Desegregating schools has long been considered a matter of equity, justice, and improved student achievement.

But there is still a lot to learn about exactly how having diverse classrooms improves student achievement. For example, do student peer groups affect individual achievement?

Yes, peer effects are important determinants of student achievement, but it remains difficult to calculate the actual effects of desegregation directly. WCER researcher Jane Cooley uses a new approach to identify the effect of peer behavior on individual student achievement.

Cooley finds that peer group effects are stronger within race than across races. At the same time, lower-achieving students benefit relatively more than higher achievers from increases in average peer achievement. In other words, the within-race effects diminish across the range of student achievement.

Previous studies have not determined the effects from contemporaneous achievement of peers of the same race. But Cooley finds that these effects play a central role in determining the achievement benefits associated with creating racially diverse classrooms.
FROM THE DIRECTOR
This issue of Research Highlights reinforces the interdisciplinary nature of the research one finds here at the Center.

Researcher Eric Osthoff discusses a collaboration between the NSF-funded SCALE Math and Science Partnership and the Los Angeles Unified School District to develop a reform science curriculum that immerses teachers and students in the full cycle of science inquiry.

In a study of public elementary schools in North Carolina, researcher Jane Cooley uses a new approach to identify the effects of peer group behavior on individual student achievement. She measures specific effects of desegregation by separating the effects of teacher quality from those of student peer group composition.

Sharon Derry and colleagues discuss the challenges faced by researchers who use video and who want to improve the design of formal and informal learning environments, including planning a study, shooting footage, choosing clips for analysis, developing final products for presentation, and archiving and curating video and related products.

Richard Halverson and colleagues helped produce a guide for the U.S. Department of Education called “Using student achievement data to support instructional decision making.” This practice guide shows how to adapt lessons or assignments in response to students’ needs, how to alter classroom goals, and how to modify student grouping arrangements.

Cooley’s study found a lack of cross-racial effects. Such a lack would limit the benefits of desegregation. For example, nonwhites would experience gains in achievement if grouped with higher achieving nonwhite peers on average, and whites would experience losses if grouped with lower-achieving white peers on average. Furthermore, given that lower-achieving students benefit relatively more than higher-achieving students, we might expect efficiency gains in terms of increases in average achievement, to the extent that desegregation also creates more mixed-ability classrooms.

A higher concentration of nonwhites is negatively correlated with achievement. This suggests that creating more diverse peer groups would raise nonwhite achievement while having little effect on white achievement.

Cooley’s findings suggest that previous studies have severely understated the effects of peers. That’s because those studies have overlooked behavioral effects derived through contemporaneous achievement gains.

Over the past 5 years the Los Angeles Unified School District has worked to improve student achievement in math and science by collaborating with the NSF-funded SCALE Math and Science Partnership, which makes its home at WCER.

The district has helped researchers develop a reform science curriculum which consists of ‘immersion units.’ These curriculum units immerse teachers and students in the full cycle of science inquiry: posing scientific questions, giving priority to evidence, connecting evidence-based explanations to scientific knowledge, and communicating and justifying explanations. An accompanying teacher professional development (PD) program engages teachers in the immersion unit as both teachers and learners.

Among the project’s strengths have been a cadre of science experts who are committed to the curriculum. They distribute instructional materials, design and deliver PD, provide technical assistance and coaching to teachers, and keep principals informed about district science activities.

Teacher PD institutes use a “train the trainer” model. Science lead teachers learn the immersion unit, then share the unit and the approach with colleagues with support from a district science expert. Human resources (attitudes and commitments to science teaching) are leveraged to create social resources (collaboration and a collective focus on student learning). As a result, groups of educators become professional communities.

ABOUT THE SCALE MSP

SCALE is a national network of more than 50 working groups of educators and researchers focused on improving mathematics and science teaching and learning at all levels. The project aims to make it the norm that every student, every year, will experience high-quality teaching of core mathematics and science concepts. This 5-year Math and Science Partnership (MSP) includes three major urban school districts and three universities. It includes mathematicians, scientists, engineers and education practitioners.

Students at all grade levels are engaged in deep and authentic science and mathematics instructional experiences. Simultaneously, the partnership seeks to improve pre-service and in-service mathematics and science professional learning. Finally, the partnership seeks to improve models of collaboration among K-12 and post-secondary institutions in ways that more fully integrate engineering, mathematics and science faculty.

The SCALE MSP began in 2002, with an original NSF funding commitment of $36 million over 5 years. The reform sought to address teacher pre-service as well as in-service development through collaboration between university curriculum and PD designers and research and evaluation specialists; university science and science education faculty; K-12 administrators and instructional support specialists; and K-12 teachers.

District and School Contexts for System-wide Science Reform
Designing and delivering curriculum and PD requires collaboration across organizational boundaries and across role groups. This collaboration has helped the district align curricular materials with content standards, ensured that immersion units and PD met scientists’ criteria for accurate and important science content, and incorporated classroom teachers’ ideas on adapting units and instructional strategies to students’ learning needs and styles.

Four themes emerged during interviews with SCALE staff, teachers and administrators.

First, powerful factors in the district have limited the extent to which educators at all levels emphasized science versus other core academic subjects. State accountability policies have shaped local instructional priorities by focusing heavily on mathematics, reading, and language arts.

Second, federal and state accountability policies ranked math and language arts higher than science. Educators pointed to federal rules that weight language arts and math more heavily in determining whether schools and districts are making Adequate Yearly Progress. This has limited the implementation of science instructional reforms.

Third, some interviewees believed language arts and math were foundational to success in other subjects such as science. They believed it was prudent to give more attention and resources to language arts and math until students showed proficiency in such “basic” subjects.

Fourth, the same policies that prioritized language arts and math over science also prioritized science over other subjects. In fact, even as interviewees described the low status of science relative to language arts and math, they said science still had higher priority than social studies and history.

Challenges to further success

A recent change in district instructional priorities has begun to work against long-term prospects for immersion science there, as well as the prominence of the SCALE PD model. Just prior to the 2007-08 school year the district shifted its science reform strategy by adopting the Full Option Science System (FOSS) curriculum for all elementary grades. The district continued to encourage teachers who wanted to implement SCALE immersion units to do so, yet support of the FOSS curriculum rollout sent strong signals to educators that FOSS would become the heart of elementary science instruction.

In addition, the national economic recession has pummeled California with decreased state revenues and budget shortfalls that are passed on to school districts and other local entities. At the time of this writing, LAUSD was considering laying off up to 8,500 employees, increasing class sizes, and cutting programs.


Eric Osthoff
Among the guide’s recommendations:

1. Make data part of an ongoing cycle of instructional improvement.

   Adopt a systematic process for using data to bring evidence to bear on teachers’ instructional decisions and to better meet students’ learning needs. Using data cyclically to improve instruction includes the following steps: Teachers should collect and prepare data about student learning from a variety of relevant sources. Teachers should next interpret the data and develop hypotheses about factors contributing to students’ performance and the specific actions they can take to meet students’ needs. Teachers then should test these hypotheses by implementing changes to their instructional practice. Finally, they should collect and interpret new student performance data to evaluate their own instructional changes.

2. Show students how to examine their own data and set learning goals.

   This process can motivate elementary and secondary students by mapping out accomplishments that are attainable, revealing achievement gains, and giving students a sense of control over their own outcomes.

3. Establish a clear vision for schoolwide data use.

   Schools should establish a strong culture of data use to ensure that data-based decisions are made frequently, consistently, and appropriately. A “data culture” emphasizes collaboration across and within grade levels and subject areas, to diagnose problems and refine educational practices. Planning, leadership, implementation, and attitude all affect the schools’ success with developing and maintaining a data culture.

4. Foster a data-driven culture.

   School and districts can ensure that teachers, principals, and staff understand their roles in using data. They can invest in leadership, professional development, and structured time for collaboration. They also may need to invest in relevant technologies and specialized staff.

5. Develop and maintain a districtwide data system.

   Districts should develop and maintain high quality data systems that enable all decision makers to access data quickly. A high quality data system also links disparate forms of data for analysis and reporting to a range of audiences. Districts and schools need financial and human resources to develop safeguards that ensure data are timely, relevant, and useful to educators.

(continued on page 7...)
Researchers Using Video Face Options & Challenges

Video technology is transforming research in the learning sciences.

Video provides rich records of student and teacher interactions: eye gaze, gesture, body posture and proximity, content of talk, tone of voice, facial expressions, and use of physical artifacts. Video also captures between-person processes such as the alignment and maintenance of joint attention.

Video technologies allow researchers to collect, share, study, present, and archive detailed cases of teachers’ practice. Video libraries support teaching, learning, and intensive study of those practices.

UW–Madison education professor Sharon Derry chaired a national task force of scholars in writing guidelines for researchers who use video and who want to better design formal and informal learning environments. Some findings from their work, funded by the National Science Foundation, recently appeared in *The Journal of the Learning Sciences*. Researchers face several challenges, including deciding which elements of a complex environment should be video recorded; which analytical frameworks and practices are available and appropriate; what technological tools are available and which must be developed; and how research protocols can encourage data sharing while protecting subjects’ privacy rights.

**Selecting Clips**

Selective emphasis shapes all phases of video research, determining which events are brought into focus for deeper analysis. The process involves (a) planning a study, (b) shooting original footage, (c) choosing one or more clips from a body of such footage, (d) focusing on the selected video appropriately, depending on research goals, (e) developing final products for presentation, and (f) archiving and curating video and related products.

Most research using video involves detailed analysis of selected clips. Researchers are often concerned with closely describing and accounting for the relative frequency of a type of event. Inductive approaches apply when a minimally edited video corpus is collected and/or investigated with broad questions in mind but without a strong orienting theory. A deductive approach is required when the researcher has a strong theory and clear research questions.

Researchers taking a narrative approach may work more or less deductively or inductively. Those with a strong theory or set of research questions may delineate the terrain in advance by designing interviews or protocols before stepping into the research setting.

The Trends in International Mathematics and Science Study (TIMMS) video project represents a way in which these two categories of selection overlap conceptually. The huge TIMMS video corpus has been used for professional development purposes and to support cross cultural studies of teaching. But “sampling representativeness” has been an overriding concern in selecting for both purposes.

**Analyzing the Results**

A discovery-oriented approach to video analysis aims to reveal unanticipated findings. A top-down approach, meanwhile, uses records to identify and code events determined before data collection. The task force guidelines suggest that researchers should focus first on theory-driven questions and develop concrete plans for a first pass through the video records. Having good questions helps maintain perspective and prevents the researcher from getting lost in detail.

At the same time, the researcher should anticipate new discoveries and be ready to articulate questions that can be refined and tested during multiple passes through the data. An explicit multistage analysis can strengthen the likelihood of generating findings that are reliable and valid.
In the early stages of analysis it can help to share a video segment with a group of other researchers to gather multiple interpretations of the events, to specify dimensions for analysis, and to brainstorm potential issues to investigate further.

**Sharing Data**

Technologies for sharing and reporting video research include tools for analysis, tools for supporting case development and sharing, models for sharing video in reports of research, metadata schemas, collaboratories and virtual repositories, and practices addressing legal and ethical issues related to video sharing.

Unfortunately, most video technologies support only certain phases of the workflow. At least 10 different functions of video research are supported by different tools. That means researchers must investigate available tools and acquire or develop a toolkit that meets their budgets, that can be accessed or supported from their sites, that supports their research practices and goals, and that involves them in a supportive user community.

Researchers need to consider different ways to share and report video data together with print and other media. For example, a few minutes of a single-camera video record can be provided on a compact disc and included with a printed issue of a journal. Relevant video clips can be posted to, and accessed from, a website, and site visitors may add commentary. Sharing video data among learning scientists could help accelerate the growth of scientific understanding of learning and teaching. Multiple researchers could gain access to video data records that now tend to reside on the shelves, on DVDs, and on hard disks of individual researchers.

**Ethical concerns**

Confidentiality concerns arise whenever researchers collect or share recordings in which viewers may recognize individual subjects. Confidentiality can be protected by restricting access to the video and to personal information such as the names of the participants or the schools in which data were collected.

What parts of a video corpus should be a public resource and for what purposes are controversial questions. A major difficulty is that video data, once collected, might be used in multiple ways, and it may not be possible, at the time that a recording is made, to specify what these uses might be. Furthermore, often it is not known at the time of collection even who will be studying the data. As video data records travel further from the research project in which they were collected, the types of users and uses may expand in unpredictable ways. So it’s important to register extensive metadata on the contextual aspects of video data capture and attributions for subsequent citation and source tracing.

Today’s video researchers must strive to become adaptive experts with knowledge of the many issues covered in these guidelines, ranging from analysis to technology to ethics. But no one researcher can do it all. The very objects of video research must include programs of work that will create infrastructures allowing us to become an adaptive, distributed, collaborative, expert community.

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**WHAT’S A PRACTICE GUIDE?**

A practice guide lists specific recommendations that are actionable. Those recommendations taken together represent a coherent approach to a complex problem. Health care professionals, for example, use practice guides to assemble and communicate evidence-based advice for practitioners about specific clinical conditions. Each recommendation is explicitly connected to the level of evidence supporting it. Each is represented by a grade (strong, moderate, or low). See “Using Student Achievement Data to Support Instructional Decision Making.” Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance. (NCEE 2009-4067).

A word of caution: The panel report does not provide compelling evidence that these recommendations lead to improved student outcomes. The recommendations do, however, rest on panelists’ experience and research on how teachers and administrators can use data to make instructional decisions that raise student achievement.

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