Members of the education research community are all too familiar with debates about the value of various research methods. Politicians and researchers alike have vested interests in different methods. Some argue that randomized field trials are the best method in nearly every circumstance. But others argue that comprehensive case studies offer value as well. Mixes of qualitative and quantitative methods can be ideal, depending on circumstances.

Let's take a particular example. Children's development in a mathematics classroom can be measured by tests, of course. But much of what goes on in the classroom is not captured and not evaluated by tests. Capturing and analyzing classroom discussion and student/teacher interactions reveals vital information about teaching and learning. Researchers capture this information via audio and video recording. Video analysis is useful not only for research, but it can be a powerful tool for professional development when teachers watch videos of their own teaching.

Videotape has been used as a research tool for some time, but with the advent of digital technology, researchers who analyze recorded classroom interactions no longer have to work with bulky tape cartridges and suffer through the time-consuming process of rewinding and fast forwarding.

Qualitative data analysis software is nothing new. nVivo and NUD*IST have been around for a long time. They’re used by sociologists, market researchers, lawyers, and psychologists, among others, to manage and analyze textual data. But these tools don’t incorporate video data.

(continued on next page...)

Most public school districts use a uniform salary schedule to determine teacher compensation, but alternatives systems like merit pay and performance-based pay are attracting more attention. In a recent Policy Brief, Debbi Harris examines ways that several different compensation systems are likely to affect teacher behavior and student learning.

Over the past 15 years WCER’s Consortium for Policy Research in Education (CPRE) has worked to identify effective allocation of education funds and to best align them with powerful school-based strategies to improve student learning. In this issue of Research Highlights is the second of a four-part series where you’ll read about school finance adequacy; reallocating funds at the school level and by educational strategy; and using resources to greatly improve student performance.

Researchers studying classroom teaching in any grade level or content area have more sophisticated ways to evaluate classroom teaching, thanks to new technologies in digital video analysis. The Transana program, developed at WCER, gives researchers sophisticated tools for detailed video analysis and markup. As a result, videotaped classroom interactions become more useful in preservice training and inservice professional development.

Transana, developed at WCER by David Woods, Chris Fassnacht, and colleagues, is software that lets researchers easily transcribe and analyze digital video of classroom interactions. Researchers can select and categorize analytically important segments of video from large video collections, and they can add analytic codes to the video for fast, flexible retrieval. They can also produce a variety of analytic maps, graphs, and reports to help them gain insight into what this incredibly rich and dense data source has to show.

For example, researchers at WCER use Transana to watch the development of students’ growth in mathematical reasoning over the course of a couple semesters in a classroom. Pam Asquith, Suyeon Kim, and colleagues code and notate classroom interactions, noting students’ and teachers’ physical gestures as they talk. Conversations are analyzed in terms of who poses a question, the quality of the student’s response, follow-up discussion, and teachers’ scaffolding. Transana is particularly well suited for studying the gestures of students and teachers, says Pam Asquith of WCER’s project, Understanding and Cultivating the Transition from Arithmetic to Algebraic Reasoning http://labweb.education.wisc.edu/knuth/taar/. Gesture analysis is prominent in psychology, she says, and Transana helps her team measure the growth of students’ reasoning in mathematics classrooms.

Much of what goes on in the classroom is not captured and not evaluated by tests. Capturing and analyzing classroom discussion and student/teacher interactions reveals vital information about teaching and learning.
When Suyeon Kim highlights a line of text in the transcript, the corresponding video segment automatically plays in an adjoining window. She measures the length of pauses in the conversation. She codes teacher-student interactions according to the degree of student-centeredness and the degree to which they perpetuate discourse. For example, she codes a conversational segment with IRE to indicate teacher Initiation, student Response, and teacher Evaluation. The code IRF means teacher Initiation, student Response, and then Follow-up questions with probing. The code IDE means student or teacher Initiation, student Demonstration, followed by student or teacher Evaluation.

Transana has been downloaded by researchers the world wide, more than 45,000 times. And until very recently Transana was available for free download. But expenses of maintaining and updating the software have made it necessary to charge $50 for the single-user version. Transana’s lead developer David Woods says he wasn’t happy about having to charge, but it’s a necessary step. He explains that funds available through targeted development, donations, and grants were no longer adequate to ensure Transana’s ongoing development, “So we chose to start charging rather than to reduce the amount of time being devoted to developing and supporting the program.”

Because Transana is open-source, users can download the program’s full source code and customize it to meet their own needs, and are encouraged to share their program changes with all Transana users by submitting their changes to the development team. Users who desire custom built extensions but lack the necessary programming skills can also help fund Transana’s ongoing development to have them built by Woods and his colleagues.

For more information visit the Transana site at www.transana.org

Figure 1 Transana Website screen capture of Transana software, developed at WCER by David Woods, Chris Fassnacht and colleague
Alternative Teacher Compensation Approaches: Promises and Pitfalls

About 95% of public school districts use a uniform salary schedule. But merit pay and performance-based pay programs are attracting the attention of policymakers and educators across the nation.1 Critics of traditional compensation systems and newer alternatives point out the strengths of the system they support, but the limitations of individual systems are frequently misunderstood or unrecognized. To improve the viability of a new plan, WCER Fellow Debbi Harris suggests that policymakers and stakeholders conduct extensive analyses before implementation. In a recent Policy Brief2 Harris examines ways that different compensation systems are likely to affect teacher behavior and student learning.

Three kinds of teacher compensation systems are common: the uniform salary schedule used in most districts, performance-based systems, and outcome-based systems.

Systems similar to the uniform salary schedule are typical in unionized professions, where hours worked and years of service primarily influence compensation rates.

Performance-based systems (also known as behavior-based systems) tie some portion of salary to observable teacher behavior, such as demonstration of a specific pedagogical technique. Outcome-based systems (also known as pay for performance) link compensation to student performance, such as test scores and attendance.

The uniform salary schedule
Under the uniform salary schedule, teachers can take pedagogical risks without facing corresponding financial risks. Teachers generally believe that the uniform salary schedule is objective. The uniform salary schedule requires minimal monitoring. It is easy to determine a teacher’s years of experience, particularly when a teacher remains in the same school for many years. When teachers apply for salary credit based on coursework they can be required to submit a certified transcript. Districts can predict anticipated teacher outlays with a high degree of accuracy (unless union negotiations force an unexpected change in the salary schedule).

But the uniform salary schedule provides no financial incentive for teachers to work hard. Salary depends on experience and education; performance is not a factor. High-quality teachers may feel unappreciated and unrewarded because they know that low performers in their district receive the same compensation.

The uniform schedule does not necessarily attract the best candidates into teaching. Many bright and talented young students choose careers in business and other professions that pay a premium. The commonly rewarded characteristics—experience and attainment of advanced degrees—are not necessarily the characteristics of high-quality teachers.

Merit pay systems
The two most common forms of merit pay systems each have unique advantages and disadvantages. Performance-based systems reward teachers for what they do, and outcome-based systems reward teachers for student performance.

Both performance-based and outcome-based systems provide financial incentives to improve skills that affect
Once a district or state has identified goals and considered the feasibility of using financial incentives to reach those goals, policymakers need to design a compensation system tailored to their context.

student learning, rather than to the acquisition of advanced degrees. Performance- and outcome-based systems also may encourage desirable candidates to enter and remain in teaching. Highly talented candidates and teachers want to teach in systems that provide additional pay for their superior performance. Compensation systems that tie pay to performance may also enjoy political support: Taxpayers and legislators may be more willing to approve school funding increases if they know that the money will be used to reward high-performing teachers.

While innovative compensation systems may offer advantages, they also require sustained political and financial support from policymakers. Unfortunately, policymakers have rarely demonstrated such commitment, and political support is frequently not sustained. And for merit pay to improve the quality of teaching, either poor-quality teachers must leave the profession and be replaced by higher quality teachers, or existing teachers must improve. Well-designed merit pay systems are often complex. Since the parameters vary from plan to plan, even teachers who have worked under merit pay may have difficulty understanding a new program. And although compensation policy assumes that money strongly motivates employee performance, money may play a smaller role in motivating teacher behavior than in other professions.

Performance (behavior)-based systems
Whatever the means of assessment, the focus of performance-based compensation is always on the teacher, not the students. This assumes that, as teacher performance changes, student learning will increase. Performance-based compensation provides a financial incentive for teachers to improve their teaching skills. Such a system may be particularly motivating for teachers whose evaluations are close to the thresholds for additional pay. Another advantage is that differential teacher performance is rewarded without regard to such confounding influences as student background, which complicate systems based on student performance.

However, it can be difficult to connect measurable behaviors to quality teaching. By one estimate, only about 3% of a teacher’s contribution to student achievement can be explained by skills that are easy to measure. The remaining 97% is attributable to qualities such as enthusiasm, which are not measurable, and for which good proxies are not available. No single teaching style or skill set is clearly superior: Some constructivist teachers do a marvelous job and so do some traditional teachers. One way out of this dilemma would be to reward performance based on some criteria other than specific classroom practices.

Outcome-based systems
Teacher compensation systems that focus on student outcomes emphasize results, rather than teacher behavior. A focus on student outcomes allows teachers to use their professional expertise to decide the best way to reach particular students. Another advantage is that outcome-based systems encourage teachers to seek assistance in weak areas: Teachers can openly discuss their shortcomings and work with colleagues and administrators on improving, since doing so will make receiving incentive pay more likely. Political benefits may also result, as holding teachers responsible for student learning makes sense to the public.

Past outcome-based pay plans have often assessed teachers based on students’ absolute test scores, rather than on amount of improvement. A teacher whose students have gained 20 points, but remain below some cutoff, could be rated and rewarded more highly than a teacher whose students have gained only five points but scored over the threshold. And although students in low-income communities desperately need top-notch teachers, who tend to be effective for both high- and low-achieving students, outcome-based compensation systems have encouraged some of the best teachers to transfer to affluent schools where they are more likely to receive achievement bonuses.

Some school districts have turned to value-added achievement measures, an increasingly popular strategy. Value-added measures attempt to isolate individual teachers’ contributions to student learning (for more, see WCER’s Value Added Research Center Web site at http://www.wcer.wisc.edu/varc/).

Individual and group reward systems
Individual reward systems encourage high performers to remain in teaching and they provide low performers with a strong incentive to leave. On the negative side, individual financial rewards for student performance do nothing to encourage teachers to help colleagues or to perform tasks like hall duty that help the school function smoothly yet provide few individual benefits.

Group-based rewards recognize the collaborative nature of any school’s effectiveness and reward teachers for their collective effort. Group-based systems are generally less costly to administer than their individual-based counterparts. However, it’s difficult to screen out effects of the district, prior schools, parents, and the community.

Relative ranking systems, or tournament systems, offer rewards based on how one teacher compares to all the others in the system. Teachers are told what percentage of top performers will receive rewards prior to the beginning of the measurement period. Relative ranking allows the district to determine the amount of incentive pay to be rewarded. The district sets the cutoff in the rankings so that it matches available funds. The main problem with relative rankings is that they discourage cooperative behavior among coworkers.
Over the past 15 years, WCER’s Consortium for Policy Research in Education (CPRE) has worked to find better ways to allocate education funds and to link them to powerful school-based strategies to boost student learning. This is the second of a four-part series covering highlights from CPRE research. This article covers reallocating dollars at the school level and by educational strategy; documenting best practices in school finance adequacy; and using resources to double student performance.

Reallocating school-level funds

The U.S. education system educates only about one-third of the nation’s students to a rigorous proficiency standard. Improving education productivity must be placed onto the policy agenda and the practice agenda, says UW-Madison education professor and CPRE director Allan Odden. The goal of teaching all, or nearly all, students to high standards will require doubling student academic achievement.

But it’s unlikely that education funding will correspondingly increase, Odden says. To accomplish this goal, schools will need to adopt more powerful educational strategies and, in the process, reallocate funds. CPRE research found many examples of schools that reallocated their resources to improve student performance. From that research CPRE created a dozen case studies of schools—urban, suburban, and rural—that had reallocated resources to use teachers, time, and funds more productively.

Dissatisfied with their students’ performance, these schools redesigned their entire education programs. By reallocating resources and restructuring they transformed themselves into more productive educational organizations. They tended to spend more time on core academic subjects and they often provided lower class sizes for those subjects. They invested more in teacher professional development and provided more...
Toward school finance adequacy

Allan Odden and colleague Larry Picus studied and documented best practices in the major dimensions of schools that have cost implications – school size, class size, core instruction, specialist instruction, extra help for struggling students, professional development, and administration. They identified a level of ‘adequate’ resources for each school in a state; then they determined an ‘adequate’ resource level for each district in the state by combining school resources with district-level operations and maintenance, transportation, food services and central administration.

CPRE’s evidence-based approach to school finance adequacy has been used for state-sponsored adequacy studies in Kentucky, Arkansas, Arizona, Wyoming, Washington, and Wisconsin. Of the major states that have redesigned school finance structures to reflect adequacy, two (Arkansas and Wyoming) used the evidence-based approach as the basis for their changes. The results of adequacy studies were then incorporated into newly designed school finance formulas.

CPRE research into school finance adequacy has
• identified the overall levels of resources for public schools, changes over time, and general uses, by function;
• created two detailed expenditure reporting structures: one for identifying extant professional development investments; the other for showing how resources are used at the school level, by educational strategy;
• used this reporting structure to help identify the cost of several ‘comprehensive’ or ‘whole-school’ designs;
• developed an evidence-based approach to school finance adequacy, and
• implemented a new reporting framework to identify how resources from an adequacy reform were used by educational strategy at the school level.

More bang for the buck

CPRE studies of Wisconsin and Washington State found successful schools that had linked resource use to their instructional improvement strategies, leading to high levels of student performance with only modest additional funds. Many schools had dramatically improved student performance, primarily on state tests. They followed a similar set of steps in their doubling performance strategies. The schools
• set high goals, many times trying to educate 90 to 95% of students to proficiency levels, and a significant portion to advanced achievement levels;
• analyzed student data to learn more about the status of student performance and the nature of the achievement gap;
• reviewed evidence on good instruction and effective curriculum and developed a new instructional program for the school that was more rigorous and often research-based;
• invested heavily in teacher training, which included intensive 1- to 2-week summer institutes, longer teacher work years, resources for trainers and, most important, placing instructional coaches in each school;
• used state, local, and federal Title I funds to provide extra help for struggling students, including tutoring, extended day academic help programs, summer school, and English language development for all ELL students;
• created smaller classes in early elementary years and often lowered class sizes in grades K-3 to 15, citing research from randomized trials;
• used time more productively. They often allocated more time for core subjects and protected classes from interruptions during core class periods. Secondary schools offered double class periods in subjects where students struggled to achieve to standards;
• created ‘professional school communities’ in which teachers collaborated on the instructional program and in formative assessments analyses; and
• used programs, strategies, and resources in amounts that can be funded with the national average expenditure per pupil.

With the current revenues in the nation’s education system, Odden says, schools should be able to dramatically increase student academic performance through school restructuring and resource reallocation, at least in some subject areas, and at some grade levels.

The third installment of this series will cover use of dollars after a school finance reform, pricing adequacy recommendations and enhancing teacher compensation, and school-based budgeting or the weighted student formula.

The complete CPRE report is available online:
http://www.wcer.wisc.edu/cpre/publications/newpublications.php

Allan Odden

Defining Adequacy

As mentioned in Part 1 of this series, the term ‘adequacy’ may seem to narrowly focus on the amount of money needed to produce a desired level of student achievement. But the more general intent underlying the focus on adequacy is to redesign the education finance system to link resource levels, and to link resource use more directly to strategies that improve student achievement.
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