



# WCER RESEARCH highlights

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## New Approaches to Performance Management and Value-Added in Urban Schools

More schools and districts around the country are using data at the school level to inform instructional decisions and support student learning. That's a promising trend.

But research on using data to make instructional decisions doesn't yet provide conclusive evidence of "what works" to improve student achievement.

Sara Kraemer, Elisabeth Geraghty, Deborah Lindsey, and Cynthia Raven argue that the performance management movement addresses this concern. Researchers at WCER's Value Added Research Center, Kraemer and Geraghty analyzed human factors and organizational factors that affect performance management, school improvement, and data use. Working with Lindsey and Raven, Department of Research and Assessment, Milwaukee Public Schools, they found that the

design and implementation of data-centric improvement efforts are enhanced by using what's called a macroergonomic approach.

Macroergonomics is a subdiscipline of ergonomics. It focuses on the design of an overall work system. A work system can include personnel, technology, organization and management, and the external environment.

Kraemer and her colleagues analyzed eight public schools in Milwaukee, Wisconsin, from October 2008 through February 2009. They measured performance at the school level via value-added analysis. Value-added analysis measures school productivity and the contribution of schooling to growth in student achievement. It uses statistical techniques to separate the effects of schooling from other non-school factors that may influence student achievement, including students' prior academic achievement, family mobility, race, and socioeconomic status.

*(continued on next page...)*

### CONTENTS

- 4 Computer Games and the Future of Assessment
- 5 Improving Community College Success
- 7 What Matters in Mentoring



## FROM THE DIRECTOR



Adam Gamoran

Too many students who enter community colleges do not persist for longer than a semester, complete a program, or attain a credential. Sara Goldrick-Rab says it's time to consider the policies that affect the capacity of community colleges to serve students. She says the best research on community colleges will be interdisciplinary and it will use quantitative and qualitative methods.

We know that undergraduate students from racial and ethnic groups, and White women, are especially at risk for inadequate mentoring relationships. However, we know much less about specific factors in a research mentoring relationship that create positive experiences. But a new interdisciplinary team is exploring students' research-related self-efficacy beliefs and their career expectations. Long-term research outcomes should include an increased and diversified number of students who pursue science careers.

Some K-12 school curricula have managed to keep pace with new developments in technology by incorporating games, interactive exercises, and multimedia. Yet testing and assessment lag far behind. David Williamson Shaffer and colleague James Gee suggest that designers of assessments take a cue from computer games, which measure player performance and progress.

Research on using data to make instructional decisions doesn't yet provide conclusive evidence of "what works" to improve student achievement. But human factors and ergonomics may be a viable approach to the evolution of performance management at the school level. Staff from the Value Added Research Center recommend that schools adapt or develop a learning-team approach to performance management, and that school leadership practices may benefit from adopting a top-down, macroergonomic approach and systematizing school functions across the organization.



Adam Gamoran  
WCER Director  
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## PERFORMANCE MANAGEMENT

In the context of education, performance management refers to improving the effectiveness of schools and districts using rigorous data, regularly assessing school and district performance, and holding managers accountable. Every level of a school district can use performance management principles of quality and systems management and the associated tools and processes.

The Milwaukee Public Schools system designates individual schools as high- or low-performing, based on student attainment scores on the Wisconsin Knowledge and Concepts Exam (WKCE). However, simple measures of student attainment do not filter out students' prior academic achievement, family mobility, race, or socioeconomic status.

To assess school performance taking these factors into account, Kraemer and colleagues sampled eight schools that varied in performance by comparing their value-added measures and student attainment measures on the WKCE. They established four performance levels, each including two dimensions:

At High VA/high attainment schools, students tested high on attainment and their academic performance grew faster than the district average.

At High VA/low attainment schools, students' academic performance grew faster than the district average, even though these students tested low on the state test and they did not achieve the mandated proficiency goal.

At Low VA/high attainment schools, students tested very high, but relative to the district average, their academic performance grew slower from year to year.

At Low VA/low attainment schools, students tested low on the state test and student achievement grew slower than the district average.

### Schools' reactions to their scores

The *high VA/high attainment* schools tended to view value-added measurement as a validation because it demonstrated that they produce high-performing students. The high scores were not simply the result of having "good" students.

The *high VA/low attainment* schools also felt validated. Their student growth rates were high, even though their attainment scores didn't meet district standards.

*Low VA/high attainment* schools tended to view their VA scores with some disbelief. Even though their students tested high, these schools were not contributing to growth in student achievement. So, in fact, they were



not high-performing schools. They did, however, want to learn about growth strategies for producing high-attaining students.

*Low VA/low attainment* schools believed that students were the problem. They did not acknowledge value-added scores as a valid measure of student learning.

### How schools used data

The eight schools varied in the sophistication of their data use. The high VA/high attainment schools were able to identify mismatches between content areas of the state test and their current curriculum. These high-performing schools articulated a “culture of data use and mindset of student growth.” By contrast, low-performing schools focused on students’ behavior rather than their academic growth.

School learning teams also differed in performance. High-performing schools emphasized collaboration among school leaders and teachers. Teams met regularly to discuss and plan specific goals. Low VA/low attainment schools did not demonstrate this level of team cohesion or focus. Some meetings did not include an agenda or lacked discussion of data or improvement planning.

Kraemer and Geraghty found that a school’s perception of its productivity shapes how it plans (or doesn’t plan) for performance management. High VA/high attaining schools demonstrate that it’s possible to grow high-attaining students every year. Conversely, high VA/low attaining schools serve as examples that all students can learn, regardless of their starting point.

### The evolution of performance management in MPS

This study demonstrated that human factors and ergonomics may be a viable approach to the evolution of performance management at the school level.

First, schools should adapt or develop team-based organizational models for a learning-team approach to performance management. Those models should account for the realities and constraints of teachers’ workload, their task/teaching composition, and training development. Developing organizational and job design methods for teachers and school leaders can help reconcile mismatches between teacher job design and collaborative, team-based approaches for school improvement.

Second, in some circumstances, school leadership practices may benefit from adopting a top-down, macroergonomic approach and systematizing school functions across the organization.

Third, a human factors approach to communicating productivity metrics, such as value added, may assist in the accurate recognition of school performance. For example, parents and administrators can make comparisons across schools in networks with similar student characteristics, but which differ on productivity scores. The value added/attainment comparison metric can help differentiate school performance and provide support to schools based on their performance needs.



Reference: Kraemer, S., Geraghty, E., Lindsey, D., & Raven, C. (2010). School leadership view of human and organizational factors in performance management: A comparative analysis of high- and low-performing schools. In Human Factors and Ergonomics Society (Ed.), *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (pp. 1287-1291). San Francisco, CA: Human Factors and Ergonomics Society.

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*“What we care about is less whether students have passed point X in their development than what they are capable of doing next. We care about what they are capable of doing in a world where they have to solve complex problems with collaborators and technologies, not whether they remember the relative sizes of two species of mammals.”*

*—James Gee and David Williamson Shaffer*

In a recent paper, Shaffer and Arizona State University colleague James Gee suggest that educators should take a cue from computer games. Computer games are designed to measure player performance and progress. Students play these games because they enjoy solving problems the games present. Well designed games provide kids a good mix of practice and guidance.

Games don't just “have good assessments built into them; games are nothing BUT good assessment,” says Gee. “The player is always being tested, given feedback, and challenged to get better.”

Shaffer adds, “Good game design starts with the question: How will the player be tested? The design follows from that: How can we help the player pass the test?”

Part of the problem is that schools still consider learning and assessment two separate activities. A teacher teaches for weeks and months, but the assessment is made on one day. The single-day event captures only a snapshot of what a student can do, not what a student will probably be able to achieve in the future.

Gee and Shaffer propose a new kind of assessment. They call it a GATE: a Good Assessment for Twentyfirstcentury Education.

## Computer Games and the Future of Assessment

Some school curricula have managed to keep pace with new developments in technology by incorporating games, interactive exercises, and multimedia. Yet testing and assessment lags far behind. The disconnect between how students are taught and how they are assessed grows wider by the year.

UW-Madison education professor David Williamson Shaffer argues that assessments need to be rethought and redesigned to evaluate not just what students know, but what they can do when faced with real problems. “We only need to change three things about current assessments,” Shaffer says: “What is assessed, how the assessment takes place, and the purpose of assessment in the first place.” In other words, just about everything.

### GAMES as Assessments

The game *Urban Science* provides an example of how to use games as 21<sup>st</sup>-Century assessments. In *Urban Science*, students collaborate as city planners. In one segment, they create proposals for development of the north side of a Midwestern city adjacent to a large wetland. They address a number of economic and ecological problems in wetland ecology and conservation. Students investigate, analyze, understand, and communicate about scientific issues including local species, their life cycle, their habitat, and the role of wetlands in the local system.

To be successful, game players must develop and use skills and knowledge from State standards for environmental science. Students learn and use concepts in ecology, include system thinking and sustainability. They learn to value civic thinking and to use scientific understanding to

develop innovative solutions to real problems the city faces. They solve complex problems using the mathematics, communications, and science skills of urban planners.

Shaffer says games like *Urban Science* assess whether students are learning anything useful in their classes. Analyses of student performance measure how much a student learned to think like a city planner. Teachers see the path of students' development in the game over time. Educators quantify one of the most elusive concepts in education, Opportunity to Learn, by looking at how players do in the game compared to the context in which they were being tested.

For more about this and related projects see  
[www.epistemicgames.org](http://www.epistemicgames.org)

## ABOUT NEW ASSESSMENTS

Gee and Shaffer say we need new assessments that:

1. change what we test, by focusing on complex problem solving, collaboration, innovation, production, and design
2. change how the assessment takes place, by tracking many different kinds of information about a student, over time, and by integrating assessment with learning; and
3. change the purpose of assessment from sorting students and punishing “underperforming” teachers and schools to giving information to students, administrators, parents, and teachers. This information will support learning and will recognize that different students have different opportunities for learning inside school and out.

A GATE would set up challenges in a specific academic domain (like algebra, civics, or biology) or in a real-world profession (like medicine, engineering, or law)—any place that requires solving complex real-world problems. Solving these challenges calls for innovation, collaboration, critical thinking, system thinking, technical skills, and producing with digital media. In other words, a GATE would test whether students make the kind of choices that experts do in their professions: collaborating to solve complex problems of innovation, production, and design.

Gee and Shaffer argue that well-designed computer games can be prime examples of a GATE. Games can collect large volumes of information on student behavior as they solve problems, and organize that information in real time.

The result of using games to assess would be to drive teaching and learning towards mastery of 21<sup>st</sup>-Century thinking rather than basic facts and skills. “Rather than pushing games for learning,” says Shaffer, “we should be building games for assessment. We know that schools teach to the test. If the test is a game that requires solving real problems through innovative and collaborative thinking, then the incentives would be to teach students to work creatively, and to produce and design solutions to complex situations.”



Gee



Williamson  
Shaffer

## Improving Community College Success

Many students who enter community colleges do not persist for longer than a semester, complete a program, or attain a credential. To understand why, UW-Madison education professor Sara Goldrick-Rab examined academic research and policy research and determined that community college students face challenges at three levels:

1. students’ macro-level opportunity structure,
2. college’s institutional practices, and
3. the social, economic, and academic attributes students bring to college.

Factors operating at each level affect student success at the initial transition to college, during the experience of remedial education, and throughout students’ persistence through credit-bearing coursework.

Goldrick-Rab says improving student success in public 2-year community colleges will require reforms directed at all these levels and cannot be achieved with either student- or institution-focused incentives alone.

### Students’ goals and preparation

Ninety percent of high school students say they expect to attend college, even if their career choice doesn’t require it. Compared with 12<sup>th</sup> graders in the 1970s, 12<sup>th</sup> graders in 2000 were twice as likely to anticipate earning a bachelor’s degree. Rates of long-term expectations for earning bachelor’s degrees are similarly high among entering community college students, with 70% expecting to earn a bachelor’s degree or higher.

Relative to other undergraduates, students attending the nation’s 2-year public colleges come from a wide range of family backgrounds. For example

- 40% of undergraduates enrolled at community colleges in 2008 were non-White, compared with 33% at 4-year public colleges;
- 38% of community college students came from families where neither parent was educated beyond high school, compared with 25% at 4-year public colleges; and
- 56% were women, compared with 53% at 4-year public colleges.
- Fully 58% of African American undergraduates and 66% of Hispanic undergraduates are enrolled in community colleges.
- Today it is harder than ever for the poorest adults to afford community college, and to find support if they do enroll.

Prior academic success is not a prerequisite for admission to community colleges. The practical result is that 61% of these students must take at least one non-credit remedial course. Twenty-five percent take two or more non-credit remedial courses. Community college instructors must take on the difficult but necessary task of meeting students where they are, and helping to move them to the next academic level.

Many community college students get stuck early in their trajectories. Student progress through community college is generally slow. After 3 years, only 16% of first-time community college students who began college in 2003 had attained any kind of credential. Another 40% were still enrolled.

When students are given 6 years, completion rates improve a little. For example, 36% of students entering community colleges in 1995 had attained a credential by 2001. Another 17.5% were still enrolled. Goldrick-Rab says this indicates that completion rates need to account for the pace of progress toward completion. At the same time, students' noncompletion rate (no degree, not enrolled) hovers very close to 50%—even when allowed more time.

But Goldrick-Rab advocates moving beyond the excuse that “community colleges serve more students from low socioeconomic backgrounds who are less likely to complete college.” Instead, she promotes discussing the underlying reasons why such a relationship exists and increasing the potential for action on those underlying inequalities.

### Challenges and opportunities

Because most campuses serve a primarily local population, competition among colleges is limited. Students usually lack information about the relative quality of their local college.

Among the mix of federal funds and programs dedicated to the community college sector, very few aim to improve institutional performance.

Given limited resources available for instructional costs, community colleges rely heavily on part-time adjunct lecturers who often teach multiple courses at multiple colleges and receive low wages and no benefits.

Despite widespread interest in using data to inform decision making, it's difficult to integrate findings from institutional research into daily practice. Many community colleges lack sufficient numbers of trained researchers to use student-level data and organize it for instructional planning.

The quantity and quality of college financing information that families receive differs by social class. Why is it that economically advantaged students learn about college and how to pay for it from a variety of sources, whereas poor students often have to rely on their high school counselors?

Continuous, full-time enrollment is the optimal scenario for degree completion. However, that's impossible for many community college students, who need to work part time or even full time. Only 31% of community college students enroll full time, and 26% enroll less than half time.



### Discussion and conclusions

Educators often attribute poor completion rates to the numerous ‘deficiencies’ students bring to community college. But Goldrick-Rab's says it's important to consider the policies affecting the capacity of community colleges to serve students.

Which policies and practices represent the most promising areas for reform? Much of the best evidence on potential reform is new, and it is scarce. Understanding what works, and why, requires improved data quality. But relatively few national longitudinal surveys include sizeable samples of 2-year college students. Only a handful of state data systems allow researchers to track students into higher education and among 2- and 4-year colleges.

Goldrick-Rab says policymakers and educators need a much more rigorous research agenda, focused on community college students, to inform and evaluate future actions. Goldrick-Rab says the best research on community colleges will be interdisciplinary and it will use quantitative and qualitative methods.

Measurement of student success should account for the structural and institutional constraints that colleges face. Institutional practices deserving more careful analysis include learning communities, first-year support service programs, and adult literacy programs.

“We still know far too little about what works,” she says, “but the evidence indicates a need for a multifaceted approach; one that's flexible enough to accommodate the variety of student needs, and that's ambitious enough to create meaningful change.”



Adapted from the article, “Challenges and Opportunities for Improving Community College Student Success.” In *Review of Educational Research*, September 2010, Vol. 80, No. 3, pp. 437-469.

**Sara Goldrick-Rab**



# What Matters in Mentoring

It has always been important for young people to have mentors. Some mentors guide us through our personal lives; others help prepare us for our careers.

A new research project is bridging theory, research, and practice to mentoring college-level biology students. This work builds on years of collaboration by UW-Madison biologist Christine Pfund and physiologist Janet Branchaw. They're now joined by psychologist Angela Byars-Winston, who is Principal Investigator for a new project that measures how training research mentors in biology affects their students' career development.

A mentored research experience for undergraduates aims to increase students' interest, motivation, and preparedness for their careers. Benefits of mentored experiences include improved research skills, better preparation for post-graduate education, and increased productivity.

It's known that students from racial and ethnic groups, and White women, are especially at risk for inadequate mentoring relationships. But relatively little is known about specific factors in a research mentoring relationship that create positive experiences. Unfortunately, research mentors seldom receive training on the mentoring process and are sometimes ill-equipped to assume mentoring roles. Often, the techniques designed to improve mentoring lack a sound base in theory: They don't employ the extensive research literature on teaching and learning, or the psychology of career development. Mentoring programs are often based on anecdotal evidence and unsubstantiated strategies.

That's about to be remedied, thanks to this new collaboration. The team uses social cognitive career theory to explore students' research-related self-efficacy beliefs and their career expectations. Long-term research outcomes should include an increased and diversified number of students who pursue science careers.

## Specific aims for this research

- 1.** Establish the psychometric properties of research mentor and mentee surveys used to evaluate the Wisconsin Mentoring Seminar (*Entering Mentoring*) and establish evidence for their construct validity and reliability. Working hypothesis: The research team can produce measures with sufficient estimates of reliability and validity to support the subsequent hypothesis-testing phase of the project.
- 2.** Identify critical elements in research mentoring relationships associated with student cognitive and behavioral outcomes. Working hypothesis: Once quantified, sources of efficacy in the research mentoring relationship will predict students' research-related self-efficacy beliefs and their expectations for success.
- 3.** Modify the Wisconsin Mentoring Seminar accordingly. Test the effectiveness of the adapted mentor training program on student outcomes. Working hypothesis: A research mentor training intervention that addresses empirically-identified critical elements will enhance students' interests, intentions, and subsequent academic behaviors consistent with pursuit of a research career in science.



## The Leadership Team

Angela Byars-Winston is a counseling psychologist in the UW-Madison School of Medicine and Public Health. She studies students' academic and career development in life sciences, engineering, and medicine. Her social cognitive perspective emphasizes cultural influences for women and racial and ethnic minority students.



Christine Pfund is a cell and molecular biologist. For years she has helped lead the UW-Madison Delta Program in Research, Teaching, and Learning. Delta, a member of the Center for Research, Teaching, and Learning (CIRTL) Network, prepares graduate students, post-doctoral researchers, and current faculty to meet the challenges of national science, technology, engineering and math (STEM) higher education.



Physiologist Janet Branchaw is Director of Undergraduate Research Programs at the UW-Madison Institute for Cross-College Biology Education. The Institute provides infrastructure, leadership, and a forum for consultation to achieve the best possible biology education for university students, for K-12 students, and for informal learners of all ages. Branchaw and Byars-Winston recently completed a project hosted in WCER to adapt the Wisconsin Mentoring Seminar to use across STEM ([www.researchmentortraining.org](http://www.researchmentortraining.org))

## ABOUT THIS STUDY

This study employs a quasi-experimental research design to test the effectiveness of research mentor training on increasing positive outcomes for mentees. It compares treatment groups (trained mentors) and control groups (untrained mentors). The study uses a data set of more than 700 participants. Approaches are theoretically grounded and methodologically rigorous, and they should provide immediate translation of research findings into practical applications for mentor training interventions.

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