

“Controlled laboratory models for studying learning are great to compose laws and theorems,” said Houang. “But, in the classroom we have to deal with social psychology and a much more complex environment.”

Through PROM/SE, Schmidt and Houang are attempting to tackle the problems of low student achievement in mathematics and science from three different angles. First, they identified what is the attained curriculum to see what is the student’s content knowledge in particular areas. Second, they went into the classroom to ask teachers how much time they spent on different areas of the curriculum. Their international data from the TIMSS study indicate that there is a relationship between the amount of time a teacher spends on a topic and student achievement. Now, they are studying the intended curriculum to see if teachers are teaching what the district curriculum indicates. PROM/SE is about arming districts with the data and information they need to align all three areas.

Identifying the problems is easier than implementing solutions, Houang said. “As researchers, we can make recommendations backed by data, but the ultimate challenge falls to the districts, principals and teachers in finding strategies to implement change.” For more information on PROM/SE visit <http://www.promse.msu.edu>. ♦

A Booming Job Market

MSU’s education statisticians find plenty of job opportunities after graduation, researcher says

By: Mark Reckase, professor of Measurement and Quantitative Methods and a former assistant vice president of assessment innovations at ACT.



Mark Reckase

A few days ago, two of the graduate students from the Measurement and Quantitative Methods (MQM) Program in the College of Education at Michigan State University stopped by my office with numerous questions about job opportunities.

Conversations of this type happen frequently because the MQM program is among the largest of its kind and the students are frequently contacted by recruiters about their interest in particular jobs.

On this particular day, I was tempted to give an answer that would parallel my father’s stories about walking five miles through foot deep snow to get to school. Life was certainly more difficult when he was a child. I had the same kinds of stories about applying for jobs when I finished my degree program many years ago. I applied to every position posting I could find, even as far away as the University of Guam, and I was willing to move anywhere to get a job. I eventually interviewed at one place and was fortunate to get that position. My academic advisor was instrumental in helping me find a good position.

I suppressed my urge to give that kind of mini lecture and instead responded to the students’ questions. What is it like to work for educational testing companies? How do those positions compare to academic positions? What are jobs in state or federal departments of education like? Is it better to live in the Princeton, N.J. area or in Iowa City, Iowa? What about jobs in the major metropolitan areas like New York, Chicago, or Toronto? Because of being asked these questions so often, I now have a pretty polished set of answers.

“University positions allow you to set your own research agenda; testing companies vary in allowing you to do research. State and federal positions are more directly related to educational policy and can potentially have greater impact than other positions. The best job for you depends on your interests and career goals.”

These questions come up so frequently for a number of reasons. One is that there are more jobs available in educational testing and the analysis of educational data than there are people to fill them. This is partially a result of No Child Left Behind legislation that has resulted in all 50 states working on educational assess-

ment programs. Students who complete an MQM degree are often recruited for jobs before completing the program by testing companies that do test development and analysis work for the states.

A second reason for the interest in graduates of the program is that the MQM program at MSU is one of the best in the country as evidenced by the strength and renown of its faculty. A third reason is that our students take advantage of a number of opportunities that make them very desirable for all of the different types of positions. A growing number of students complete a master’s degree in statistics while working on their PhD in MQM. Many gain practical experience by participating in summer internship programs at the testing companies. Along with thorough coursework in statistics, educational test design and development, and psychometrics, many students work on research projects such as computerized test design for licensure and certification tests, international comparisons using the international testing programs, design and analysis of tests of teacher capabilities, and hold graduate assistantships in research centers such as PROM/SE and the Educational Policy Center. All of these experiences make MQM students very desirable for faculty positions, policy positions and at testing companies.

Ultimately, the graduates or our program decide the position that is best for them based on their own needs and preferences. One student thought she wanted to live in California, but later took a job in New Jersey. Sometimes the important consideration is where couples can both get jobs. This usually means that large educational testing companies have an advantage. In recent years, graduates of the program have gone to major universities, state agencies, survey research firms, licensure organizations, and educational testing companies.

A result that is of some concern to our faculty is that the majority of recent graduates have obtained jobs at educational testing companies. The reasons for this are that the testing companies are more aggressive in recruiting new graduates than other job opportunities, they tend to pay more than other options, and there are many more job openings in testing companies than in other positions. This is a concern because we worry about who will be training the next generation of measurement and statistical researchers in education. It is difficult for university positions to compete with the offers made by testing companies, but there are the advantages of collaboration with colleagues in a wide variety of areas in university settings. Of course, we will tell the new graduates how much we enjoy our positions at MSU, but the job decision is theirs. We hope they will make the best decision given all of the job factors. For more information on the MQM programs, check out [www. http://ed-web3.educ.msu.edu/cepse/mqm/](http://ed-web3.educ.msu.edu/cepse/mqm/) ♦

Faculty in MQM

The following lists College of Education faculty members engaged in MQM research.

KEN FRANK

Frank is an associate professor of measurement and quantitative methods. His substantive interests include the study of schools as organizations, how teachers influence one another to affect classroom practices and school decision-making, social networks, and the social context of learning.

ROBERT E. FLODEN

Floden is a professor of teacher education, measurement and quantitative methods, educational psychology and educational policy. He is associate dean for the Institute for Research on Teaching and Learning, and co-director of Teachers for a New Era. His current research examines teacher preparation and teachers’ mathematical knowledge for teaching.

RICHARD T. HOUANG

Houang is senior research specialist, an adjunct professor of measurement and quantitative methods and the Director of Research for PROM/SE. He studies relationship between mathematics and science curriculum and student achievement, item characteristics and student performance, casual modeling, domain-referenced and classroom assessment.

KIMBERLY MAIER

Maier is an assistant professor of measurement and quantitative methods and is interested in the development of statistical models for complex data structures. Her current research focuses on the application of hierarchical measurement models to multilevel item response theory.

TENKO RAYKOV

Raykov is a professor in measurement and quantitative methods. He specializes in statistical and mathematical modeling of behavioral phenomena, educational and behavioral measurement, and modeling of developmental processes.

MARK D. RECKASE

Reckase is a professor of measurement and quantitative methods. He specializes in the development of educational and psychological tests, educational policy related to testing and the psychometric theory that supports the assessment of cognitive skills and content knowledge.

SHARIF M. SHAKRANI

Shakrani is a professor of measurement and quantitative methods and co-director of the Education Policy Center at MSU. His research interests include analysis of the effects of national and states accountability systems on student achievement.

WILLIAM H. SCHMIDT

Schmidt is a University Distinguished Professor of educational psychology and measurement and quantitative methods and co-director of the Education Policy Center at MSU and co-director of PROM/SE and the project director of the Third International Mathematics and Science Study for the U.S.

BARBARA SCHNEIDER

Schneider is the John A. Hannah Distinguished Professor in the College of Education and a professor of sociology of education. Her research interests focus on how the social contexts of schools and families influence the academic and social well being of adolescents as they move into adulthood.

YEOW MENG THUM

Thum is an assistant professor of measurement and quantitative methods. His research focuses on multivariate, multilevel models of behavioral data, with additional emphasis on models for educational and psychological growth and change.

COLLEGE OF EDUCATION EDUCATIONAL BRIEFINGS

Measurement and Quantitative Methods

Moving Beyond Assessment Testing too often helps decision-makers avoid tough decisions about schools, MSU Professor Sharif Shakrani says

By: Geoff Koch, MSU University Relations

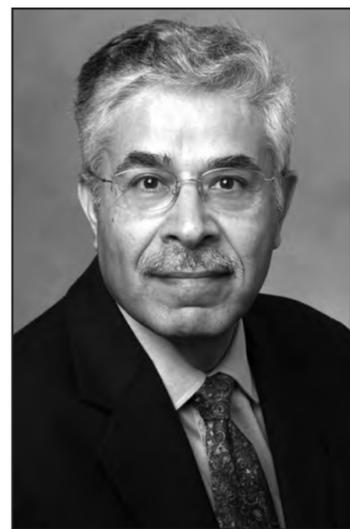
If an award was given for top educational achievement to the country that tests its students the most, then United States K-12 students should be leaving their peers in the dust. During the last 25 years, the U.S. has embraced a measure-it-early-and-often approach in the classroom and now conducts more per student testing than any other country, says Sharif Shakrani, professor of measurement and quantitative methods. Yet U.S. students continue to lag their global counterparts in math, science and reading.

“Standardized testing is cheaper than changing instruction, reducing class size or investing in professional development,” said Shakrani, also the co-director of the Education Policy Center.

“At least since the 1980s and 1990s, testing too often has been used as a first and only resort when addressing problems in schools.” The result is that scholars such as Shakrani are awash in data about K-12 students in Michigan and around the country, most of which confirms the need for tougher standards, especially for middle and high school students.

One such source of information is the Michigan Educational Assessment Program (MEAP), a series of standardized tests administered in every public primary and secondary school in Michigan. About 87 percent of third-graders met or exceeded MEAP math standards in the tests taken in the fall of 2005. These data are reason for optimism about what’s

Editor’s Note: Solid data on everything from what students learn and how they are being taught is in high demand across our nation. As the testing movement continues to drive reform, research is key to shine a light on achievements and challenges in classrooms nationwide. This issue of Educational Briefings looks at some of the scholarship that helps educators and administrators use assessment numbers to bring about improvements in learning. From rigorous math and science testing, to decision-makers using study results to effectively create change, to a growing job market for well-trained statisticians, the College of Education is on the forefront.



Sharif Shakrani

happening in elementary schools, Shakrani says.

However, the meet-or-exceed percentage dropped to about 63 percent in eighth grade. Reading skills sagged as well -- from 87 percent of third-graders meeting or exceeding standards to just 73 percent of eighth graders -- though the decline was less precipitous.

Similar trends are evident in the National Assessment of Educational Progress (NAEP), also known as the Nation's Report Card, an attempt to measure subject-matter achievement among U.S. fourth-, eighth- and 12th-graders. The exam, given roughly every two years, indicates that reading skills among U.S. middle school students have remained basically unchanged for 15 years.

Perhaps it's no coincidence that performance begins to drop off when students are allowed some choice in selecting which classes to take. "In some cases, middle- and high-school students are influenced more by hormones than homework," said Shakrani, who served as deputy executive director of the National Assessment Governing Board, which administers the NAEP exam, before arriving at MSU in 2005.

Worse, student choice combined with lax requirements in the higher grades results in a form of segregation, Shakrani says. Among Michigan 8th graders, the proportion of white students (80 percent) who meet or exceed expectations in reading profi-

ciency dwarfs that of black (50 percent) or economically disadvantaged (50 percent) students, according to the 2005 MAEP exam. The performance gap between haves and have-nots is evident in the national data as well, though the chasm yawns especially large in Michigan, Shakrani says.

Despite such dismal data, the most nettlesome state and national trends do yield to one particularly straightforward policy antidote -- strengthen standards and expect more from students throughout the K-12 system. States such as Massachusetts, North Carolina and Indiana have done just that, boosting student achievement and narrowing the gap across racial, ethnic and socio-economic lines. Michigan recently shored up its own high school graduation requirements to include more math, science, English, social science, foreign language and even online learning -- a move Shakrani views as positive.

His favorite example comes from the K-12 schools run by the Department of Defense at military bases in the United States and around the world. These schools, which serve families of enlisted military personnel and noncommissioned officers, have a higher proportion of minority students than do U.S. public schools. However, the schools also show the smallest interracial performance gap among any NAEP-tested schools, largely because of rigidly enforced common standards, parental involvement and continuous communication

among teachers, parents and students. Shakrani also sees reason for optimism in the federal No Child Left Behind (NCLB) Act, legislation that's been rife with controversy ever since it was passed in 2002. NCLB requires each state to set academic content standards and align curriculum, academic instruction and assessment to these standards. This is one of the law's most promising features, Shakrani believes, because "it makes the testing for accountability less intrusive and more meaningful by providing better information about achievement in schools, relevant to state adopted content standards." Another benefit, he adds, is that "NCLB provides tangible funding for low-achieving schools to improve remedial instruction to their students."

After spending a career in testing and assessment, Shakrani says he has concluded that fixing schools requires more than foisting yet another test on students and administrators. "Assessment may be inexpensive compared to other policy tools, but it's only like a thermometer -- it just tells you you're sick but doesn't say why or how to get better."

In other words, it's time for schools to start taking their medicine, beginning by ratcheting up requirements and expecting more of all students.

To contact the Education Policy Center, write to EPC@msu.edu. ♦

Stronger in the World

Professors use research to close the global math and science achievement gap

By: *Susan Pettit Riley, PROM/SE Director of Communications*

Strengthening our educational system hits close to home for William H. Schmidt and Richard T. Houang, both parents of school age children. The researchers are focusing their efforts on improving mathematics and science education so that their children, and ours, will graduate with the skills needed to be competitive in an increasingly global economy.

According to the research conducted by Schmidt and Houang, a rise in student achievement in mathematics and science will depend on reform at all levels of the educational system including clear State standards, a coherent curriculum, and knowledgeable teachers.

Both researchers have dedicated their careers to helping educational systems understand their strengths and weaknesses through the fields of psychometrics and statistics. Schmidt, a University Distinguished Professor, joined the Measurement and Quantitative Methods faculty in the College of Education at Michigan State University as an assistant professor after earning a doctorate in psychometrics and applied statistics from the University of Chicago. Houang, who is originally from Hong Kong, joined the faculty after earning a doctorate in educational psychology with an emphasis in psychometrics from the University of California at Santa Barbara.

Through the years both of their careers have moved away from the development of abstract methodologies to the very applied research of studying the forces needed to bring about change in schools.

When Schmidt, a native of Chicago, started his career, his work focused on the development of abstract procedures

and models. The application of these procedures was somewhat secondary. Over the years, his research has become more applied and his passion for seeing real change on real issues has grown. "Now, my focus is on reforming mathematics and science education," Schmidt said. "All my methodological efforts are to develop statistical models that serve this purpose."

Schmidt and Houang collaborated on the landmark Third International Mathematics and Science Study (TIMSS) project where U.S. student knowledge of mathematics and science was found to be lacking compared with those from 50 countries. While U.S. 4th graders performed about average in mathematics, performance by 8th graders fell below the international average. By high school, student knowledge of mathematics placed them near the bottom of international rankings, showing a dramatic and worrisome decline.

Now, the two researchers are applying their methodology developed through international work to issues right here in the Midwest. They are collaborating on "Promoting Rigorous Outcomes in Mathematics and Science Education" known as PROM/SE, the five-year, \$35 million education project led by Joan Ferrini-Mundy and Schmidt. Houang is the director of research.

"In PROM/SE, we have the unique opportunity to develop models and procedures in the context of a very specific problem - the poor performance of U.S. students in mathematics and science," said Schmidt.

As one of 12 mathematics and science partnership projects funded by the National Science Foundation PROM/SE



William Schmidt

is somewhat different from the other projects due to the involvement of Schmidt and Houang, who make sure that the data collected and analyzed utilizes the most sophisticated statistical procedures.

In the project's first year, Schmidt, Houang and researchers developed tests to determine the depths of students' knowledge in mathematics and science. With nearly 60 school districts in Michigan and Ohio signed on, the tests were administered to over 200,000 students in grades 3-12. These data and others collected through the project are still being analyzed.

Participating school districts represent a broad range of social, economic and cultural characteristics, from large, urban cities to suburbs to rural areas. Thirty-seven percent of their students come from impoverished homes. With a study group so large and diverse, the two researchers are learning things that go beyond the participating districts by seeing what is working in districts and what is not.



Richard Houang

For example, in a sampling of 7 school districts, the number of high school math courses offered ranged from 14 to a high of 46. PROM/SE researchers contend that so much variation in courses and content can impact student achievement and leave them with widely varying skills upon graduation.

New views emerging from the project on teacher training, professional development and what comprises a rigorous curriculum are throwing some long-held practices into question. The impact of this research and its methodologies on the broader field of education is palpable. The field of psychometrics has come a long way from its early roots in the late 1800's when researchers used to measure the size of a person's head as an indicator of intelligence, said Houang. "Of course, we do not do things like this anymore. The field and our methodology have become very sophisticated."

However, fundamental questions

still drive the field. How do you measure learning and the ability to learn? The roots of modern measurement stem from the testing of soldiers in the first and second world wars where the need was critical to select the best soldiers for the best task. Soldiers were put through a battery of mental tests to determine their aptitude in certain areas of combat. Study of this controlled group of soldiers led to developments in the field of testing. Prior testing had centered on measuring aptitude, rather than achievement.

Today, researchers use differing methodologies in an attempt to capture the entire scope of learning. "A student may have great aptitude or talent in a certain area but it is possible that another student without that aptitude can achieve the same level by studying harder and longer," said Houang.

Capturing both student aptitude and achievement through testing is a complicated process. Different methodologies have their strengths and weaknesses. But fundamentally, Schmidt notes, the quality of the response depends on the quality of the questions asked.

Open-ended and multiple choice questioning are only part of the equation. Studies have shown socio-economic factors can play a part in the results as well as student maturation between testing. Variations within the classroom due to teacher skill and knowledge, and in the curriculum, confound the problems. How much impact these variables have is hotly debated.