The American education system is competitive but fair — all students who work hard get their proper rewards. It works like a meritocracy. Right? Wrong, says Alberto Rodriguez. A professor of science education in the Department of Curriculum and Instruction at UW–Madison, Rodriguez says the U.S. education system not only doesn’t provide just rewards, it actually works against equity. Until the myth of meritocracy is exposed and dealt with, the education system will continue to reduce the numbers of minority students who make it through high school.

Rodriguez exposes the myth of meritocracy in a recent analysis of student achievement trends. Studying reports from the National Assessment of Educational Progress (NAEP), the National Educational Longitudinal Study (NELS) and other sources, he focused on students’ socioeconomic status, gender, and ethnic group membership. While Rodriguez found some recent improvement in achievement and participation by female students and minority students, he noticed that gaps remain between Anglo-European
More keys to systemic reform

WCER's National Institute for Science Education continues to address some of the most important areas for improving science, mathematics, engineering, and technology (SMET) education. This issue of Highlights features recent NISE findings in the areas of systemic reform, professional development, and college level SMET education.

Ideally, the education system recognizes and rewards all students who apply themselves. But in some cases the education system fails to provide just rewards and actually works against equity. NISE researchers Thomas Kratochwill and Hugh Johnston to design an observational system and rating scale for obsessive-compulsive disorder (OCD) in children. OCD commonly leads to poor peer relations, a higher absenteeism rate, and a decline in scholastic aptitude and overall school functioning.

For more information about WCER research visit our Web site at http://www.wcer.wisc.edu.

Andy Porter

From the Director

The “top tenth” varies widely

It is generally known that the mean scores on the ACT science reasoning section for minority students have ranked below the national mean. Rodriguez conducted a more fine-grained analysis, pulling out the scores of the top students from each ethnic group to take a closer look. On the 1995 mathematics portion of the SAT, for example, the top 10 percent of females

- among Asian-Americans averaged 130 points above the national mean
- among Native Americans averaged 56 points above the national mean
- among Mexican-Americans averaged 17 points above the national mean
- among Puerto Ricans averaged 6 points above the national mean
- among African-Americans averaged 14 points below the national mean.

"One would expect that many of the social and institutional factors that affect minority students' performance do not have the same effect on those college bound students who scored at the top ten percent for their ethnic group," Rodriguez says. "And according to the meritocracy myth, these students' hard work should have paid off. How far does working hard get minority students interested in pursuing a college career? Who would meet the cut of top colleges and universities?"

When Rodriguez studied student success in Advanced Placement (AP) examinations he discovered that only four percent of those students who successfully complete AP in the sciences are of Latino, African-American, and Native American ethnic backgrounds. But when combined, these ethnic groups represent over one-third of the U.S. students and students from other ethnic groups. "These patterns of achievement gaps were congruent over time and across studies," he says. "They hold regardless of ethnicity, gender, or grade level."

Rodriguez's interest in minority student achievement is not merely academic. He had to deal with the "meritocracy myth" as a student. A native of Venezuela, Rodriguez attended college in Canada. As an international student, he not only received racial taunts, but also got the distinct impression that some professors thought he couldn't succeed.

"It was in college that I discovered for the first time that the color of my skin was brown, and that made me an object of hate," Rodriguez says. "Ironically, the young guys who were throwing insults at me thought that I was from Pakistan and were calling me all sorts of racist names. Needless to say, I didn't have a clue about what they meant. I never even heard the word 'paki' before. It was much later that I realized what had happened that day."

Such personal experiences helped fuel Rodriguez's interest in improving "minority" students' success rates. In previous work, he had studied changing trends in students' participation in national tests and science-related college entrance examinations, focusing on students' gender, socioeconomic status (SES), and ethnicity. His recent work provides a more detailed analysis of academic performance by gender, within ethnic groups. For example, instead of providing aggregated scores for "all" females or for only three "generic" ethnic groups, Rodriguez separated student performance for males and females for each ethnic group whenever data were available.

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Obsessive-compulsive disorder (OCD) was once thought to be rare in children and adolescents. But it’s now believed to affect about 2 percent of the population—that’s 20 to 40 times more common than previously reported. In fact, this percentage may be an underestimation, given the secrecy of this disorder.

Obsessions can be described as “persistent ideas, thoughts, impulses, or images that are experienced as intrusive and inappropriate and that cause marked anxiety or distress.” Some typical childhood obsessions are fear of contamination, fear of something happening to themselves or loved ones, and need for exactness.

Compulsions can be defined as “repetitive behaviors (e.g., hand washing, ordering, checking) or mental acts (e.g., praying, counting, repeating words silently), the goal of which is to prevent or reduce anxiety or distress, not to provide pleasure or gratification.”

Because approximately one-third to one-half of adults with OCD report that their OCD symptoms developed in childhood or adolescence, early identification is important. Students with OCD commonly experience
- poor peer relations
- a higher absenteeism rate
- a decline in scholastic aptitude and overall school functioning, and
- an increase in drug and alcohol abuse.

Some students with OCD are placed in special education due to their inability to function in a regular classroom.

“OCD manifests itself differently in each person,” explains WCER graduate student investigator Caroline Racine. “When we monitor children and offer treatment it’s important that we accurately reflect all the observable OCD behaviors at the beginning and during treatment.”

Working with UW–Madison Professors Thomas R. Kratochwill and Hugh Johnston, Racine designed a monitoring tool to be sensitive to the individual student’s behavior and to be used in school by teachers and school psychologists. The tool consists of two measures: an OCD direct observation system and an OCD rating scale.

Monitoring at the school site is crucial because children remain there for a large majority of their day, says Racine. Before the advent of managed care, behavior change data for students being treated for OCD were most commonly collected by inpatient hospital staff. But this is an unrealistic option now, Racine explains, considering the changes in today’s health care system.

Participating in the study were graduate students and experts in the field of OCD. They watched two videotapes of trained actors who played the roles of a teacher and students. (The use of trained actors is common in research in the medical field.) The “students” exhibited behaviors commonly associated with OCD, including reassurance seeking, repeating, and need for symmetry and exactness. Videotape #1 represented the baseline phase and videotape #2 represented the treatment phase. The actors’ behaviors were scripted to reflect change from baseline to treatment. The graduate students and the OCD experts viewing the videotapes were asked to record their observations and to try to distinguish between those observed behaviors that indicated the likely presence of OCD and those that did not.

“It’s important to determine why and how treatments differ, how treatment affects the individual, and how treatment can be tailored to the individual,” Racine says. “We believe that this study provides a prototypical template for developing reliable and valid outcome assessment measures to be used with any childhood disorder where behavior is manifested outwardly”—depression, selective mutism, and attention deficit disorder, for example.

Racine developed the new OCD observation and rating scale because existing assessment devices were not indicating which behaviors were improving. Previous instruments were downward extensions of adult scales and lacked reliability and validity. Racine’s new scale provides a way to measure children’s behavioral symptoms and should help professionals determine treatment effects.

Identifying OCD more accurately continued on page 8
As it enters its fourth year of research, WCER’s National Institute for Science Education continues to develop insights into improving science, mathematics, engineering, and technology (SMET) education.

As some lines of work have been brought to a close, new lines of work have begun. This year NISE will add a study of how to strengthen teacher education in colleges and universities. Work in each area enhances work in the others, as NISE research teams focus on their interconnections. A strong commitment to dissemination ensures that their research comes to the attention of the National Science Foundation (NISE’s funding agency), professional organizations, practitioners, and other researchers.

Here are highlights of the past year’s research:

The NISE is producing a much needed theory of successful systemic reform. Two books are in process. One captures progress made and one provides new developments in evaluation strategies for systemic reform. The NISE has reconceptualized the concept of alignment, which is the cornerstone of systemic reform. Some 300 experts in SMET systemic reform convened at the second annual NISE Forum, the work of which went well beyond sharing experiences. The participants generated new insights into how systemic reform can be successful and made recommendations for where future efforts should be placed.

In the area of professional development, the NISE produced Designing Professional Development for Teachers of Science and Mathematics, published in late 1997 by Corwin Press. Already, the book is the third most heavily sold item by Corwin. A synopsis of the book has been completed by the Eisenhower clearinghouse and is being widely circulated by the U.S. Department of Education. Soon, a book on case studies that illustrate the design framework in the Corwin Press book will be available. The Professional Development Team’s analyses of the disconnect between preservice and in-service education of SMET teachers will soon be available in a series of monographs.

NISE’s College Level One Team completed a meta-analysis of small-group cooperative learning in college-level SMET and found one-half standard deviation effect size. This large and robust effect of small-group learning in college-level SMET education has captured the imagination and enthusiasm of science faculty and administrators across the country. At the Team’s Web site (http://www.wcer.wisc.edu/NISE/CL1) practitioners can learn more about small-group learning and see good examples for their discipline. The Team is expanding its work to include identifying and promoting effective assessment practices in college-level SMET. NISE’s Year 3 Forum brought together practitioners and researchers to share ideas and insights on effective assessment practices. This effort launches the work for Years 4 and 5.

NISE’s commitment to communication and dissemination has been equally productive. The award-winning Web site, The Why Files (http://why-files.news.wisc.edu), promotes understanding of the science behind the news. On July 1 the cost of producing The Why Files was picked up by the...
UW–Madison Graduate School. NISE has conducted groundbreaking research on how the Web can be used to support scientific literacy, by using The Why Files as a key site for its research.

Increasingly, the NISE is called upon by others for advice about how to conduct conferences and workshops that will enjoy the same success as NISE’s three successful Forums. In Year 2, the NISE initiated the concept of collaborating organizations. Collaborating organizations are professional associations with which NISE has developed a special relationship. This idea has continued to grow and expand. NISE collaborating organizations have helped to give visibility to and disseminate NISE work, such as the professional development book and the meta-analysis on small-group learning in SMET higher education.

The NISE sponsored a major NSF-supported conference on graduate education in SMET in June. In support of this conference a Web site was created to disseminate effective practices in SMET graduate education. With separate funding NISE has taken responsibility for coordinating the education initiatives for the two NSF supercomputer projects and for evaluating key education initiatives in these projects. Finally, the NISE has created four publication series: research monographs, occasional papers, workshop reports, and briefs. Together with the NISE Web site, these outlets serve as a prepublication mechanism for making NISE work accessible to a broad audience.

For more information visit the NISE web site at http://www.wcer.wisc.edu/NISE, or write niseinfo@mail.soemadison.wisc.edu, or call (608) 263–9250.

“Meritocracy” continued from page 2

population. In Wisconsin, not a single African-American female took and passed any of the science AP exams in 1995. Rodriguez asks:

► Why is the representation of these ethnic groups so low?
► Why do 20 percent more African-American females than African-American males successfully complete AP science exams nationally?
► How do successful minority students navigate through the social and institutional obstacles to completing a postsecondary education?
► Whose interests are being served by these tests?

The new majority culture

So how are these findings important for educators? It happens that students most likely to suffer from the “meritocracy myth” belong to the fastest growing ethnic groups in the country. Population growth projections estimate that Latinos and Latinas will constitute the largest ethnic minority group in the U.S. by the year 2010. While a small percentage of these minority students participate in college entrance exams and AP programs, affirmative action programs are being attacked in places like the University of California.

“Those of us who call for systemic reform must more forcefully bring these issues of equity forward,” Rodriguez says. “Intervention programs, more socially relevant curricula, and better professional development programs for teachers are all needed. Education reform efforts must recognize the challenges to teaching and learning that social inequalities create in our schools.”

Until then the myth of meritocracy will continue to haunt the growing population of “minority” students struggling to make it through high school and beyond.

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[Adapted from an article forthcoming in a special issue of the Journal of Women and Minorities in Science and Engineering.]
Let's renovate our school finance systems

For most of this century education funding has been channeled to school districts. But since the 1980s, education reform has created a variety of new policy initiatives that require states to consider how to finance school sites (e.g., school-based management, school-level accountability, and charter schools). As states address this new task, they realize that their current district-based finance structures require significant modification, if not a complete overhaul, to produce a system that fairly and adequately responds to fiscal and curricular goals of the future.

UW–Madison Professors William Clune, Law, and Allan Odden, Education, say new finance systems should align with other initiatives of standards and school education reforms. Based at WCER’s Consortium for Policy Research in Education (CPRE), Odden says, “With the right kind of change, finance systems and structures could help the education system improve the productivity of the educational dollar. Many more students could be taught to high standards.”

Current systems don’t cut it

Current district-oriented school finance systems seem inadequate for fiscal and curricular goals, Clune says. First, recent court decrees have required much higher levels of equitable expenditures per pupil across school districts within a state. (Clune and Odden refer to this goal as “horizontal equity.”) Clune and Odden notice that the balance may be tipping toward a standard that looks at expenditures and away from the standards of the 1970s that just required equal access to the local property tax base.

For example, Texas court decisions in 1989 and 1995 called for eliminating the wealth advantages of the top 50 districts and ordered the funding of the bottom 50 districts brought up to at least the state average.

Second, courts and legislatures are moving beyond the goal of equity toward the goal of adequacy, meaning a funding level sufficient to support higher student achievement. Adequacy
requires a certain base funding as well as adjustments for price and special needs of pupils and schools.

Third, school finance formulas are disconnected from movements within education policy that seek to encourage higher levels of student achievement. District-based funding formulas can and should encourage school-site management, performance awards, and performance-based compensation for teachers. "These all are important elements for high performance organizations," says Odden.

Set specific fiscal equity targets

There is disarray in the current system of delivering state aid to school sites. "Despite constant tinkering by legislatures and courts, fiscal equity across districts has improved but not all that much for several decades," Clune says. "The courts' increased emphasis on strict horizontal equity in school finance litigation reinforces the need for some solution." To correct the problem of unstable and inadequate minimum funding, Odden and Clune recommend that courts and legislatures design specific fiscal targets for equitable education. For example, a state's plan could guarantee spending at the higher of the state or national median expenditure per pupil.

This plan, called a foundation plan, should be sufficient to eliminate all "savage inequalities" in the nation's public schools. It also should allow all districts to finance some version of a school created to teach all students to high performance standards. An additional element is then required: that minimum spending levels must be stabilized and protected from erosion in subsequent years by annual inflation adjustments.

Above the foundation level of an adequate education for the average student across the state, a substantial amount of compensatory aid is needed to meet the special educational needs of poor children, especially those attending high-poverty schools. "Poor children are by far the largest identifiable group whose educational outcomes fall below state-defined minimums for an adequate education," Clune says. "And high-poverty schools face overwhelming problems in meeting so many special needs." A categorical grant of approximately $1,000 per pupil (including federal aid) is a reasonable estimate of the extra instructional costs involved in bringing scores up to state minimums, Odden says, assuming an effective and well-managed educational intervention.

Redesigning school finance toward school-based budgeting should also help to increase productivity. Almost all of the big decisions about how to increase student performance should be made at the school level. "Education research and experience from outside education strongly suggest that the unit with primary responsibility for meeting performance goals (i.e., the school) also should have budgetary flexibility," says Odden. "The growth of choice schools and charter schools emphasizes the need for school-based budgeting."

Such a shift toward school-based budgeting suggests four additional changes in school finance:
1. Budgeting 80% or more of a district's operating budget, in a lump sum, to school sites
2. Setting aside a modest amount, say 2 to 4 percent, of the total educational budget for professional development of teaching skills in a coherent, powerful, accelerated curriculum
3. Changing teacher compensation from experience and education units to direct measures of knowledge and skills, and
4. Setting aside another small amount, say 1 to 2 percent, of a district's budget for rewarding improved student achievement.

States should move to this new finance agenda as quickly as possible, Odden says.

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The study focused on the concept of accuracy in treatment monitoring. “Not only was it important to establish accuracy from a theoretical standpoint, but also from a practical standpoint,” Racine says. Accuracy means the instrument’s ability to reflect “true behavior” as defined by the performance standard.

Racine’s OCD direct observation scale proved sensitive to change in the expected direction for the target behaviors of OCD, although varying degrees of sensitivity were demonstrated between experts and graduate students.

The research demonstrates that the relationship between direct observations and ratings in the assessment of observable compulsions can be high when conditions are optimal. For more information contact Caroline Racine cnracine@students.wisc.edu or (608) 238–8309.