Early contacts with child welfare agencies or special education programs often do not act as a protective factor for students with emotional and behavioral disorders because contact with these agencies is not sufficiently early, comprehensive, or coordinated across agencies.

A study by UW–Madison education professor Kimber Malmgren and colleague Sheri Meisel supports a large body of research that identifies early childhood as a critical developmental period when emotional and behavioral disorders (EBD) can be prevented or ameliorated. Youth with EBD who are involved with multiple service agencies experience multiple risk factors in childhood. These risk factors include academic and behavioral problems, experience with abuse and neglect, high rates of mobility, and parental incarceration. These characteristics have been consistently associated with negative school and community outcomes that extend into adulthood.

Children and adolescents with EBD often have multiple and intensive needs that reduce their ability to function in a variety of settings. These overlapping needs make collaboration critical among the public agencies that serve youth with EBD. Thus, many state and county agencies coordinate efforts and combine resources to create care systems and other programs to serve these youth.

Malmgren’s study focused on a special education program, a child welfare agency, and a juvenile justice agency in a northeastern U.S. suburban school district. The study’s interagency focus provides an important systemic perspective to understand the characteristics of youth at risk for EBD and their trajectory toward identification and receipt of specialized public services. For most youth, behavior problems were cited as a reason for the initial referral for special education services. Only 5.6% of the students in the study were initially referred for special education on the basis of academic problems alone. An additional 22.5% were initially referred into special education because of a combination of behavioral and academic difficulties.

More than half of youth in the study were labeled EBD when they were first determined eligible for special education. The average age of these youth at initial identification was 11.4 years.
A New Interdisciplinary Training Program

A new $5 million grant from the U.S. Department of Education will enhance our capacity to conduct high-quality research on practical questions in education and will help to prepare a new generation of scholars in the social sciences with expertise in the design, implementation, and statistical analysis of evidence on “what works” in education.

The five-year grant will fund a new interdisciplinary training program that aims to attract the most talented students in the social sciences to focus their early training and doctoral dissertations in the education sciences. Two-year advanced fellowships will enable top students to work on dissertations that both advance their disciplines and address questions on education policy and practice.

Funded by the Institute of Education Sciences, the program will accommodate 30 fellows from the disciplines of sociology, economics, psychology, political science, and social welfare. The faculty who will provide the training will include 20 scholars from the social sciences, education, public affairs, and social work.

We’re grateful to be given this opportunity. This award is a testimony to the strength of graduate training at UW–Madison and to its tradition of interdisciplinary collaboration between education and the social sciences. This program also builds on our growing capacity to use randomized trials to address pressing problems of educational policy and practice.

Adam Gamoran
WCER Director
Professor of Sociology and Educational Policy Studies

Records in the juvenile justice system studied showed evidence of substance abuse among 43.3% of the youth in the study. Examination of this variable by ethnicity showed disproportionately more documentation of substance abuse for African American participants: 55.3% of African American participants’ case files compared to 33.3% of the White participants’ files.

Juvenile justice records also indicated that 15.6% of participants had parents or siblings incarcerated at some point prior to the study.

Child welfare case records showed evidence of abuse or neglect among youth in the study. Of the youth with child welfare case records, 49% experienced physical abuse, 29.4% experienced sexual abuse, and 75% experienced neglect. According to the records, 93.1% of the African American participants had experienced neglect, compared to 55.6% of the White and 40% of the Hispanic participants.

Prior to the special education referral process, 48.8% of youth in the study experienced difficulties or delays in multiple academic areas. An additional 16.7% experienced academic problems in a single area prior to referral. It is noteworthy, Malmgren says, that in 35.3% of the cases no academic problems were documented prior to referral for special education.

Special education case records also showed that 91.7% of the participants experienced conduct problems in school prior to referral for special education.

Of all participants, 35.2% had been retained in grade at least once during their academic careers. Of these youth, 59.1% were retained in the primary grades.

Student mobility a factor

Malmgren says that interagency prevention strategies should be directed at children before age 6 (when 25% of the study’s participants were already identified by at least one agency) and certainly before age 8 (when over 50% were already identified).

She calls “worrisome” the finding that younger ages of identification by child welfare or special education correlated with younger ages of first contact with juvenile justice. In other words, early contact with child welfare or special education did not act as a protective factor.

Regardless of ethnicity, females tended to be identified at a later age than males, in all three agencies. Malmgren says this pattern denotes either differential treatment (i.e., authorities turning a blind eye to female emotional or behavioral problems) or different patterns of development with regard to EBD.

For most of the youth, eligibility for public school special education was the initial entry point into the public agency system. A large majority of youth experienced behavioral difficulties, and more than half experienced academic problems in multiple areas, in the early school years (i.e., prior to special education referral). These problems likely contributed to their high rates of suspension and retention, Malmgren says.

Regardless of ethnicity, participants experienced high rates of school mobility both before and after referral for special education. Prior to referral, this effect was more pronounced for African American and Hispanic youth than for White youth. After
Concepts and Procedures Reinforce Each Other

As children develop their problem-solving abilities, what comes first: their conceptual knowledge or their procedural knowledge? Or do these grow in tandem?

The debate has long continued. But recent research shows that conceptual and procedural knowledge appear to develop in a hand-over-hand process. Gains in one type of knowledge support gains in the other, which in turn support gains in the first.

These findings emerge from recent research conducted by UW–Madison education professor Martha Alibali and colleagues.* Their study has implications for teaching, because understanding the process of knowledge change is a central goal in the study of development.

Conceptual knowledge is flexible and not tied to specific problem types and is therefore generalizable. It involves understanding the principles that govern a domain and interrelations between units of knowledge in a domain.

Procedural knowledge is the child's ability to execute action sequences to solve problems. Procedural knowledge is tied to specific problem types and therefore is not widely generalizable.

Linking concepts and procedures

Competence in mathematics requires children to develop and link their knowledge of concepts and procedures. Competing theories have been proposed about the developmental relations between conceptual knowledge and procedural knowledge. According to concepts-first theories, children initially develop (or are born with) conceptual knowledge in a domain and then use this conceptual knowledge to generate and select procedures for solving problems in that domain. This theory and evidence in support of it have been used to justify reforms in mathematics education that focus on inculcating conceptual knowledge before teaching procedural knowledge.

In contrast, procedures-first theories hold that children first learn procedures for solving problems in a domain and later extract domain concepts from repeated experience solving the problems.

Alibali and her colleagues maintain that the debate over which type of knowledge develops first may obscure the gradual development of each type of knowledge and the interactions between them during development. The iterative model indicates how such a process may occur: Increases in one type of knowledge lead to increases in the other type of knowledge, which in turn lead to further increases in the first.

Problem representation may be key

Alibali has found that improved problem representation is one pervasive mechanism of cognitive development. Alibali defines problem representation as the internal depiction or recreation of

referral, over 70% of all participants attended more than one school in an academic year. This finding suggests that school mobility should be considered a significant risk factor that may be associated with the development of academic and behavior problems in childhood and adolescence.

Findings from the same study focus on the high rates of mobility experienced by these students and resulting negative academic outcomes; “School Mobility and Students with Emotional Disturbance,” (in press).

Taken together, the findings that participants had high rates of mobility, suspension, and chronic attendance problems suggest limited opportunities for consistent involvement in school. Malmgren calls these findings troubling because high-risk youth benefit from strong attachment to schooling and to adult mentors in school environments.

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a problem in working memory during problem solving. Students form a problem representation each time they solve a problem. Problem representation refers to this transitory, internal representation of individual problems.

Improved problem representation may underlie the relations between conceptual and procedural knowledge. First, it may underlie the link from conceptual knowledge to improved procedural knowledge. Children’s conceptual knowledge may guide their attention to relevant features of problems and help them to organize this information in their internal problem representation. This well-chosen problem representation may then support generation and use of effective procedures.

Second, improved problem representation may underlie the link from procedural knowledge to improved conceptual knowledge. Use of correct procedures could help children represent the key aspects of problems, which could lead to improved conceptual understanding of the domain.

In their research, Alibali and colleagues evaluated the first pathway: the link from improved conceptual knowledge to improved problem representation to improved procedural knowledge.

**Decimal fractions exercise**

In a recent study of fifth-grade students, Alibali and colleagues evaluated the iterative model of the development of conceptual and procedural knowledge in two experiments on children’s learning about decimal fractions. Decimal fraction knowledge is a central component of mathematical understanding. But children struggle to understand decimal fractions, and some never master them. Interventions that eliminate misconceptions and improve understanding of decimal fractions are greatly needed, Alibali says. Because of the potential power of the number line for representing decimal fractions, Alibali and colleagues developed an intervention using number line problems.

To evaluate the iterative model, Alibali and colleagues assessed children’s conceptual and procedural knowledge of decimal fractions before and after a brief instructional intervention. In Experiment 1, they examined individual differences in prior knowledge and in amount of learning. The goal was to provide correlational support for each of the links in the iterative model. In Experiment 2, they manipulated support for forming correct problem representation during the intervention. The goal was to evaluate the causal link from formation of correct problem representation to improved procedural knowledge. The first experiment provided correlational evidence for the relations proposed within the iterative model. The second experiment provided causal evidence for one link in the model—that from improved problem representation to improved procedural knowledge.

In both experiments, children’s initial conceptual knowledge predicted gains in procedural knowledge, and the gains in procedural knowledge predicted improvements in conceptual knowledge. Correct problem representation was an important link between conceptual and procedural knowledge.

Neither conceptual nor procedural knowledge developed in an all-or-nothing fashion, with acquisition of one type of knowledge always preceding the other. Nor was either type of knowledge fully developed at the beginning or at the end of the study; rather, they appeared to develop in a gradual, hand-over-hand process. These iterative relations highlight the importance of examining conceptual and procedural knowledge together, Alibali says.

**Implications for education**

These findings have at least three important implications for education. First, competence in a domain requires knowledge of both concepts and procedures. Developing children’s procedural knowledge in a domain is an important avenue for improving children’s conceptual knowledge in the domain, just as developing conceptual knowledge is essential for generation and selection of appropriate procedures. Current reforms in education focus on teaching children mathematical concepts and often downplay the importance of procedural knowledge. Furthermore, some educators treat the relations between conceptual and procedural knowledge as unidirectional. But this study found that the relations between conceptual and procedural knowledge are bidirectional and that improved procedural knowledge can lead to improved conceptual knowledge.

A second implication of these findings is that identifying the learning processes of good learners and supporting these processes in students who use weaker methods can enhance children’s learning.

A third instructional implication is that supporting correct representation of problems is an effective tool for improving problem-solving knowledge.

Alibali develops this discussion to include the mechanisms of change in reasoning that involve expressing knowledge in language and gesture in “Mechanisms of change in the development of mathematical reasoning,” *Advances in Child Development and Behavior* (in press).

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*Alibali’s colleagues in this study are Bethany Rittle-Johnson (Peabody College, Vanderbilt University) and Robert S. Siegler (Carnegie Mellon University).*
Intervention Programs Can Have Powerful Effects

Instructional improvement intervention programs like Accelerated Schools, America’s Choice, and Success for All can have powerful effects on the enacted curriculum in U.S. schools.

UW–Madison education professor Eric Camburn and his colleagues found that teachers do not vary the curricular content of literacy instruction for students in their classrooms. Literacy instruction does, however, vary widely across classrooms, largely as a result of teachers’ participation in 1 of the 3 instructional improvement interventions.

Camburn and colleagues* reached these findings while studying literacy instruction in third-grade classrooms in 53 high-poverty schools. These schools were participating in the 6-year Study of Instructional Improvement (http://www.sii.soe.umich.edu/).

The study analyzed instructional logs for reading and language arts from more than 150 third-grade teachers over the course of one school year. Teacher logs provide reasonably accurate data about the enacted curriculum when they are filled out immediately after lessons and with enough frequency to discriminate reliably across objects of measurement.

The teachers taught in 33 school districts in 11 states. Fifteen schools were participating in Accelerated Schools, 15 were in America’s Choice, and 16 were in Success for All. The remaining 7 schools were chosen as comparison sites because they were not participating in any of the three reform programs.

Camburn and colleagues examined the logs and the enacted curriculum along two dimensions: For the first, they characterized the curriculum in terms of nine reading/language arts strands. Then, within each strand they identified a second dimension of the curriculum—the developmental level, or the level of difficulty or cognitive demand of the skills being taught.

This approach to measuring the enacted curriculum moves beyond a focus on “the overlap between what is taught and what is tested” to measure the degree and nature of curricular focus found in particular lessons and the level of difficulty of instructional content taught on particular days.

Camburn points out that a researcher’s ability to discriminate across teachers increases as the number of occasions of measurement increases. But this reliability also depends on how much variation in content coverage exists (a) among teachers and (b) for each teacher from one occasion to the next. If teachers vary greatly in cumulative content coverage, but there is little occasion-to-occasion variance for individual teachers, relatively few observations are needed to discriminate among teachers. Conversely, if differences among teachers in cumulative content coverage are smaller and/or occasion variance for individual teachers is larger, relatively more observations are needed.

Several themes emerged from the analyses:

1. The largest amount of variation in the enacted curriculum occurs at the occasion-of-measurement level. This suggests that teachers vary to a significant extent the content and difficulty of the skills they teach from day to day.

2. There is little evidence of differentiation in either the amount or the skill level of reading comprehension or writing instruction students in the same classroom receive over the course of a year.

3. Even with large occasion variance in content and skill coverage, it is possible to discriminate reliably among teachers’ patterns of curriculum enactment.

4. The intervention programs—Accelerated Schools, America’s Choice, and Success for All—had large effects on the enacted curriculum. The effects were consistent with their intended designs.

These findings suggest that teachers have less autonomy in enacting the curriculum than is suggested by popular images of schools as loosely coupled systems and teachers as curriculum brokers. In fact, Camburn says, intervention programs can have powerful effects on the enacted curriculum in U.S. schools. Curriculum coverage in U.S. classrooms can be treated as an alterable variable in discussions of education reform.

This research is one of a number of recent studies Camburn has conducted on the measurement of instruction. The research reported here and a mixed-method study validating measures of instruction from a daily log appear in a special issue of The Elementary School Journal, Vol. 105, No. 1, September 2004. A third paper assessing the validity of measures of instruction based on annual surveys was presented at the annual AERA meeting this spring.

* Camburn’s colleagues in this study are Brian Rowan and Richard Correnti at the University of Michigan.

Funding: Grants to the Consortium for Policy Research in Education from the Atlantic Philanthropies (USA), the National Science Foundation, and the U.S. Department of Education.
Achievement Gap Can Be Narrowed Further

The U.S. Department of Education’s Title I program aims “to ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging state academic achievement standards and state academic assessments.”

The use of Title I funds has been controversial. In part, this is because some schools have put their Title I funds to more productive uses than other schools. But whenever an inner-city or poor rural school produces an exemplary program that helps its students achieve notable results, Title I funding almost invariably made it possible, says UW–Madison education professor Geoffrey Borman (see sidebar, next page).

In recent research, Borman found compelling evidence suggesting that Title I has met many needs of disadvantaged students. Long-term trend data from the National Assessment of Educational Progress (NAEP) indicate tremendous progress in the 1970s and 1980s in closing the persistent achievement gaps separating low-income and more advantaged students, and African American and White students. During this period, the gap between African American and White students, for instance, shrank by about two grade levels.

It’s not possible to establish a true cause-and-effect relationship between the closing gaps and the improvements in Title I students’ outcomes, yet two points are clear, Borman says. First, the students served by Title I clearly would have been worse off academically without the program. Second, the fact that the NAEP data show such remarkable national progress demonstrates that educational inequality can be reduced in a relatively short time when new policies and funding sources target improving education and other services for disadvantaged students.

Given the central purpose of Title I—to close the achievement gap—and the emphasis of the No Child Left Behind Act on research-proven strategies, how should policymakers, administrators, and teachers use Title I funds to continue to work toward attaining educational equality in U.S. schools? Borman suggests the following:

Start early
Evidence indicates that closing the gaps must begin with a strong educational foundation of high-quality preschool and full-day kindergarten programs. Preschool interventions help close achievement gaps and can have important long-term effects on students through middle school and high school and even into adulthood.

Extend learning into the summer
Over the long summer break, all students tend to forget some of the material they learned during the school year. It has been estimated that during the summer break the typical child loses more than one month’s worth of skill or knowledge in math and reading/language arts combined. Low-income students have fewer out-of-school opportunities and resources to sustain the achievement gains they make during the school year. As a result, over the summer, poor students tend to slip even farther behind their more advantaged peers.
Accelerate school-year learning

There are many strategies for accelerating the school-year learning of poor and minority students. Borman identifies two strategies that stand out as both research-proven and capable of widespread dissemination throughout Title I schools: reducing class size and implementing select comprehensive school reform models. Using funds from the U.S. Department of Education’s Title I and Comprehensive School Reform programs, thousands of schools have purchased reform models and developers’ technical assistance and transformed student learning, teaching, and school management.

Long-term economic returns

From a meta-analysis of 232 studies of the achievement effects of comprehensive school reform, Borman concluded that the overall effects of such reform are statistically significant, meaningful, and more positive than the effects of other interventions that have been designed to serve similar purposes and similar student and school populations.

In addition to the overall effects of comprehensive school reform, Borman studied the specific effects of 29 of the most widely implemented models. He found three models in particular that had established strong evidence of statistically significant effects on achievement outcomes across relatively large and diverse collections of schools throughout the U.S.—the Comer School Development Program, Direct Instruction, and Success for All.

Solid research evidence suggests that with significant investments in preschool, summer school, and school-year programs, the achievement gap can be significantly narrowed and potentially eliminated, Borman says. Further, investing in programs such as these can produce long-term economic returns and benefits to our society that considerably outweigh their substantial costs.


Funding: Center for Research on the Education of Students Placed At Risk (CRESPAR) and the National Institute on Educational Governance, Finance, Policymaking, and Management.


(1) To ensure that high-quality academic assessments, accountability systems, teacher preparation and training, curriculum, and instructional materials are aligned with challenging state academic standards so that students, teachers, parents, and administrators can measure progress against common expectations for student academic achievement;

(2) To meet the educational needs of low-achieving children in our nation’s highest poverty schools, limited English proficient children, migratory children, children with disabilities, Native American Indian children, neglected or delinquent children, and young children in need of reading assistance;

(3) To close the achievement gap between high- and low-performing children, especially the achievement gaps between minority and nonminority students, and between disadvantaged children and their more advantaged peers; and

(4) To hold schools, local educational agencies, and states accountable for improving the academic achievement of all students, and identifying and turning around low-performing schools that have failed to provide a high-quality education to their students, while providing alternatives to students in such schools to enable the students to receive a high-quality education.
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