



WCER Highlights

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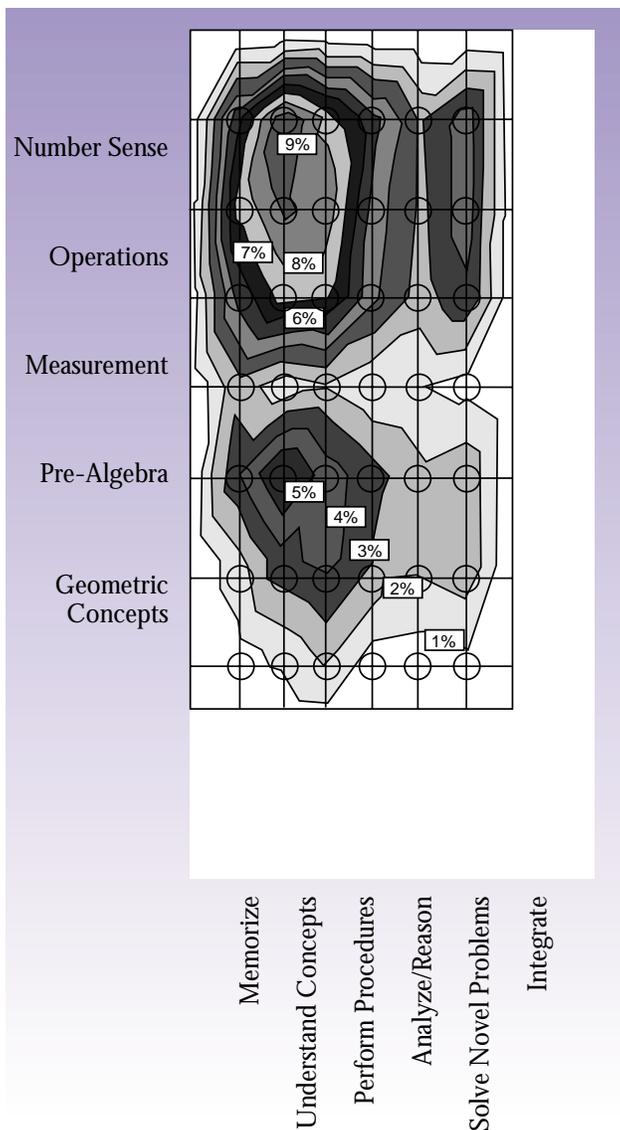
Surveys of the enacted curriculum

Standards-based reform may not yet have brought instruction into alignment with state tests, according to recent findings by WCER's Andrew Porter and John Smithson. Their recent study, reported at AERA's 2000 annual meeting, also found that mathematics instruction was slightly more aligned with NAEP (National Assessment of Educational Progress) standards than with state tests. In science, the opposite was true.

In science, the opposite was true.

Porter and Smithson reached their conclusions using an instrument they devised for states and districts to use in conducting formative and summative evaluations of standards-based reforms in math and science. Eleven states participated in the study, which was funded by the National Science Foundation through a subcontract with the Council of Chief State School Officers.

Teachers were asked to describe the degree of emphasis their instruction placed on each of many topics in mathematics and science over the past year. For each topic they taught, teachers also indicated the degree to which they emphasized one of several cognitive demands (for example, memorization, solving novel problems, performing procedures). Porter and Smithson also analyzed NAEP and state test content, item by item.



"Topographical maps" like this one can show content coverage, as reported by teachers.

WCER Highlights



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- 3 Minority scholars
- 4 Training programs enhance graduate experience
- 6 CPRE helps develop skill-based pay system

From the Director

Supporting graduate students

This issue of *Highlights* covers a variety of topics relating to improved education from the primary grades through graduate school.

The WCER-School of Education Research Training Program, for example, strengthens and supplements the training that graduate students ordinarily experience through their departments. The program benefits graduate students in the School of Education for whom research is a major element in their career plans.

WCER is proud of the support it offers graduate students. In a typical year, WCER supports more than 100 graduate students through project assistantships. These students work on a wide variety of education research and development projects, and they profit enormously from their work experiences. Typically, students publish jointly with their professors, and often they settle on their Ph.D. projects based on the work they are doing in WCER. Without WCER support, they wouldn't be able to be full-time graduate students; more importantly, they wouldn't have the internship/mentorship experiences that are perhaps the most valuable aspect of their doctoral training.

For more information about WCER research, please visit the WCER web site at www.wcer.wisc.edu.

Andy Porter



JEFF MILLER

instruction. And the results of the content analyses of the tests are definitive.

For each subject and grade level, state tests are more aligned with each other than they were with NAEP, although the differences are not large (e.g., .36 versus .31 for eighth-grade mathematics and .45 versus .35 for eighth-grade science).

Porter and Smithson found that instruction in one state is quite similar to instruction in another state. State average instruction-to-instruction alignment indicators ranged from .63 to .80. These high degrees of alignment suggest better sampling might have produced similar results. "However," said Porter, "one should not interpret this to indicate lack of variation in practice across teachers within a state. When individual teacher reports of content are compared within a state, or even within a school, the degree of alignment drops considerably."

In general, instruction in a state was no more aligned to that state's test than it was aligned to the tests of other states. Porter says this suggests that standards-based reform has not yet brought instruction into alignment with state tests.

Smithson and Porter used the data to construct "maps" of the content coverage of state assessments, NAEP assessments, and instructional practice as reported by teachers (see illustration, page 1). Practicing educators have found these topographical representations of content to provide a useful representation of content emphasis in instruction and on assessments. Content maps can be compared to get a picture of where there is alignment and where there is not alignment between, say, a state assessment and NAEP, or a state assessment and instruction in that state.

continued on page 8

The resulting data allowed comparison of the alignment of assessment to assessment (including state assessment alignment with NAEP), alignment of instruction to assessment, and alignment of instruction with instruction (state by state) at each grade level, for each subject. Alignment is described through an index that ranges from 1.0, perfect alignment, to 0.0, no alignment. The index also describes the extent to which relative emphases of each topic and cognitive demand on say, one test, matches the relative emphasis of the same content on another test (or instruction).

Two caveats are necessary before considering these results, Smithson says.

First, to the extent that a state test is not aligned to a state's content standards, one might not want instruction to be aligned to the state's test. Nevertheless, to the extent a state test is used in an accountability program, it may have an influence over instructional practice.

Second, these data are illustrative only. The samples of instruction in each state cannot be taken as representative of that state. The samples are neither random nor sufficient in size. The data are, however, a proof of concept of the approach to testing effects of standards-based reform on

The Surveys of Enacted Curriculum (SEC) collaborative works with states in developing a systematic, efficient method of collecting, analyzing, and reporting data on curriculum content and instructional practices. State participants and invited experts work together to develop the survey materials and to improve their knowledge and skills in survey design, data analysis, reporting, and strategies for using data in professional development.

The SEC collaborative develops strategies for using enacted curriculum surveys and data with



Smithson



Lecture series presents minority scholars

For the past 11 years, the UW–Madison School of Education and the Wisconsin Center for Education Research have cosponsored a series of visits and lectures by nationally known minority scholars. This program seeks to

- ▶ celebrate outstanding contributions of minority scholars in education,
- ▶ strengthen and build additional ties between faculty on the Madison campus and minority scholars throughout the nation, and
- ▶ extend the number of role models for minority students in education at both undergraduate and graduate levels.

WCER Director Andrew Porter, creator of the series, says, “The scholars have played an important role in the life of the School of Education and the Center. New collaborations with UW–Madison students and faculty have been stimulated. A few former scholars have even joined the UW–Madison faculty.” The program is coordinated by Lois O’Brien Opalewski.

To date, the program has hosted 62 minority speakers, who represent a variety of fields, practitioners as well as scholars, junior and senior. A sampling of presentations over the course of the series:

Howard Fuller, Marquette University. While superintendent of Milwaukee Public Schools from 1991 to 1995, Fuller spearheaded the school district’s strategy for change, including comprehensive curriculum reform, decentralized decision making, school facilities improvements, and support for fairness in funding for public education at the state level.

Vivian Gadsden, University of Pennsylvania. Gadsden examines the nature of persistence and consequences of intergenerational learning within families. She explores the issues of race, class, and gender within home, school, and social contexts. Recent projects have included a multigenerational study of 25 African American families, a parent-child Head Start project with African American and Puerto Rican families, and a project with adolescent and young adult mothers and fathers.

Beatriz (Toni) Clewell, The Urban Institute. What factors encourage or impede equal access to educational opportunity for members of racial/ethnic minority groups and women? Clewell is particularly interested in strategies that have been effective in increasing the diversity of the teaching pool. Another area of research interest has been the access of members of underrepresented racial/ethnic groups and women to science, mathematics, and engineering fields.

Leo Tanguma, University of Northern Colorado. A mural painter and native Tejano, Tanguma spoke on Chicano muralism and provided a slide show of his works, which are on display in Texas, Oregon, California, Colorado, and Wisconsin. He hopes to raise consciousness with his murals, calling them the “natural expression of people’s desire for liberation and, hopefully, they will stimulate some type of action.”

Carol D. Lee, Northwestern University. Lee studies the knowledge that African American underachieving adolescents construct in their home and community experiences—knowledge that may be used to apprentice these students in uses of high academic literacy. Specifically, she looks at genres of talk in African American English vernacular as tools for cognitive mediation, helping speakers of this language variety to develop mental models of processes involved in literary interpretation.

Theodore Lewis, University of Minnesota. Lewis studies technology education, vocational education, and human resource development. His recent work has focused on the impact of technology on work and jobs. He has written about the epistemological problems that confront the practical subjects that seek disciplinary status.

Manuel Ramirez III, University of Texas at Austin. Ramirez’s research on cross-cultural psychology focuses on multicultural psychotherapy, on the relationship of acculturation to mental health and family dynamics, and on the relationship of multicultural orientations to life and cognitive flexibility to success in university environments.

Violet J. Harris, University of Illinois at Urbana-Champaign. Harris’s research focuses on literacy and language acquisition and development; historic development of literacy among Blacks and literacy materials created specifically for Blacks; literature for children and youth, particularly that labeled multicultural; reader response; and analyses of the publishing industry.

Kenji Hakuta, Stanford University. Hakuta’s research is in the areas of psycholinguistics, bilingualism, language shift, and the acquisition of English in immigrant students. He spoke on the educational rights of language minority students.

Kris D. Gutierrez, University of California, Los Angeles. In her talk, “Rethinking Diversity: Literacy in the 21st Century,” Gutierrez spoke about the literacy practices of urban schools. She is concerned with the social and cognitive consequences of literacy practices in formal and nonformal learning contexts.

Training programs enhance graduate experience

Graduate students at UW–Madison have access to numerous programs that enrich their experience and provide support. The Research Training Program (RTP) strengthens and supplements the training that graduate students ordinarily experience through their departments. The program benefits graduate students in the School of Education for whom research is a major element in their career plans.

“My experiences to date have been rigorous and enriching,” says Adrienne Dixon, a graduate student in her second year of the Research Training Program. “I’m pleased to have a community of colleagues with whom I can share my work and know that I will receive critical, yet necessary, feedback to further develop my research.”

A grant from the Spencer Foundation to the UW–Madison School of Education funds three new fellows in the program each year. The Graduate School adds funds for two Advanced Opportunity Fellowships, for a total of five new fellows in the program each year. Students enter the program in their second or third year of study.

“We make Spencer Foundation funds go further by leveraging them with other funds from within the University,” says program director, Professor Emerita Elizabeth Fennema. “The Graduate School offers two fellowships designated for racial minority or economically disadvantaged students that match three fellowships from Spencer funds. The departments that nominate students for these five fellowships guarantee the students two additional years of support. Because of these arrangements, we’re able to offer five four-year packages of support.”

Prior to this year the program was directed by Professor Mary Metz. School of Education Dean Charles Read and WCER Director Andrew Porter have provided program leadership.

- RTP students
- ▶ get early guidance from a broad committee, not just a single advisor;
 - ▶ write annual plans and assessment of their progress, together with those committees;
 - ▶ participate in a seminar that examines the critical elements of good research across departments and research approaches;

- ▶ receive systematic training in both theory and methods, including methods in a different genre from the one they plan to use;
- ▶ work with faculty on research projects; and
- ▶ produce sole- or lead-authored research of their own before the dissertation.

WCER has a special relationship with the RTP. WCER Director Andrew Porter helped design the program and continues to help administer it.



Ford

WCER provides offices and computers to funded fellows. Porter also has taught a special proseminar many times, and he designed and has taught a one-credit course in which students present and critique their own research. Most recently Porter cotaught the course with Dean Read. All of the teachers of the Spencer seminars have been, or are currently, WCER researchers.

Michael Ford is an RTP fellow. “More than anything else,” he says, “this program has provided support and resources for me to develop a research agenda. In addition to the financial support that has freed me to develop my own ideas, the program has provided some valuable experiences that I otherwise wouldn’t have received.” He calls the RTP seminar “a great opportunity to learn about the diversity of research being conducted in education. The diversity of the participants is an ideal context for bringing into focus research issues and challenges common across all traditions. My exposure to the way these issues emerge in different traditions, I think, has become a resource to help me be more critical toward my own work.”

The dissertations written by Fellows cover a broad range of topics, including African-American school reform movements in Milwau-



Latham



Fennema



Read

program year 2000–01. Every year many more students qualify for the program than can be funded. So each cohort of students admitted to the program includes both funded and unfunded students. The terms of program participation are the same for all students.

At least twenty-five faculty members are engaged in the program each year, as committee members, seminar instructors, and attendees at the meetings and conferences supported by the Spencer Foundation that bring together representatives of universities with similar grants to support doctoral education for students planning careers in research.

“With office space and hands-on research experience, WCER has made it possible for our students to get into the research enterprise meaningfully and early, getting to know a variety of scholars and approaches in the process,” says Dean Read. “Attentive mentoring with encouragement for the student to learn about research outside his/her major professor’s lab is a central theme of our RTP, and WCER makes it possible for us to do that, with a breadth that other leading education schools cannot match.”

The program is designed not only to benefit its students, but to serve as a model of best practice for departments across the school, Metz says. It is already doing so by example. When the program conflicts with established departmental practices, it stimulates thought, discussion, and action about those practices.

For more information about the RTP, contact Elizabeth Fennema at efennema@facstaff.wisc.edu.

A Spencer mentor

Adam Gamoran is a professor of sociology and educational policy studies at UW–Madison. For the past 10 years or so he has led informal weekly meetings for a group of graduate students primarily in sociology and education policy studies, but also

from *Brown* to the 1990s; day care and wage-earning mothers in the U.S., 1890–1920; school uniforms in a comparative perspective; electronic networks in the classroom; and higher education for women in the U.S., 1780–1840.

The program is becoming well known and well regarded: There was an increased pool of unusually strong applicants (23) for the pro-

gram from educational administration, curriculum and instruction, political science, and economics. The meeting series is an opportunity for cross-disciplinary intellectual exchange.

At the meetings, participants engage in four kinds of activities:

- ▶ Members of the group present their work-in-progress to each other and receive comments.
- ▶ Speakers from on campus or off campus are brought in to discuss their work.
- ▶ Participants discuss recent publications on “hot” topics, for example, a study of the gap in test scores between Black and white students.
- ▶ Sometimes students meet for informal chat.

Gamoran recently received a Spencer Mentor award of \$50,000 to use at his discretion for training graduate students. “Broadly speaking, I’m using these funds to try to make UW–Madison the best place in the U.S. for students to study the sociology of education,” Gamoran says. “My goals are to enhance the training experiences graduate students receive here and to recruit new students in the sociology of education.”

Gamoran’s Spencer funds enhance this group, for example, by funding visits by guest speakers. Last semester’s theme was the topic of multilevel modeling. Gamoran presented introductory material, students presented their own material, and an outside expert, the University of Michigan’s Steve Raudenbush was brought in for a one-day workshop. Gamoran recalls the day as “a wonderful team-building experience as well as being intellectually enriching.”

The funds also helped ten graduate students attend an annual conference in the Sociology of Education at Notre Dame University and has supported students who have presented papers at various conferences. This year the funds will support a graduate student trainee in the sociology of education.



Gamoran

The Spencer Foundation is a private foundation that grants funds to support research that contributes to the understanding of education and improvement of its practice.

Through its Fellowship Programs, the Spencer Foundation supports scholars engaged in educational research at different stages of their professional lives.

CPRE helps develop skill-based pay system



Odden

With assistance from staff of WCER's Consortium for Policy Research in Education (CPRE), Cincinnati Public Schools has developed a knowledge- and skill-based pay system for teachers, coupled with a knowledge- and skill-based evaluation system. The plan must first be approved this fall by a majority of members of the Cincinnati Federation of Teachers.

Teachers will be evaluated for their planning and preparation for class, success at creating an environment for learning, their teaching ability, and their professionalism. Each of these domains includes several standards, which describe specific skills or responsibilities that fall under that domain. Further, several components are included for each standard, which then form the basis for a four-level rubric for each standard (unsatisfactory, basic, proficient, and distinguished). UW-Madison Education Professor Allan Odden helped design the system.

The new pay system would label beginning teacher as "apprentices" and give them opportunities to progress to higher levels. They would advance at their own pace by meeting goals outlined by the district and by passing comprehensive assessments. Pay would be increased accordingly. Teachers would complete self-assessments and prepare portfolios of their work. Although this system evaluates teachers more frequently, it does so in a context of standards that teachers had a major role in developing.

Funding for this work was provided by grants from the Pew Charitable Trusts, the Carnegie Corporation of New York, and the U.S. Department of Education.

Odden says, "The underlying principle in this approach is that various performance levels are based more on defined knowledge and skill levels than on the traditional degrees and credits. In addition, this system could easily set a performance standard higher than that of the local licensing entity."

"Teachers who distinguish themselves will be able to rise higher, faster," said Assistant Superintendent Kathleen Ware. "For those teachers, it is a great reward. For others, it is a great motivator."

The Cincinnati school board agreed to the plan this spring. The five-tiered system of career levels aligns with 16 new teaching standards, in-depth assessments, and professional development. Rick Beck, the new president of the Cincinnati Federation of Teachers, added, "The new compensation structure, together with the proposed teaching standards, performance reviews of teachers, and focused professional development, are all directed to improve instructional practice in the district."

In designing this plan Odden facilitated the work of the district committees at several daylong meetings. Odden and other CPRE Teacher Compensation staff had provided similar assistance to the district and Cincinnati Federation of Teachers in designing their School Incentive Award Program. This experience enhanced the quality of facilitation provided because Odden knew the district's overall context as well as the specifics of the strategic plan.

The plan would be phased in over five years. Teachers demonstrating proficiency in professional development courses sponsored by the district would receive one-time bonuses of \$1,000. Teachers with dual licenses in academic and content areas, special education degrees, or certification by the National Board for Professional Teaching Standards would be able to add \$1,250 to their base salaries.

In some cases, the new evaluation system could result in pay cuts or even job losses for teachers who do not meet standards set by the district. But any teacher with 22 or more years of experience would be protected from possible demotion or pay cuts.

For more information, visit WCER's CPRE web site at www.wcer.wisc.edu/CPRE.



Teaching children equations

Part of the job of teaching mathematics to children is uncovering and correcting misinformation they bring with them to the classroom. In research funded by the Office of Educational Research and Improvement, U.S. Department of Education, WCER researcher Tom Carpenter found that some children develop concepts about equations and the “equals” sign earlier than was supposed.

Kindergarten teacher Mary Jo Yttri gave her students the problem $4 + 5 = x + 6$. To her surprise, every one of the children thought that the answer should be 9.

Intrigued, Yttri then used plastic cubes to model this equation with the children. To illustrate the problem, they made a stack of four cubes, then a stack of five cubes. In another space, they made stacks of nine and six cubes. Yttri asked the children if each arrangement had the same number of cubes. The children knew that the groupings did not have the same number of cubes and they were able to tell her which one had more. Several children were able to tell the teacher how they could make both groupings have the same number of cubes.

But even after doing this activity, the children still thought that the answer to the equation was 9. As other research has documented, children in the elementary grades generally think that the equals sign means that they should “carry out the calculation that precedes it” and that “the number after the equals sign is the answer to the calculation.” Elementary school children generally do not see the equals sign as a symbol that expresses the relationship “is the same as.”

Misconceptions about the meaning of the equals sign are not eliminated with one or two examples or a simple explanation, says Carpenter, who directs WCER’s OERI-funded National Center for Improving Student Learning and Achievement in Mathematics and Science. “This incident also illustrates that children as young as kindergarten age may have an appropriate understanding of equality relations involving collections of objects, but have difficulty relating this understanding to symbolic representations involving the equals sign.”

Teachers must make a concentrated effort over an extended period of time to establish appropriate notions of equality, says Carpenter. “Teachers should also be concerned about children’s conceptions of equality as soon as symbols for representing number operations are introduced. Otherwise, misconceptions about equality can become more firmly entrenched.”

The *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000) recommends that algebraic concepts be taught throughout the elementary years. The concept of equality is crucial to algebraic thinking, says Carpenter, and “it looks like we have to change the way we teach math in the early years if our students are to understand even such a foundational idea the way adults do.”

“Like a teeter-totter”

Karen Falkner teaches a first- and second-grade class in a school district in the Midwest. Children typically stay in her class for two years. Her students have progressed in their understanding of equality over the past year-and-a-half.

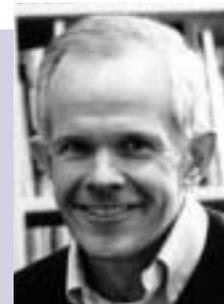
When Falkner initially asked students to solve the number sentence $8 + 4 = x + 5$, the students answered with “12.” Some extended the sentence by adding “= 17.” Most said that 12 was correct because “eight plus four equals twelve.”

But some students objected. Lillie gave the most spirited explanation. “The equals sign means that it has to be even,” she explained. “The amount has to be the same on each side of the equals sign. [Gesturing with her hands.] It is just like a teeter-totter. It has to be level.” The class wrestled with this problem for some time.

“As we reflect on our introduction of the notion of equality and the equals sign to this class and others,” Carpenter says, “we continue to be amazed at the interest and excitement that the children bring to the discussions. Lillie uses her teeter-totter metaphor with the enthusiasm of a child ready to play on one.” Another student, Skip, is genuinely outraged that anyone should fill in a blank so that an equation reads $12 = 17$.

These are not the bored comments of children looking forward to recess, but the excited contributions of children who are exploring a new world of thinking and communicating mathematically and who are enjoying the power of that new knowledge. These children are developing an understanding of equality as they learn about numbers and operations. This understanding will allow them to solve equations and will lay a firm foundation for later learning of algebra.

[For more information, visit www.wcer.wisc.edu/NCISLA. This article originally appeared in different form in the journal *Teaching Children Mathematics*, December 1999.]



Carpenter



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Surveys

continued from page 2

"While these maps are powerful tools for helping practitioners understand their own instruction and their state assessment, they are not exactly correct in one respect," Smithson says. "For the purposes of map construction, content emphasis is calculated as though the distinction between topics and the distinctions between cognitive demands are on an ordered scale, but they are not. Still, if one compares the topographical maps to a more correct bar graph, the topographical maps are not misleading and tend to be easier to interpret."

The results provide an indication of the power of the approach described here for assessing alignment. Though Porter and Smithson do not present analyses of state content standards and frameworks, such analyses could be done using procedures similar to those used for analyzing state and NAEP assessments. Analyses such as those reported here provide an objective and replicable way of testing the effects of standards-based reform on instructional practices.

WCER Institute attracts varied talents



The first WCER Institute on Research and Practice was held in mid-July on the UW–Madison campus. Those attending included local- and state-level education officials, state legislators and staff, and university faculty from sites throughout the Midwest. Presentation topics included research-based practices, advancing accountability and professional development, mathematics curriculum and instruction, and building capacity to improve practice.

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