# Academic Resilience in Mathematics among Poor and Minority Students

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## Abstract

Based on national data from the Prospects study, we identified the individual characteristics that distinguished academically successful, or resilient, elementary school students from minority and low-socioeconomic-status (SES) backgrounds from their less successful, or nonresilient, counterparts. We also formulated and tested 4 models of the risk factors and resilience-promoting features of schools: (*a*) effective schools; (*b*) peer group composition; (*c*) school resources; and (*d*) the supportive school community model. Our results suggested that minority students from low-SES backgrounds were exposed to greater risks and fewer resilience-promoting conditions than otherwise similar low-SES White students. Results, though, generally supported the applicability of uniform individual- and school-level models of academic resiliency to all low-SES students, regardless of their race. Greater engagement in academic activities, an internal locus of control, efficaciousness in math, a more positive outlook toward school, and more positive self-esteem were characteristic of all low-SES students who achieved resilient mathematics outcomes. The most powerful school characteristics for promoting resiliency were represented by the supportive school community model, which, unlike the other school models, included elements that actively shielded children from adversity.

The objective of this study was to improve understanding of the individual- and school-level features that distinguish academically successful, or resilient, elementary school students from minority and low-socioeconomic-status (SES) backgrounds from their less successful, or nonresilient, counterparts. We addressed this objective through several means. First, rather than considering the resilience of students from only one racial/ethnic group, as have many previous studies, we contrasted the outcomes for

three groups: African-American, Hispanic, and White students. We investigated whether the allotments of the individual and school characteristics associated with academic resilience differed as a function of race/ethnicity and whether any of the characteristics were more important predictors of resilience among certain racial/ethnic subgroups. To clarify how schools may affect students' resilient outcomes, we formulated and tested four models of the risk factors and resilience-promoting features of schools: (*a*) effective schools; (*b*) peer-group composition; (*c*) school resources; and (*d*) the supportive school community model. Taken together, these analyses provide valuable new information regarding the extent to which characteristics of academically resilient children may generalize across individuals and the extent to which various school-effects models apply to and affect the resilience construct.

## Individual and School Characteristics Associated with Academic Risk and Resilience

Historically, children from poverty have been disproportionately placed at risk of academic failure (Natriello, McDill, & Pallas, 1990). Along with poverty, researchers also have associated an individual's status as a racial or cultural minority with academic risk (Gordon & Yowell, 1994; Natriello et al., 1990). Beyond such individual factors, schools that serve children of poverty and of color also may introduce risk factors by failing to provide a supportive school climate, by institutionalizing low academic expectations, or by delivering inadequate educational resources. Finally, academic risks may be associated with the potential discontinuity, or "lack of fit," between the behavioral patterns and values socialized in the context of low-income and minority families and communities and those expected in the mainstream classroom and school contexts (Delpit, 1995; Gordon & Yowell, 1994; Taylor, 1991). For instance, Fordham and Ogbu (1986) argued that because African Americans have had limited opportunities in the United States, they developed an "oppositional" culture that equated doing well in school with "acting white" or "selling out." Therefore, individual characteristics, school characteristics, and the interactions between individual and school characteristics all may contribute to a student's risk of academic failure.

Increasingly, researchers have begun to look at the other side of risk, focusing on the factors that enable at-risk students to "beat the odds" against achieving academic success. Borrowing primarily from the field of developmental psychopathology, a growing body of educational research has identified individual attributes that promote academic resiliency. Developmental psychologists, such as Rutter (1987) and Garmezy (1991), have recognized that among groups believed to be at high risk for developing particular difficulties, many individuals emerge unscathed by adversity. The observation that only one out of four children of alcoholic parents will become an alcoholic is a familiar example of this phenomenon (Benard, 1991). The capacity for resilience varies from individual to individual, and it may grow or decline over time, depending in part on protective factors within the person that might prevent or mitigate the negative effects of stressful situations or conditions (Henderson & Milstein, 1996). Individual characteristics of resilient children typically include high self-esteem, high self-efficacy, and autonomy (Wang, Haertel, & Walberg, 1994). Resilient children also are actively engaged in school (Finn & Rock, 1997), have strong interpersonal skills, maintain healthy expectations, and have a high level of activity (Benard, 1991). All of these characteristics highlight the underlying perseverance, strong will, and positive disposition of the resilient child.

Substantial research on resilient children has focused on historically disadvantaged minorities of low socioeconomic status. In

particular, educational researchers have devoted considerable attention to academically successful African-American students (e.g., Clark, 1983; Connell, Spencer, & Aber, 1994; Taylor, 1994; Winfield, 1991). This focus is understandable, in that minority students tend to be affected by poverty and other risk factors to a greater extent than White students. Researchers such as Taylor (1994) have pointed out additional risk factors associated with being an African American, including daily experiences of discriminatory behavior from individuals and institutions, and political, occupational, and residential restrictions motivated by race. Nevertheless, no known research has examined whether the characteristics of resilient minority and majority students differ.

Beyond the individual characteristics of resilient children, researchers have begun to pay more attention to how schools may affect students' academic resiliency. Resilience researchers have noted that school environments may provide protective factors that mitigate against school failure and that they may introduce additional stressors and adversities that place students at even greater risk of academic failure. A few researchers, such as Benard (1991), Henderson and Milstein (1996), and Wang, Haertel, and Walberg (1995), have devoted considerable attention to the issue and have formulated theoretical models of how schools may foster resiliency in students. Little systematic research, though, has tested these models or provided other evidence concerning the processes and characteristics of schools that may affect academic resilience.

Some contemporary researchers have suggested that the effective schools model of the 1970s and 1980s, which was popularized by Ron Edmonds (1979), tells a great deal about how schools may affect resilience, in that effective schools are said to promote academic success among traditionally low-performing disadvantaged minority students (Lee, Winfield, & Wilson, 1991; Masten, 1994; Wang et al., 1994, 1995). At least one feature included in the effective schools model, the goal of achieving a safe and orderly school environment, has been linked to the affirmation of healthy social behavior that is characteristic of resilient children. However, the true core of the effective schools model is focused on developing students academically—the academic press model. Developing into a successful student may, in itself, shield children from adversity by enhancing self-esteem, efficacy, and a sense of belonging within the school. Most often, though, when discussing the features of schools that foster resilience, these researchers have listed effective school characteristics, such as strong principal leadership and a clear school mission, but have been less definitive about the processes through which these characteristics may be related to the psychosocial phenomenon of resilience.

Another research tradition that seems to have influenced models of how school environments may affect students' academic resilience is the school effects approach popularized by Coleman et al. (1966) and perpetuated by educational production-function studies of the relations between school resources and achievement. This approach holds that school funding, resources, and the peers students go to school with are important predictors of students' academic outcomes. Although contemporary resilience researchers have not made the connection to this model, Wang et al. (1995) and others, such as Masten (1994), have noted that limited resources in the school environment, and within the community at large, may prevent students from achieving resilient outcomes. Wang and her colleagues also have suggested that students who attend schools with high concentrations of underachieving, poor, and minority students may be at increased risk of academic failure. In contrast, at-risk students who attend well-funded schools with quality resources and more advantaged and academically successful peers presumably stand a better chance of achieving resilient academic outcomes.

Like the effective schools characteristics, though, few authors have noted mechanisms through which a school's resources and the composition of its student body may build resilience within students. Some notable exceptions exist, especially regarding how racially integrated schools may affect African-American adolescents' academic outcomes. Clark (1991), for instance, reviewed research suggesting that at-risk African-American high school students who had interracial friendships developed better academic and social outcomes in high school and in college. Clark conceptualized these resilient outcomes as a product of African-American students' mainstream socialization, which is often required to succeed in the decidedly middle-class culture of schools. This is one clear conceptualization of the mechanisms underlying these so-called school compositional or contextual effects, but most resilience researchers have used measures of school resources and school composition only as simple indicators of the level of risk or adversity in the child's learning environment.

A final set of school characteristics seems to function more clearly as protective mechanisms and processes for promoting academic resilience. Consistently, resilience researchers cite the need for caring and supportive teachers (e.g., Benard, 1991; Henderson & Milstein, 1996; Werner & Smith, 1989), a safe and orderly school environment (e.g., Freiberg, Stein, & Huang, 1995; Wang et al., 1995), positive expectations for all children (e.g., Benard, 1991; Henderson & Milstein, 1996; Rutter, 1987), opportunities for students to become meaningfully and productively involved and engaged within the school (e.g., Benard, 1991; Braddock, Royster, Winfield, & Hawkins, 1991; Finn & Rock, 1997), and efforts to improve partnerships between the home and school (e.g., Comer, 1984; Masten, 1994; Wang et al., 1994). Rather than general measures of a school's "effective" features, or indicators of the level of risk or adversity introduced by a school's student composition or lack of resources, this group of school attributes has a much clearer link to promoting the psychosocial process of resilience building.

## Objectives and Hypotheses

Educators and researchers have done a great deal more to classify and describe conditions of risk than to develop successful remedies (Catterall, 1998; Wang & Gordon, 1994). Out of this research has emerged a tendency to label whole groups of students as "at risk" when, in fact, many of them succeed. Rather than identifying achievement gaps, resilience research offers the possibility of discovering why individuals succeed despite adversity. Focusing on alterable student behaviors and school-level features that are related to academic resilience provides the additional benefit of identifying potential changes to policies and practices that may promote academic resilience among more children placed at risk. Although there has been clear progress in formulating models of the school characteristics associated with academic resilience, the empirical research needed to test and refine these models, and to establish related policies and interventions, remains thin. Resilience research is clearer regarding the individual characteristics of children that are generally associated with academic success, but little is known about how these characteristics may generalize across students of different ages, races, or ethnic groups. Therefore, despite the promise of the academic resilience concept, more detailed research is needed to realize its full potential.

Several important theoretical ideas and hypotheses influenced the direction of our research. First, like Masten (1994), we envisioned resilience as a developmental process occurring over time, eventually characterized by good psychosocial and behavioral adaptation despite developmental risk, acute stressors, or chronic adversities. We therefore used a longitudinal design, which tracked the mathematics progress of low-SES children from third through sixth grade. Second, with respect to

theoretical models of how schools may affect students' resilience, we hypothesized that those models with clearer links to fostering the psychosocial process of resilience would be more consistent predictors of this outcome. Thus, although some researchers have referred to school resources, the composition of the student body, and effective schools characteristics as important indicators of environmental risks or supports, these school features may have less powerful direct effects on students' academic resilience than school-based efforts that shield disadvantaged children from the risks and adversities within their homes, schools, and communities.

Finally, because no research on academic resilience has explored racial/ethnic group differences, our across-group analyses of the distributions of the individual and school characteristics associated with academic resilience, and of the racial/ethnic group interaction effects (both group by individual characteristics and group by school characteristics), were largely exploratory and descriptive. These analyses, though, were guided in part by some previous findings from outside resilience research. First, as Natriello et al. (1990) noted, indicators of risk, such as poverty and minority status, are not independent, "so that a child likely to be classified as educationally disadvantaged on one is more likely to be so classified on the basis of the others" (p. 16). Correspondingly, relative to low-SES White students, the "double jeopardy" of being a low-SES minority student may compound the chance of being exposed to other individual and school characteristics associated with risk rather than resilience. We hypothesized, therefore, that our analyses of the across-group distributions of individual and school characteristics would tend to reveal greater exposure to risk conditions, and less exposure to resiliency-building conditions, for low-SES African-American and Latino students than for low-SES White students.

Hypotheses regarding racial/ethnic group interaction effects were guided by two streams of research. First, research comparing minority and White students on psychosocial variables associated with academic success, such as an internal locus of control, a strong self-concept of one's ability, and high self-esteem, appears to provide no consistent evidence concerning across-group differences, including potential interaction effects (Graham, 1994). With respect to possible interactions between school variables and racial/ethnic group membership, some evidence, which dates to the Coleman report (Coleman et al., 1966), has suggested that minority students may be more strongly affected by school variables than White students. The recent Tennessee class-size experiment (Word et al., 1990) also provided strong evidence that improved school resources—in the form of reduced class sizes—may have a more profound effect on the achievement of minority students than of White students (Krueger & Whitmore, 2001). Finally, school effects that foster students' resiliency often depend on strong, supportive relationships with their teachers. Although Ferguson (1998) warned that the evidence is thin, the research he reviewed suggests that teachers' beliefs, expectations, and behaviors may affect African-American students more than Whites. Taking these findings into consideration, we hypothesized that some school effects would be stronger for African-American and Latino students than for White students, but we did not expect to find racial/ethnic group interaction effects for the individual psychosocial variables predicting resilient outcomes.

## Method

### Data and Sample

This research was based on data from Prospects: The Congressionally Mandated Study of Educational Growth and Opportunity. The national Prospects sample was selected using a three-stage stratified design, with districts as the first-stage unit, schools within districts as the second-stage unit, and, where necessary for design efficiency, stu-

dents within designated grades within schools as the third-stage unit. The data set contains standardized achievement scores for as many as 40,000 students from three grade cohorts (first grade, third grade, and seventh grade) over a 4-year period beginning in 1991. Students completed questionnaires during each year of the study. Detailed questionnaires also were administered during each year of the study to parents, teachers, school principals, and school district personnel. The Prospects data collection staff abstracted additional student-level information from school records during the spring of each year of the study. Although Prospects provides student sample weights, our analyses focused on a select subsample of at-risk students, and therefore the use of sample weights, which were designed to generate national estimates when analyzing data for the total sample, was not appropriate.

The data set we employed contained 3,981 students in the third-grade cohort with complete data on the variables of interest. Of those 3,981 students, 15% were African American, 19% were Latino, and 66% were White. An ordinary least squares regression analysis was performed on this sample to identify students performing better or worse on the sixth-grade Comprehensive Test of Basic Skills, Fourth Edition (CTBS/4), Total Math outcome than predicted by their third-grade Total Math score and SES. The following equation resulted:

$$Y_i = 298.94 + 5.82(\text{SES})_i + 0.64(\text{GR3\_MATH})_i.$$

We obtained standardized residual scores for each student by subtracting the achievement score predicted by the regression from the student's actual score and expressing the resulting residual as a $z$ score. Students with standardized residuals of 0.33 or greater were defined as performing better in mathematics than expected, or as academically resilient, and those with standardized residuals at or below $-0.33$ were defined as performing worse in mathematics than expected, or as nonresilient. We then reduced the sample to contain only African-American, Latino, and White students from low-SES backgrounds, defined as at or below a value of $-0.33$ on the standardized SES measure ($M = 0.01$, SD $=$ 0.76).

After applying these selection criteria for race/ethnicity and SES, the final sample was reduced to 925 students, of whom 26% were African American, 32% were Latino, and 43% were White. The parents of these children, on average, had 1991 to 1994 household incomes between $7,500 and $14,999 and had completed schooling through the eighth to twelfth grade (or GED). We calculated a 4-year average of approximately 2.5 for parent education level, which was coded 1 to 9, where 2.0 is "beyond eighth grade" and 3.0 is "high school graduate or GED." The 4-year average of 4.67 for income, which ranged from 1 to 10, was between 4.0 ($7,500–$9,999) and 5.0 ($10,000–$14,999).

During the baseline year of the study, the 925 students were enrolled in 146 schools. Due to student mobility, the students attended a total of 249 schools over the 4-year period. Five hundred and twenty-one students met the criterion for performing above expectations on mathematics achievement (23% African American, 35% Latino, and 42% White), and 404 were identified as performing below expectations (29% African American, 27% Latino, and 44% White). Resilient students performing above expectations had median national percentile scores of 39 on the third-grade pretest and 59 on the sixth-grade posttest, and nonresilient students performing below expectations had median national percentile scores of 38 on the pretest and 11 on the posttest.

We measured resiliency in terms of mathematics outcomes for two primary reasons. First, although there has been recent national progress, minority students in the United States remain underrepresented in technical fields, such as engineering, that depend on skills in mathematics (National

Science Foundation, 2000). Therefore, understanding how to promote resilient mathematics outcomes for poor and minority students, and thereby promoting a stronger educational and career pipeline for the advancement of these groups, is of considerable national significance.

Second, analyzing resilience in the context of school-based outcomes for a relatively homogeneous group of students from disadvantaged socioeconomic backgrounds, the goal of our study was to reveal school effects and students' attitudes and behaviors that were related to the resilience construct. Our statistical adjustments and our focus on a specialized sample of poor and minority students helped hold constant many other differences that are related to varying family contexts, but our choice of mathematics outcomes also helped us in this endeavor.

Murnane (1975), among others, has found that, relative to reading, mathematics is an academic subject that tends to be influenced more by differences across schools than differences across families. This observation is further supported by the summer learning literature, which measures achievement gains, or losses, when students are out of school during the summer months. This literature suggests that, without the benefit of school, students tend to suffer more pronounced summer achievement losses in mathematics than in reading (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Further, Cooper and his colleagues noted that larger socioeconomic-based differences in summer learning outcomes are found for reading than mathematics. In explaining these differences, the authors noted that all children's home environments tend to provide more out-of-school opportunities to practice reading than mathematics skills. Because reading tends to be more dependent on out-of-school opportunities to learn than mathematics, differences between the out-of-school literacy environments of students from varying social classes become more salient for understanding students' reading outcomes. The focus on math helped us in further addressing potential family background differences that remained after our sample selection procedures.

### Measures

Brief descriptions of all measures are provided in Table 1 along with means and standard deviations for the original sample of 3,981 students. For all measures summarized in Table 1, with the exception of the third- and sixth-grade CTBS/4 Total Math scale scores, we developed four yearly measures. After developing each yearly measure, we took their average as the final longitudinal measure. Thus, the final measures used in the analyses represented the typical individual, classroom, and school experiences of each child from the third through sixth grades. As the descriptions in Table 1 suggest, most variables used in the analysis were composite measures. In developing each of the four yearly composite measures, each item was standardized to a mean of 0 and standard deviation of 1, and the mean of the items representing each construct was obtained as the final yearly factor measure. The factor structures of all yearly composite measures were then analyzed using principal components analysis with varimax rotation. As a summary of the internal consistency reliability of each derived construct, Table 1 also provides Cronbach's alpha for the first of the four yearly composites.

We developed a set of individual characteristics of resiliency and four categories of school characteristics related to academic resilience: peer group composition variables; school resources variables; effective schools measures; and supportive school environment measures. We included in our analysis some of the most widely cited individual characteristics associated with resilience: self-esteem; self-efficacy; engagement in school; and a positive disposition. The choice of these variables allowed us to test the generalizability across racial/ethnic groups of an accepted set of individual fac-

TABLE 1. Descriptions of Variables

| Variable Name | Description |
|---|---|
| CTBS/4 Total Math scale scores | Third- ($M$ = 676.36, SD = 46.69) and sixth-grade ($M$ = 733.01, SD = 47.80) vertical scale scores composed of the Math Concepts and Applications and Math Computation subtests. |
| Socioeconomic status | A composite measure derived from the income, education level, and occupation reported by the parent ($M$ = 0.01, SD = 0.76). |
| Student engagement | A composite measure of the extent to which teachers agreed that a student expressed attitudes and exhibited behaviors indicating an interest in schoolwork and a desire to learn ($M$ = 0.10, SD = 0.63, $\alpha$ = .92). |
| Self-esteem | A composite measure of how strongly each student agreed that he or she is a good person of value ($M$ = 0.04, SD = 0.41, $\alpha$ = .58). |
| Self-efficacy in mathematics | A composite measure of the degree to which students reported that they were good mathematics students who had few problems with the subject ($M$ = 0.07, SD = 0.54, $\alpha$ = .63). |
| Positive attitude toward school | A composite measure of how positively students viewed attending school ($M$ = 0.00, SD = 0.46, $\alpha$ = .52). |
| Percentage minority students | The percentage of minority students attending the school ($M$ = 0.35, SD = 0.33). |
| Percentage free-lunch eligibility | The percentage of students at the school eligible for free or reduced-price lunch assistance ($M$ = 0.50, SD = 0.26). |
| Percentage low-achieving students | The percentage of students at the school achieving below the fiftieth national percentile ($M$ = 0.36, SD = 0.17). |
| Availability of instructional resources | A composite measure of teacher reports of the availability of a variety of basic instructional resources, such as notebooks, pens and pencils, and a photocopier ($M$ = 0.06, SD = 0.71). |
| Teacher's years of experience | A continuous variable based on teachers' responses to the question, "Counting this year, how many years in total have you taught at either the elementary or secondary level?" ($M$ = 14.24, SD = 5.58). |
| Class size | A continuous variable representing teachers' reports of the typical number of students in their classrooms ($M$ = 24.33, SD = 4.14). |
| Percentage of academic instruction | A continuous variable indicating the percentage of classroom time teachers reported that they devoted to academic instruction ($M$ = 0.70, SD = 0.10). |
| Clear goals | A composite variable indicating the extent to which teachers reported that school goals were clearly stated and that the staff shared a vision for achieving high standards ($M$ = 0.00, SD = 0.58, $\alpha$ = .65). |
| Principal leadership | A composite variable measuring the degree to which teachers reported that the principal was an effective administrator and was supportive of their needs ($M$ = −0.03, SD = 0.59, $\alpha$ = .77). |
| Monitoring student progress | A composite variable indicating the degree to which teachers shared information with other teachers about a student's academic progress ($M$ = 0, SD = 0.56, $\alpha$ = .60). |
| Safe and orderly environment | A composite measure of the degree to which principals reported a lack of student behavioral problems ($M$ = −0.02, SD = 0.52, $\alpha$ = .82). |
| Positive teacher-student relations | A composite measure of the degree to which students reported positive classroom interactions with their teachers ($M$ = 0.35, SD = 0.35, $\alpha$ = .61). |
| Support for family involvement | A composite variable indicating the extent to which parents reported opportunities for families' involvement in the life of the school ($M$ = 0.03, SD = 0.39, $\alpha$ = .71). |

NOTE.—$N$ = 3,981.

tors related to the resilience construct. We also attempted to choose sets of school variables that were representative of each of the four school effects models. This choice of school variables supported our analysis of how well accepted school-effects models generalized across racial/ethnic groups, and it supported our examination of whether the students' exposure to the various school characteristics differed by resilience status. Below, we provide more detailed information about the questionnaire items on which the measures were based.

***Individual characteristics.*** We developed four measures of individual characteristics associated with resilience. General self-esteem was based on a 10-item scale derived from Rosenberg (1979). Typical items include "I feel good about myself" and "I am able to do things as well as most people." Rather than assessing general academic competencies, we used a domain-specific assessment of students' efficacy in mathematics (Pajares, 1996). This scale is composed of four items, including "I have a lot of trouble in math" and "I am very good at math."

Student engagement was based on 10 items, reported by the student's classroom teacher, in the Student Profile Instrument, including ratings of the extent to which the student pays attention in class, works up to his or her potential, and takes part in class discussions. Most items making up this scale fall into level 1 (i.e., acquiescence to classroom and school rules) of Finn's (1989) taxonomy of engagement, but several represent characteristics of level 2 engagement (i.e., initiative taking by the student). Finally, we measured students' overall disposition toward school using a six-item scale, which included items such as how enjoyable the student found mathematics class and how positively the student felt about going to school every day.

***Peer group characteristics.*** We developed three variables to summarize the peer group characteristics within the schools that students attended. These variables took into account two widely used school-level indicators of risk—the concentration of economically disadvantaged and minority students, and the overall academic performance of students within the school. All three variables were based on single items drawn from the Characteristics of Schools and Programs Instrument, which was completed by the school principal or by other school personnel who had access to the requested information. The variables, percentage minority students, percentage free-lunch eligibility, and percentage low-achieving students, are described in Table 1.

***School resources.*** Rather than school-level measures of resources, the three variables derived from the Regular Classroom Teacher Questionnaire represented the resources students experienced in their classrooms. Our first variable, the teacher's years of experience, was noted as one of the most important school resources in Hedges, Laine, and Greenwald's (1994) synthesis of education production-function studies. The importance of our second variable, class size, was highlighted by the recent statewide experiment of Word et al. (1990) that documented the strong effects of small class sizes on student achievement. Along with an experienced teacher and the greater attention afforded by a small class, students need basic supplies, such as pencils and notebooks. Our third measure, the availability of instructional resources, was based on teachers' average responses to six items assessing the availability of: (*a*) notebooks for students; (*b*) pens and pencils; (*c*) ditto masters; (*d*) photocopiers; (*e*) basic supplies; and (*f*) general materials to meet students needs.

***Effective schools variables.*** Although the effective schools literature has generated a longer list of school characteristics associated with effectiveness, the four variables we developed from teacher questionnaires are among the most frequently cited. Few would disagree that maximizing learning time, monitoring student progress, having clear schoolwide goals, and strong principal leadership are features strongly identified with the effective schools model (Levine & Lezotte, 1995). Percentage of academic instruction was based on regular classroom teachers' reports of the proportion of classroom time that was devoted to academic activities rather than noninstructional tasks (e.g., attendance), the personal or social development of students, or other classroom activities. The monitoring student progress measure was based on three items from the Classroom Teacher Questionnaire that assessed the frequency with which teachers measured students' aca-

demic progress and shared this information with other classroom teachers, compensatory education teachers, or special education teachers.

Clear goals and strong principal leadership were composite factors based on responses from both regular classroom and resource (i.e., Chapter 1) teachers. Clear goals was comprised of three items that asked regular or resource teachers how strongly they agreed that "Most of my colleagues share my beliefs and values about what the central mission of the school should be"; "Goals and priorities for the school are clear"; and "Staff members maintain high standards." Principal leadership was based on six items asked of regular or resource teachers. Typical items are "The principal deals effectively with pressures from outside the school that might interfere with my teaching" and "The principal sets priorities, makes plans, and sees that they are carried out."

***Supportive school environment.*** Three composite variables comprised this category, which focused on the school variables most clearly linked to the psychosocial construct of resilience. One variable, safe and orderly environment, also has been mentioned as an important effective schools variable. Due to the stronger link between this variable and resilience, rather than its relation to school effectiveness in general, we included it within the supportive school environment category. The safe and orderly environment variable was based on principals' ratings of the degree to which nine behaviors, including gang activity and physical conflict among students, were problems with students at their schools. Positive teacher-student relations, based on six items from the Student Questionnaire, assessed the degree to which students reported positive and supportive relationships with their teachers. Typical items include "Most of my teachers really listen to what I have to say" and "In class I often feel 'put down' by my teachers." The third variable, support for parent involvement, was based on 15 items from the Parent Questionnaire, including "The school feels it is important for parents to participate in the life of the school" and "Parents have a say in setting school policy."

### Analytical Procedures

After obtaining our sample of low-SES resilient and nonresilient students based on the regression model described previously, we began by comparing simple descriptive statistics by resilience status and by racial/ethnic group. These descriptive statistics are presented in Table 2. To answer the primary questions of the study, we performed a series of multivariate analyses of variance (MANOVAs) with resilience status and race/ethnicity as factors of classification. We first examined differences between resilience groups and among racial/ethnic groups on the set of individual characteristics. Second, we examined group differences on the four sets of school characteristics. In addition to the main effects of resilience status and race/ethnicity, our analyses also examined the potential interactions of these two factors. Therefore, these analyses answered (*a*) whether the individual characteristics and schools of resilient and nonresilient students differed; (*b*) whether the individual characteristics and schools of White, African-American, and Latino students differed; and (*c*) which, if any, of the individual and school characteristics were more important predictors of resilience among certain racial/ethnic subgroups.

Because students were sampled within schools, the variances computed for the student-level measures were smaller than would be obtained if a simple random sample of students were drawn. To compensate for potentially underestimated variance estimates, we used a conservative Type I error rate of $\alpha = .001$ for all MANOVA tests of significance. When statistically significant results were obtained from the MANOVA, followup univariate analyses employed a similarly conservative Type I error rate of $\alpha = .01$.

TABLE 2. Sample Means and Standard Deviations by Resilience Status and by Race/Ethnicity

| | Resilience Status | | | | Race/Ethnicity | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Resilient ($n$ = 404) | | Nonresilient ($n$ = 521) | | African American ($n$ = 236) | | White ($n$ = 398) | | Latino ($n$ = 291) | |
| Variable | $M$ | SD | $M$ | SD | $M$ | SD | $M$ | SD | $M$ | SD |
| Individual characteristics: | | | | | | | | | | |
| Student engagement | .11 | .59 | −.38 | .59 | −.22 | .64 | −.09 | .62 | −.03 | .65 |
| Self-efficacy in mathematics | .01 | .56 | −.16 | .59 | −.05 | .53 | −.02 | .60 | −.14 | .57 |
| Positive attitude toward school | .08 | .38 | −.11 | .50 | −.03 | .44 | −.02 | .45 | .06 | .44 |
| Self-esteem | −.02 | .39 | −.10 | .39 | −.01 | .35 | −.06 | .43 | −.09 | .36 |
| Peer group characteristics(%): | | | | | | | | | | |
| Minority students | .51 | .37 | .49 | .35 | .70 | .27 | .20 | .22 | .75 | .25 |
| Free-lunch eligibility | .65 | .25 | .64 | .24 | .79 | .19 | .50 | .22 | .74 | .19 |
| Low-achieving students | .43 | .17 | .43 | .19 | .49 | .17 | .34 | .14 | .50 | .16 |
| School resources: | | | | | | | | | | |
| Class size | 23.83 | 4.43 | 23.42 | 4.42 | 23.08 | 4.42 | 22.87 | 3.74 | 25.18 | 4.90 |
| Availability of instructional resources | .10 | .78 | .08 | .59 | .12 | .70 | .09 | .76 | .07 | .64 |
| Teacher's years of experience | 14.61 | 5.74 | 13.60 | 5.63 | 13.58 | 5.36 | 14.56 | 5.83 | 14.12 | 5.81 |
| Effective schools features: | | | | | | | | | | |
| Clear goals | −.02 | .61 | −.08 | .60 | −.14 | .66 | −.02 | .58 | −.01 | .58 |
| Percent of academic instruction | .71 | .11 | .70 | .11 | .71 | .11 | .70 | .11 | .70 | .10 |
| Strong principal leadership | −.03 | .60 | −.01 | .59 | −.02 | .60 | −.06 | .61 | .03 | .56 |
| Monitoring student progress | −.03 | .65 | −.03 | .60 | −.15 | .60 | .04 | .57 | −.04 | .70 |
| Supportive school community: | | | | | | | | | | |
| Safe and orderly environment | −.06 | .50 | −.16 | .53 | −.23 | .39 | .03 | .51 | −.19 | .58 |
| Positive teacher-student social relations | .39 | .31 | .25 | .36 | .28 | .33 | .32 | .35 | .36 | .34 |
| Support for family involvement | −.11 | .37 | −.11 | .34 | −.09 | .34 | −.06 | .34 | −.20 | .38 |

## Results

### Individual Characteristics

Results of the two-way resilience status × race MANOVA for individual characteristics associated with resilience are summarized in Table 3. The multivariate tests of both main effects were statistically significant ($p < .001$), whereas the interaction of resilience status and race was not. Univariate analyses for resilience status revealed statistically significant main effects for all four outcomes, student engagement, self-efficacy in mathematics, positive attitude toward school, and self-esteem, all of which favored resilient students. Univariate analyses for race revealed a main effect for self-efficacy in mathematics. Post hoc comparisons using the Bonferroni method indicated that low-SES White students tended to have greater self-efficacy in math than their Latino counterparts.

Thus, greater engagement in academic activities, efficaciousness in mathematics, a more positive outlook toward school, and higher self-esteem were characteristic of low-SES students who achieved resilient outcomes in mathematics. Effect sizes, which were calculated as the resilient students' mean on the variable of interest minus the nonresilient students' mean divided by the pooled standard deviation, for student engagement revealed the largest difference of $d = 0.75$. Effect sizes for self-efficacy in mathematics, $d = 0.29$, positive attitude toward school, $d = 0.27$, and self-esteem, $d = 0.21$, also revealed substantial differences favoring resilient students. Generally, these findings were fairly consistent across racial/ethnic groups, because the resilience status × race interaction did not attain statistical significance. In this way, all four factors were similarly important in distinguishing resilient and nonresilient White, African-American, and Latino students.

### Peer Group Characteristics

The MANOVA results for peer group characteristics are presented in Table 4. Statistically significant effects were found for race only ($p < .001$). Univariate analyses for race revealed differences for all three variables, percentage minority students, percentage free-lunch-eligible students, and percentage low-achieving classmates. Post hoc comparisons using the Bonferroni method revealed that low-SES White students attended schools with smaller proportions of minority students, free-lunch-eligible students, and low-achieving classmates than low-SES African-American and Latino students, regardless of resilience status.

Despite the potential risks associated with attending schools with high concentrations of underachieving, economically disadvantaged minority students, these results suggest that it had little bearing on students' resilience status. This finding was relatively consistent across racial/ethnic groups, though low-SES African-American and Latino students were consistently more likely than low-SES White students to at-

TABLE 3. Multivariate Analysis of Variance for Individual Characteristics

| | | Multivariate | | Univariate $F$ | | | |
|---|---|---|---|---|---|---|---|
| Source | $df$ | $F$ | $df$ | Student Engagement | Mathematics Self-Efficacy | Self-Esteem | Attitude toward School |
| Resilience status | 1 | 39.60*** | 4, 916 | 147.87*** | 19.39*** | 8.69** | 38.14*** |
| Race | 2 | 5.11*** | 8, 1832 | 4.13 | 5.05*** | 3.19 | 2.07 |
| Resilience status × race | 2 | 1.19 | 8, 1832 | 1.91 | .58 | .36 | .10 |
| Within-group error | 919 | | | (.35) | (.32) | (.15) | (.19) |

NOTE.—Values enclosed in parentheses represent mean square errors.
**$p < .01$.
***$p < .001$.

tend schools with high proportions of low-achieving students from low-SES and minority backgrounds.

### School Resources

The results of the two-way resilience status × race MANOVA, listed in Table 5, indicated that the only statistically significant difference was for race ($p < .001$). Univariate analyses revealed a difference among racial groups for class size. Bonferroni post hoc comparisons indicated that low-SES Latino students were more likely to attend larger classes than low-SES White and African-American students.

Thus, these outcomes indicate that conventional indicators of school resources, such as class size, teacher experience, and the overall availability of basic instructional supplies, were not necessarily important distinguishing features of the schools attended by academically resilient students. There is some evidence, though, that low-SES minority students attended schools with lower levels of resources than did low-SES White students.

### Effective Schools Variables

Results for the two-way MANOVA, listed in Table 6, revealed a main effect for race ($p < .001$), but no main effect for resilience status. Univariate analyses revealed only one difference by race for the monitoring student progress variable. Post hoc comparisons using the Bonferroni method indicated that low-SES White students held an advantage over low-SES African-American students, in that they attended schools in which teachers reported that they more closely monitored their progress. The MANOVA for the interaction of race × resilience status did not attain our stringent criterion of $p < .001$ ($p = .017$).

These results suggest that the schools attended by resilient and nonresilient students do not differ in terms of widely accepted effective schools indicators. Relative to low-SES White students, though, we

TABLE 4. Multivariate Analysis of Variance for Peer Group Characteristics

| | | Multivariate | | Univariate *F* | | |
|---|---|---|---|---|---|---|
| Source | *df* | *F* | *df* | Minority (%) | Free Lunch (%) | Low Achievers (%) |
| Resilience status | 1 | .94 | 3, 917 | 1.73 | .81 | .08 |
| Race | 2 | 152.05*** | 6, 1834 | 503.54*** | 192.32*** | 107.38*** |
| Resilience status × race | 2 | 1.34 | 6, 1834 | 2.91 | 1.54 | .10 |
| Within-group error | 919 | | | (0) | (0) | (.02) |

NOTE.—Values enclosed in parentheses represent mean square errors.
***$p < .001$.

TABLE 5. Multivariate Analysis of Variance for School Resources

| | | Multivariate | | Univariate *F* | | |
|---|---|---|---|---|---|---|
| Source | *df* | *F* | *df* | Class Size | Instructional Resources | Teacher's Experience |
| Resilience status | 1 | 2.30 | 3, 917 | .95 | .28 | 6.19 |
| Race | 2 | 8.88*** | 6, 1834 | 23.47*** | .39 | 2.13 |
| Resilience status × race | 2 | .56 | 6, 1834 | .82 | .55 | .40 |
| Within-group error | 919 | | | (18.56) | (.50) | (32.41) |

NOTE.—Values enclosed in parentheses represent mean square errors.
***$p < .001$.

found that low-SES African-American students attended schools that were less characteristic of the effective schools model. This inequity may be of special importance because we found some evidence that the resilience of low-SES minority students was more dependent on attending an effective school than was the resilience of low-SES White students.

### Supportive School Community

Results of the two-way resilience status × race MANOVA are summarized in Table 7. Both main effects were statistically significant ($p < .001$). Univariate analyses revealed differences for safe and orderly environment and for positive teacher-student relations, both of which favored resilient students. Differences between resilient and nonresilient students were equivalent to effect sizes of 0.41 and 0.19 for, respectively, positive teacher-student relations and safe and orderly environment

Univariate analyses also revealed statistically significant differences by race for safe and orderly environment and support for family involvement. Bonferroni post hoc comparisons indicated that low-SES White students attended schools with safer and more orderly environments than did minority students. The difference in support for parent involvement favored White and African-American students over Latino students. Relative to low-SES Latino students, low-SES White and African-American students attended schools that were more supportive of family involvement.

A more supportive school environment, therefore, was associated with students' academic resilience. A safe and orderly school environment and positive teacher-student relationships were the characteristics that mattered most. However, there appeared to be some inequities in the distribution of these school characteristics by race. Most importantly, low-SES White students at-

TABLE 6. Multivariate Analysis of Variance for Effective Schools Features

| | | Multivariate | | Univariate *F* | | | |
|---|---|---|---|---|---|---|---|
| Source | *df* | *F* | *df* | Clear Goals | Percent Academic Instruction | Strong Principal Leadership | Monitoring Student Progress |
| Resilience status | 1 | 2.16 | 4, 916 | .98 | 3.79 | .47 | .04 |
| Race | 2 | 4.63*** | 8, 1832 | 3.84 | .84 | 1.83 | 6.61** |
| Resilience status × race | 2 | 2.33 | 8, 1832 | 1.07 | 6.90** | .52 | .94 |
| Within-group error | 919 | | | (.36) | (.01) | (.35) | (.39) |

NOTE.—Values enclosed in parentheses represent mean square errors.
**$p < .01$.
***$p < .001$.

TABLE 7. Multivariate Analysis of Variance for Supportive School Community

| | | Multivariate | | Univariate *F* | | |
|---|---|---|---|---|---|---|
| Source | *df* | *F* | *df* | Safe and Orderly Environment | Positive Teacher-Student Relations | Support for Family Involvement |
| Resilience status | 1 | 12.90*** | 3, 917 | 9.54** | 31.20*** | .02 |
| Race | 2 | 13.12*** | 6, 1834 | 26.01*** | 2.07 | 12.94*** |
| Resilience status × race | 2 | 2.00 | 6, 1834 | 1.11 | 1.92 | 2.43 |
| Within-group error | 919 | | | (.25) | (.11) | (.12) |

NOTE.—Values enclosed in parentheses represent mean square errors.
**$p < .01$.
***$p < .001$.

tended schools with safer and more orderly environments than did their low-SES African-American and Latino peers.

## Discussion

### SES and Race

Most previous research on academic resilience has focused on at-risk minority students. Our results suggest that this focus has been well justified, in that the "double jeopardy" of being poor and a minority student exposes students to greater risks and fewer resilience-promoting conditions. Within our sample of African-American, Latino, and White students from relatively homogeneous low-SES backgrounds, minority students have lower academic self-efficacy and are exposed to school environments that are less conducive to academic resilience. These differences between minority and White children and their schools could in part explain the frequently noted achievement gaps that separate minority and majority students.

With respect to overcoming these achievement gaps, we found some evidence indicating that effective schools characteristics may be more important for African-American students' academic resilience than for White and Latino students' resilience. This finding is consistent with earlier research on effective schools. Because the foundation of the effective schools research tradition was built on a model of "what works" for disadvantaged African-American students (Edmonds, 1979), it seems appropriate that the effective schools model had somewhat greater predictive strength for our low-SES African-American subsample than for our other subsamples.

In general, though, the results from the present study support the applicability of uniform individual- and school-level models of academic resiliency to all low-SES students, regardless of their race or ethnicity. Additional research is needed to assess our tentative findings for the roles of effective schools characteristics in shaping African-American students' academic resilience. The link between minority students' resilience and initiatives that address disparities between school and home environments, such as multicultural education, and other work, such as that of Boykin et al. (1982) on teaching with "verve," also deserves the attention of researchers.

### Individual Student Characteristics Promoting Resilience

Regardless of a student's race, the individual characteristics we studied consistently differentiated resilient and nonresilient students. Taken together, our findings provide a clear profile of the individual characteristics of academically resilient elementary students, a profile that appears to apply to children placed at risk from all racial backgrounds. Greater engagement in academic activities ($d = 0.75$), a stronger sense of efficaciousness in mathematics ($d = 0.29$), a more positive outlook toward school ($d = 0.27$), and higher self-esteem ($d = 0.21$) were the characteristic features differentiating low-SES students who achieved resilient outcomes in mathematics from those who did not. The relative strength of student engagement in differentiating between resilient and nonresilient students also provides evidence consistent with that presented by Finn and Rock (1997), suggesting that students' active participation and interest in the classroom and school are important factors for counteracting academic risk.

### A School Model of Resilience

What form should a school-level model for fostering academic resilience take, and how may this model inform policy and theory? First, efforts to minimize overt markers of risks within the school do not seem to be productive policy options for promoting the academic resilience of elementary students. Though the peer group may be important for adolescent students, our analysis indicates that the social and academic backgrounds of an elementary student's

peers have little to do with his or her chances of achieving resilient academic outcomes. Similarly, the risks associated with attending an underfunded school with limited resources do not appear to be associated with students' outcomes.

These two results, though, should be considered in light of several caveats. Because low-SES students tend to attend schools with high concentrations of poor and minority students who are low achievers, our regression model identifying resilient and nonresilient students, which controlled for student SES, may have partialled out some of the potential effect of these correlated school-level variables. Therefore, our analyses may have underestimated the effects of the peer composition model. This argument does not appear to apply to the findings for school resources, though, because our results do not suggest that low-SES students attended schools with resources that differed substantially from those afforded the average student in the Prospects sample. The composition of the student body at each school and overall measures of school resources, though, are less than precise measures of whom each child befriends at the school and what available resources are at his or her disposal. Both sets of measures could have varied considerably among students within the same school. It is also likely that this simple model of peer effects does not adequately capture the underlying mechanisms that actually drive school compositional or context effects.

Rather than the widely used school composition and school production-function models, the most powerful school models for promoting resiliency appear to be those that include elements that actively shield children from adversity. Most importantly, our analysis of the multivariate supportive school community model revealed that resilient students tend to develop much stronger and more supportive relationships with their teachers than do nonresilient students.

Comparisons between the supportive school community model and the effective schools model pit two contrasting theories about which school processes are most important for fostering students' academic success. Phillips (1997) characterized the effective schools research and the early research on Catholic and private schools as belonging to the theoretical stream of "academic press." Phillips cites variables such as the amount of time spent on instruction, clear achievement-oriented goals, and high expectations for student achievement as exemplars of this tradition. In contrast to the emphasis that the academic press model places on individualism and instrumental motivation, the more recent communitarian model of school organization cites community, democracy, and an ethic of caring as indicators of successful schools (Battistich, Solomon, Kim, Watson, & Schaps, 1995; Bryk, Lee, & Smith, 1990; Griffith, 2002; Noddings, 1988; Phillips, 1997; Shouse, 1996). Also, rather than the direct link between academic press and student achievement, both the communitarian model and the supportive school community model stress that progress toward improved achievement begins with efforts to foster the healthy social and personal adjustment of students.

Our analysis lends the greatest support to the communitarian model of school organization. The relative strength of our supportive school community model is particularly appealing during an era when, as Phillips (1997) pointed out, traditionally communal institutions like families and neighborhoods have become less stable and supportive than they once were. The model is also appealing in the sense that its emphasis on the psychosocial adjustment of children addresses the potential lack of fit between the behavioral patterns and values socialized in the context of low-income and minority families and communities and those expected in the mainstream classroom and school contexts. Finally, and most importantly, the model has clear and direct applicability to the problem of academic risk

because of its focus on fostering students' resilience.

### Limitations

Several limitations of the study are associated with the definition of resilience and the definitions of the school effects models. Resilience is an elusive construct. In the current study, we have conceived of resilience in mathematics as a developmental process occurring over grades 4, 5, and 6 that is eventually characterized by higher-than-expected academic performance despite the adversities associated with poverty and initial low achievement. This method is somewhat of an advancement in research on resilience, but longitudinal designs of even greater duration would further understanding of this complex developmental process. Our method does not, for instance, distinguish potentially important differences on an array of factors that may have affected student outcomes on our baseline third-grade achievement measure, including differences in access to early childhood interventions, differences in the quality of early elementary instruction that the child received, and potential family background differences associated with early cognitive development. Without earlier baseline measures, at first grade or even prior to that, our models are insensitive to these potentially important differences in students' early academic development.

Regarding the theoretical models of how schools may affect students' resilience, as we hypothesized, the models with clearer links to fostering the psychosocial process of resilience were more consistent predictors of this outcome. We are aware, though, that one variable comprising our supportive school community model, safe and orderly environment, also appears in some writings on effective schools models. This point is somewhat of a limitation of our study, in that one may argue that this variable is as much an effective schools feature as a supportive school community feature. In this respect, we urge researchers to adopt stronger theoretical and conceptual frameworks for understanding resilience. Rather than using discrete school effects models that may be more or less applicable to understanding how schools may promote resilience, future efforts should model direct theories of action that are associated with resilience. In this way, researchers may move beyond applying these prior school effects models, which provide limited theoretical or practical understanding for how to promote resilience, and toward stronger and more direct theories and replicable models of how schools can promote academic resilience.

### Implications

Notwithstanding, this article adds to the academic debate concerning models of school effects and to practical discussions of how to improve schools and the academic achievement of the students they serve. Specifically, our analyses have important implications for both theoretical and practical models for improving schools for poor and minority students. We find that attentiveness to the psychosocial adjustment and school engagement of academically at-risk students are the keys to academic resilience. We also find that school-based initiatives that actively shield disadvantaged children from the risks and adversities within their homes, schools, and communities are more likely to foster successful academic outcomes than are several other school-based efforts. The large differences between resilient and nonresilient children on the individual characteristics, and the roots of resilience within individual differences, also suggest that there may be as much to learn by studying the characteristics of "effective students" as by studying the features of "effective schools." Future analyses that model the correlates of at-risk students' academic success as potential pathways and interactions between individual differences and school organizational attributes may be especially powerful for understanding resilience among poor and minority children.

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