measured carefully, and rewarded appropriately, depending on the context, according to UW Madison education professor Allan Odden and colleagues.

Odden says compensation systems can be designed to reward teachers based on classroom performance. Such systems can improve instructional practice and produce higher levels of student learning. When compensation is brought into the teacher-quality agenda, Odden says, it makes the system take several things more seriously: teacher recruitment, selection, professional development, and evaluation. In most places, he adds, such forms of compensation also lead to higher levels of pay, thus producing better teachers, better-paid teachers, and higher-performing students.

But in many places the teacher compensation system is broken: teachers are not compensated fairly either by comparison to other teachers or by comparison to other degreed professionals.

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Adam Gamoran

Two Programs Announced

Professor of Curriculum and Instruction Beth Graue will assume the role of WCER Director of Graduate Training this fall. In this role she will enrich the environment for preparing graduate students at WCER by coordinating training activities across projects, content areas, and methodological approaches. As part of this new role, Graue will relocate the Doctoral Research Program to WCER. Developed with funds from the Spencer Foundation, this program is offered to select students in the School of Education and has been cited as a national model of interdisciplinary, multimethod doctoral preparation in education. It will complement WCER's Interdisciplinary Training Program, which brings social science doctoral students to research in education sciences and has a quantitative rather than a multimethod focus. One of Graue's first tasks will be to assess the needs of WCER graduate students from the perspectives of students and faculty.

Improving U.S. education is central to WCER's mission, but there is much to be learned from education in other countries. Professor of Curriculum and Instruction Tom Popkewitz will enhance WCER's portfolio of international education research by meeting with potential investigators, developing working groups, identifying potential funding sources, and linking WCER with other international education initiatives across campus to further the prospects for support for international education research.

Adam Gamoran
WCER Director
Professor of Sociology and
Educational Policy Studies



Tony Milanowski



The pay gap between teachers and other college educated workers has increased in the last 10 years. WCER researcher Tony Milanowski says the best research he has seen suggests teachers are paid about 12% less than other occupations requiring a college degree.

Teachers with specialties in short supply, such as mathematics and science, for example, are paid no more than teachers in other disciplines.

Some of the best and brightest undergraduates majoring in science and mathematics disciplines choose not to go into teaching because of relatively low pay. Some say they'd be much more likely to consider teaching as a career if it paid as much as jobs in the private sector. In a study for The Consortium for Policy Research in Education, Milanowski found that a salary level 45% above the local average would have attracted 48% of the sophomore survey respondents and 37% of the junior respondents to a career in K-12 teaching. (See story, http://www.wcer.wisc.edu/news/coverStories/start-ing_teacher_salaries.php.)

Pay scales based solely on a teacher's seniority do not reward superior performance. And the relationship between teacher quality and years of teaching experience is weak or non-existent after teachers' first five years, says Milanowski.

And although teachers must take continuing education courses, often in the summer, most single-salary pay schedules reward teachers for the number, and not the quality, of these credits.

There's also an equity issue. In a June 2006 report the Education Trust found that school districts like Milwaukee and Chicago, with high percentages of low-income and minority students, are more likely to have teachers who are unqualified, inexperienced, and less talented academically. The study shows a direct connection between poor teacher quality and low student achievement.

(See <http://www2.edtrust.org/NR/rdonlyres/010DBD9F-CED8-4D2B-9E0D-91B446746ED3/0/TQReportJune2006.pdf>)



Proposed solutions

New compensation strategies have been developed over the past several years in an attempt to connect teacher compensation to progress in student achievement.

“Pay for performance” plans aim to improve student learning and to reward teachers for their contribution to that learning. But “pay for performance” means a new focus on changing the conditions that make a difference for students and teachers.

Performance awards are based on either the performance of the individual teacher’s students or the performance of students under a group of teachers or school. But opponents of individual-based performance awards argue that current testing systems do not accurately assess student progress and create an inaccurate measure of teacher performance.

Some new pay systems attempt to provide incentives for engaging in professional development specifically related to school or district goals. Some systems aim to attract and retain effective teachers in low-income schools or other hard-to-staff schools or in high-need subject areas such as math and science.

Denver, Colorado’s ProComp program rewards teachers for achievement in four areas: helping to increase student achievement, developing professional knowledge and skills, receiving satisfactory evaluations, and filling special needs in schools or specific positions. Odden says ProComp’s success shows that voters are willing to back higher teacher pay if it promises to raise student achievement.

Skill-based or knowledge-based systems reward teachers for developing core competencies related to the teacher’s subject specialty, or that match the district’s overall teaching priorities. Research indicates that, at least in concept, teachers view these programs more favorably than early attempts at merit pay or career-ladder systems, and some districts with skill-based pay experience higher rates of retention of highly qualified teachers.

Challenges remain

New compensation systems can cost more than traditional systems. Funding them can be difficult both in the short term and long term. In a study of the Cincinnati school system WCER’s Milanowski found that teachers did not think the district could afford the performance pay program, and thus did not believe it would continue. In Minneapolis, teachers felt the state would discontinue funding their program, leading many eligible teachers not to participate. In California, the state set aside big money one year, but when the economy slowed, it dropped the program.

Funding has come from local tax increases and state appropriations. “The problem is that when economic downturns hit, politicians look at these programs as a place to cut,” Milanowski says.



“But this happens in the private sector too: if profits go down, often less is available for performance pay. The difference is in the private sector better employee performance can often help to generate the money needed to pay for performance.”

Successful programs can become expensive as a high percentage of teachers qualify for higher salaries through skill development or higher performance. Milanowski says that although only a few programs have been around long enough to tell, that did happen in North Carolina.

In addition, those with vested interests in the status quo often oppose such changes. Successful compensation changes can’t be imposed from above or achieved by simply copying models from elsewhere. They need to be crafted based on local needs, organizational capabilities, and realistic financial projections. Depending on the level of support for the single salary schedule, districts and policymakers may find it politically difficult to implement any significant compensation reform. Milanowski estimates that about one-half to two-thirds of the programs he’s observed failed to get off the ground.

An eighth-grade science teacher with a master’s degree and 5 years’ experience teaching in a low-income neighborhood where many students have special needs brings much to the classroom and should be compensated well.

A 12th-grade language arts teacher with 20 years experience in an isolated rural district, and with lots of continuing education credits, and who has taught summer school for the past five years should also be compensated well.

But continuing to rely on a compensation formula that recognizes only longevity and continuing education credits does justice neither to the teachers, nor to their students.



Allan Odden





Immersion Units Enhance Science Instruction

Imagine you're an elementary school science student beginning to study a life science unit on decomposition. You have two options: You could read with your teacher from a text about life on a forest floor and how matter decomposes. Or, you could go outside and gather leaves and other compostable materials, bring them inside and put them into a large plastic soda bottle. Over the next days and weeks you would observe substances as they decompose (or not). You would observe and smell how moisture, air, temperature, and light affect the process of decomposition on different substances. You would watch the living and nonliving worlds interact, you would pose your own questions about decomposition, and you would test your ideas.

Which option would you prefer?

Some fortunate students have experiences in their science classes that fundamentally change their views of science and technology. They move from passive consumers of information to active participants in important scientific processes. In other words, they become apprentices on the way to becoming scientists or engineers. But far too often, the best science instruction is restricted to the best and brightest students attending the best schools.

The soda bottle decomposition investigation is one example of an inquiry that is part of an 'immersion unit.' Immersion units are instructional materials leveraging a powerful influence on student learning. And an immersion model for collaborative development and facilitation of professional development is opening doors to successful, widespread, and sustainable implementation of immersion units and high-quality science instruction.

Educators and scientists in WCER's System-wide Change for All Learners and Educations (SCALE) partnership are developing conceptually coherent science units, one for all grade levels, Kindergarten through Grade 12, to represent and support the SCALE goal of rigorous and engaging science teaching and learning for all students. SCALE's Immersion work includes instructional materials design and development as well as professional development for teacher-learning facilitators at partner universities and districts.

SCALE's Immersion Unit Design Team says the primary functions of such immersion units include:

1. Giving students deeper learning opportunities. Greater depth means that students develop a conceptual understanding.
2. Providing model instructional material to support best practices in science teaching. Immersion units can help teachers as they help students.
3. Encouraging student ownership of the immersion experience. Students come to see themselves as doers of science, rather than just consumers of science.

The team designs immersion units not only to improve students' scientific understanding and competence, but also to support professional learning for pre-service and in-service teachers through supported district implementation. The interdisciplinary team includes

- university science, technology, engineering, and math faculty,
- learning scientists (cognitive psychologists, curriculum designers, and education faculty),
- school district curricula coordinators,
- lead teachers and other representatives, and
- district change consultants.

Among their recommendations for producing system-wide, high-quality immersion units are:

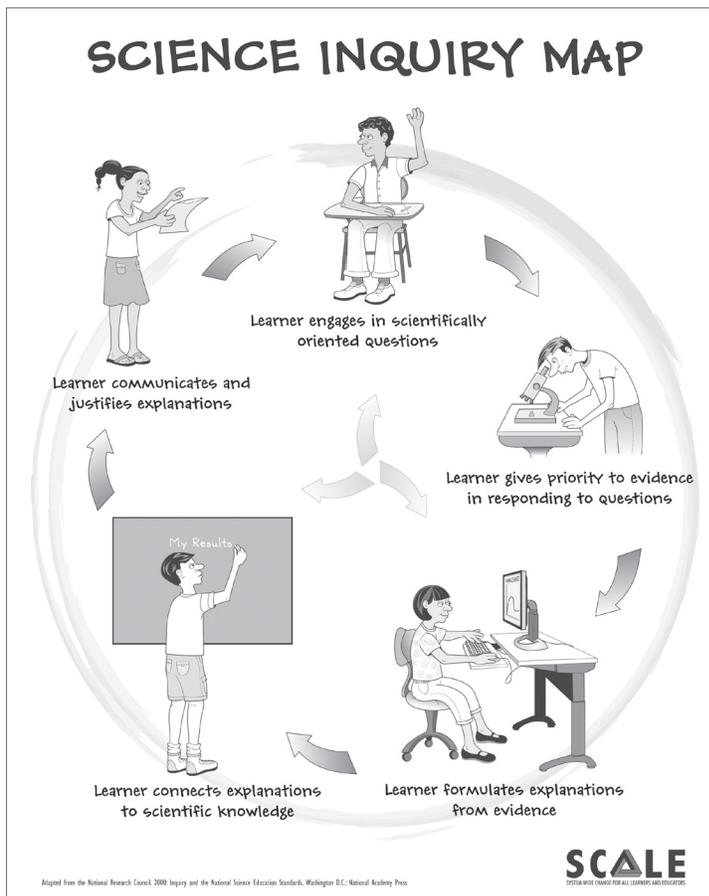
1. Each immersion unit should include the full scientific inquiry cycle, that is, students should select a research question, design an experiment, collect the data, analyze the data, determine a conclusion, and present the results.
2. The units should be coordinated with the curriculum rather than standalone experiences.
3. Units should focus on core content concepts that are traditionally hard to learn and yet are important precursors of other science concepts.
4. Regular teachers should teach units. Immersion units can enhance professional development as they teach process and content to science teachers for better year-round science teaching.
5. Students should experience science as an ongoing production of knowledge, rather than as recreations of experiments or reviews of historical byproducts.
6. Units should be taught by the regular teachers. Immersion units can enhance professional development as they teach process and content to science teachers for better year-round science teaching.

Let's go to the Los Angeles basin, where there's a coordinated effort by the SCALE Immersion Unit team; California State University, Dominguez Hills; California State University, Northridge, and California State University Los Angeles, and the Los Angeles Unified School District. The consortium produces intensive weeklong institutes for LAUSD science teachers based on five immersion units. During the institutes, teachers immerse themselves as learners in the science content and the best instructional practices in the context of their grade-level immersion unit. Teams facilitating the institutes include STEM and education faculty, district leaders, and teachers who have implemented the units in their own classes.

The institutes introduce teachers to an immersion unit, prepare them to teach it, build leadership skills, and develop a common vision among the co-facilitators. Teachers who attend summer institutes have access to follow-up activities including mentoring from local science experts. The institutes have been offered for the last 2 summers and offerings will continue to grow in coming years.



Sociologist and WCER Director Adam Gamoran has obtained a five-year grant from the National Science Foundation to study the effects of teacher professional development with immersion units in 4th and 8th grade in Los Angeles. With colleagues Geoffrey Borman, UW-Madison professor of Educational Leadership and Policy Analysis, and Ted Bartell, Los Angeles United School District director of program evaluation and research, Gamoran will examine student science achievement in 40 randomly-selected schools whose teachers attend summer institutes to learn how to teach with immersion units, compared to achievement of students in control schools whose teachers will attend institutes in later years. Teachers who attend summer institutes will also have access to a variety of follow-up activities, including ongoing mentoring from local science experts. The first institutes are taking place this summer.



SCALE

SYSTEM-WIDE CHANGE FOR ALL LEARNERS AND EDUCATORS

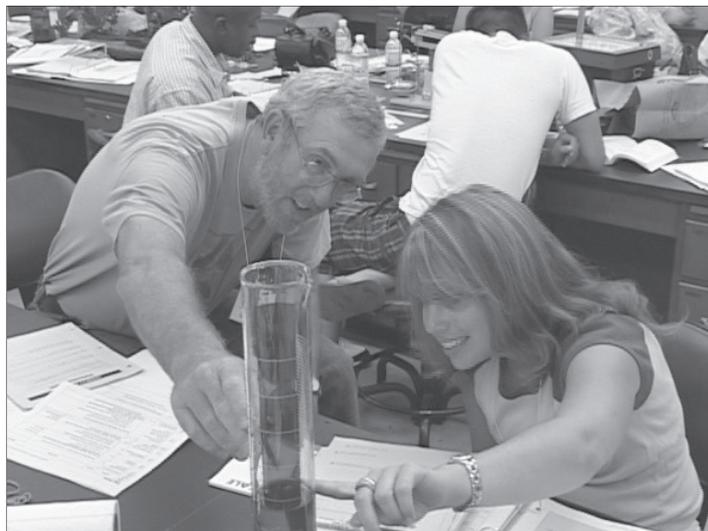
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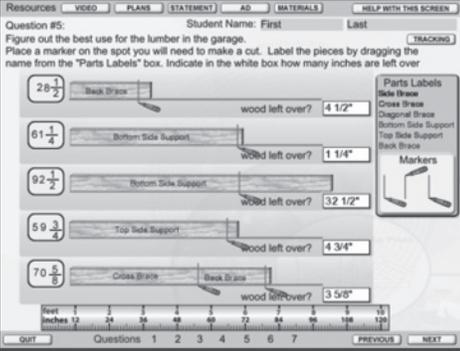
What's New?

- » Terry Millar Receives 2006 Madison Metropolitan School District Distinguished Service Award
- » Mathematics and Science Specialty High Schools
- » Serving a Diverse Student Body: What's Different?
- » MMSD Earth Science PD

For more information see the SCALE site project pages at <http://www.scalemsp.org/>

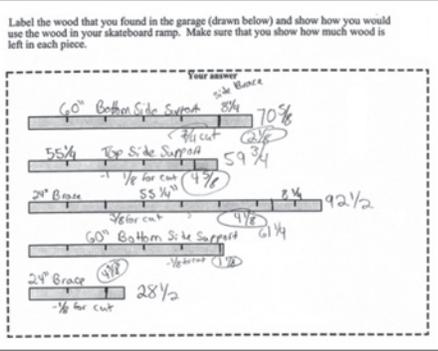


CBA Item

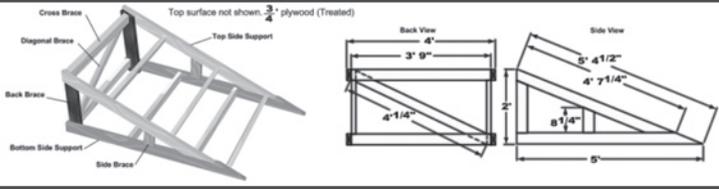


Computer

PPA Item



Paper



Information from the Video Anchor

Low Achievers May Benefit From Interactive Assessments

Students with special learning needs require alternative forms of assessment that allow them to express all they know and can do. Without these accommodations, teachers can't accurately measure student learning.

In a recent study, low-achieving students in mathematics made slightly larger gains on a multimedia computer-based assessment than on a traditional pencil-and-paper assessment. This suggests that the multimedia test may have accommodated at least some special needs of these students.

UW-Madison education professor Brian Bottge and colleague Enrique Rueda developed and evaluated the effectiveness of a multimedia computer-based assessment in a recent study of 109 seventh-grade students and their two math teachers. Students in each of the six classes were randomly assigned to either a computer-based assessment or a paper-and-pencil assessment.

Bottge had developed a multimedia Enhanced Anchored Instruction (EAI) problem called Fraction of the Cost, which had been integrated into the school's math curriculum the year before. Bottge developed Fraction of the Cost to address the knowledge and concepts in the National Council of Teachers of Mathematics (NCTM) Standards recommended for students in grades 6-8.

Fraction of the Cost includes an 8-minute video presentation, or anchor. It stars three local middle school students. In the video, they visit a skateboard store and discuss how they can afford to buy materials for building a skateboard ramp. To solve the problem, students need to (a) calculate the percent of money in a savings account and sales tax on a purchase, (b) read a tape

measure, (c) convert feet to inches, (d) decipher building plans, (e) construct a table of materials, (f) compute whole numbers and mixed fractions, (g) estimate and compute combinations, and (h) calculate total cost.

After students in the math class view this video they describe the mathematics problems involved, then work in small groups. The teacher then assesses the students' learning either with the computer-based assessment (CBA) or the paper-and-pencil based assessment (PPA). Each assessment contains constructed-response items that measure the concepts in Fraction of the Cost.

The CBA measures the same concepts as the PPA, with the additional benefit of providing students a level of interactivity similar to what they had experienced in the contextualized authentic-like problems in EAI. Bottge anticipated that the new test would especially benefit the low-achieving students: They could access information for solving the EAI problem on the test rather than having to recall the relevant information from the instructional period.

To identify differences in students' problem-solving strategies, Bottge recorded and measured students' search paths as they worked on the CBA. Bottge predicted that the CBA would eliminate some of the cognitive demands of problems for the low-achieving students and would thus enable them to more fully demonstrate their understanding of the math concepts they had learned.

That seems to have happened. The study showed that low achievers made slightly larger gains on the CBA than on the PPA.

This research provides a first step in developing multimedia-based assessments that can match the contextualized nature of Enhanced Anchored Instruction. The accommodations provided

CBA Item

Resources VIDEO PLANS STATEMENTS AS SA TERMS HELP WITH THIS SCREEN

Question #3: Student Name: First Last
Measure the wood in the garage. Place the mouse on the green dot.

answer boxes

28 $\frac{1}{2}$

61 $\frac{1}{4}$

92 $\frac{1}{2}$

59 $\frac{3}{8}$

70 $\frac{3}{8}$

Read the measure on the graphic, and then label the length of the board by moving the numbers into the answer boxes.

Measure Labels

1	2	3	4	5	6	7	8	9	0
$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$		

Computer

PPA Item

What are the lengths of wood in the garage?

Your answer

Quantity	Description	Size in Feet	Size in Inches
1	Long	5' 10 $\frac{1}{2}$ "	70 $\frac{1}{2}$ "
1		5' 1 $\frac{1}{4}$ "	61 $\frac{1}{4}$ "
1		4' 1 $\frac{3}{4}$ "	54 $\frac{3}{4}$ "
1	Wood	2' 4 $\frac{1}{2}$ "	28 $\frac{1}{2}$ "
1		7' 8 $\frac{1}{2}$ "	92 $\frac{1}{2}$ "

Paper

by more flexible test formats may have the potential to more adequately assess deeper understandings of students with poor language skills.

In future work Bottge expects to merge interactive assessments as used in this study with interactive instructional tools to provide formative measures of student skills. The aim is to help teachers individualize instruction and to help them evaluate the effectiveness of curricular materials and instructional practices.

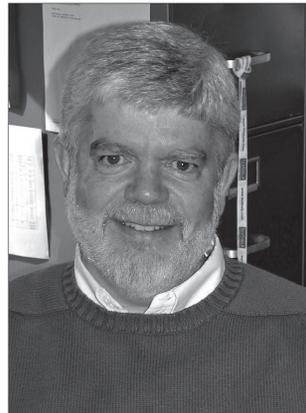
This research was funded by a grant from U.S. Department of Education, Institute of Education Sciences.

Capturing Math Understanding: A comparison of Two Assessment Methods. Symposium paper with Rueda at American Education Research Association Annual Meeting, San Francisco, April 2006.

<http://www.nmsa.org/Publications/RMLEOnline/Articles/Vol27No1Article1/tabid/529/Default.aspx>



Enrique Rueda



Brian Bottge

Constructivist Approach... What is it?

The new wave of reform in mathematics education encourages teachers to provide more opportunities for students to enhance their computing and problem-solving skills in concept-rich contexts. One such reform is known as the **constructivist approach**.

The **constructivist approach** to teaching encourages students to construct and reconstruct their math understanding as they interpret new information in light of what they already know. Students deal with novel problems in a variety of settings so they can recognize the relationships among important mathematical ideas.

But how can educators modify the teaching practices used in special education and other remedial settings to align with current reform-oriented practices? Judging from current practice and research, it will not be easy to make the transition to more constructivist teaching practices with students needing remediation, says UW–Madison education professor Brian Bottge.

Enhanced Anchored Instruction (EAI) provides one avenue. EAI requires students to solve a problem in a multimedia format and then apply what they learn. In related hands-on problems they construct something meaningful to them, for example, a skateboard ramp or a working model hovercraft.

EAI research addresses the curricular and instructional needs of low performing students in reform-oriented math contexts. But here's the catch: Little attention has focused on developing assessments that can adequately measure the problem-solving ability of students who learn with EAI.

Director Adam Gamoran
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 Production Instructional Media Development Center

WCER Research Highlights is published by the Wisconsin Center for Education Research, School of Education, University of Wisconsin–Madison. WCER is funded through a variety of federal, state, and private sources, including the U.S. Department of Education, the National Science Foundation, and UW–Madison. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the funding agencies. Fourth-class, bulk-rate postage is paid at UW–Madison, Madison, WI. Send changes of address to WCER, 1025 West Johnson Street, Madison, WI 53706 or call (608) 263-4200. Include the address label from this issue.

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ISSN 1073-1822
 Vol. 18, No. 1
 SUMMER 2006

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