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ABSTRACT

In order to address concerns about the intellectual quality of students' work under various "active learning" formats appearing in education reform efforts, this study developed a model of authentic pedagogy and assessed its presence in 23 restructured schools. The proposed authentic pedagogy is consistent with an active learning perspective and posits standards of intellectual quality, rather than teaching techniques or processes, as the central target of innovation. The study defined authentic academic achievement with three criteria: construction of knowledge, disciplined inquiry, and value beyond school. The school study examined instruction for one year at 23 schools (equally divided among elementary, middle, and high schools) with emphasis on six valued outcomes: (1) authentic pedagogy and authentic academic performance; (2) equity for students; (3) empowerment of teachers, parents, and principals; (4) sense of community among staff and students; (5) reflective professional dialogue; and (6) accountability. The study found that schools varied substantially in their success on standards for authentic pedagogy. Overall, pedagogy was rarely rated at the higher levels of the study's standard indicating that the promotion of authentic teaching is enormously difficult. Authentic pedagogy did appear to improve authentic academic performance for all students in mathematics and social studies. Finally, student achievement was reasonably equitable across gender, race, ethnicity, and socioeconomic status. (Contains 44 references.) (JB)

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AUTHENTIC PEDAGOGY AND STUDENT PERFORMANCE

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I. Problem: Active Learning without Standards for Intellectual Quality

A variety of school reform proposals advocate moving from traditional teacher-centered teaching toward more progressive, student-centered or constructivist classrooms.[1] Important distinctions might be made among these proposals, but they reflect a common interest in students actively constructing meaning, grounded in students' experience, rather than students simply absorbing and reproducing knowledge transmitted from subject-matter fields. This common dimension might be summarized as active learning.

A host of activities have the potential to engage students in thinking, problem solving, and construction of meaning. These include small group discussion; cooperative learning tasks; independent research projects; use of hands-on manipulatives, scientific equipment and arts/crafts materials; use of computer and video technology; community-based projects such as surveys or oral histories; and service learning.

Students often show more animated, visible engagement in these activities, and teachers may interpret heightened engagement as student learning. But even highly active students can produce work that is intellectually shallow and weak. We have observed situations like the following: students working diligently in small groups to complete routine mathematics or vocabulary assignments, but one student gives the answer for others to copy; students completing interviews of community residents, with all questions prespecified by the teacher and the students' merely recording respondents' short answers, without trying to interpret their cumulative meaning; students using the card catalogue, computers, and mathematics

[1]For diverse examples, see Bruer (1993), Brooks & Brooks (1993), Wells & Chang-Wells (1992), Elmore (1990), Marshall (1992), Sizer (1992).

manipulatives to reinforce superficial exposure to fragments of knowledge without promoting in-depth understanding of an idea.

Reform efforts focused on active learning may lead down an illusory path where student participation in activities can become an end in itself, regardless of the intellectual quality of students' work.[2] All persons, regardless of their formal education "construct meaning." Presumably, the point of education is to improve the quality of the meanings we construct, or to help students "use their minds well" (Sizer, 1984). This requires standards for intellectual quality; that is, criteria that help to define the difference between successful, powerful, and laudable uses of the mind versus uses of the mind that signify mediocrity, failure or unproductive cognitive work. Resistance to student-centered teaching may be due in part to teachers and parents who have already sensed this problem. To address the skepticism, educators will need to show both that new approaches to pedagogy are grounded in high intellectual standards and that practice faithful to the standards actually enhances student performance.

This article addresses each concern. First, we offer a conception of authentic pedagogy consistent with an active learning perspective, but which posits standards of intellectual quality, rather than teaching techniques or processes, as the central target of innovation. Then we provide empirical evidence that authentic pedagogy (defined by these standards) pays off in student performance across different grades and subjects. The standards of intellectual quality for authentic pedagogy and evidence of a link between authentic pedagogy and student

[2]Regnier (1993) offers a succinct explanation of how preoccupation with technique in education stifles intellectual life in schools.

performance should advance research and practice on student-centered, or constructivist teaching.

II. Authentic Human Achievement: A Source of Standards for Pedagogy and Student Performance

Calls for education reform arise not simply from high drop-out rates or low test scores, but also from concerns that the kind of mastery required for students to earn school credits, grades, and high scores is frequently trivial, contrived, or meaningless. In contrast "authentic" academic achievement stands for accomplishment that is significant, worthwhile, and meaningful. Consider the kinds of mastery demonstrated by successful adults -- scientists, musicians, business entrepreneurs, politicians, craftspeople, attorneys, novelists, nurses, designers. What key characteristics of their work justify calling their accomplishments authentic? And how do these characteristics of "real" accomplishment differ from the work that students complete in school?[3] We define authentic academic achievement through three criteria: construction of knowledge, disciplined inquiry and value beyond school.[4]

Construction of Knowledge

Persons in the diverse fields named above face the primary challenge of constructing or producing, rather than reproducing, meaning or knowledge. They express this knowledge in written and oral discourse (words and symbols in documents and conversation or speeches), by

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[3]This complicated matter involves controversial educational values, it has not received extensive scholarly study, and it beckons for interdisciplinary analysis of the relationship between formal attempts to educate and the ways that human competence is expressed in non-educational settings. The conception proposed here is based upon the work of Archbald & Newmann (1988), Berlak et al. (1992), Resnick (1987), and Wiggins (1993).

[4]These ideas have evolved from Archbald and Newmann (1988). The definitions that follow are more fully developed in Newmann, Secada & Wehlage (forthcoming).

making and repairing things (products such furniture, buildings, videos, sculpture), and in performances for audiences (musical, dramatic, athletic). In contrast, the conventional curriculum asks students only to identify the discourse, things, and performances that others have produced and codified, for example by recognizing the difference between verbs and nouns, between socialism and capitalism; by matching authors with their works; by correctly labeling rocks and body parts.

Disciplined Inquiry

A second defining feature of authentic academic achievement is its reliance upon a particular type of cognitive work: disciplined inquiry. Disciplined inquiry consists of three main features: use of a prior knowledge base from one or more fields; striving for in-depth understanding rather than superficial awareness; and expressing conclusions through elaborated communication.[5]

Prior knowledge base. Authentic accomplishments build on prior knowledge that has been accumulated in a field. The knowledge base includes facts, vocabularies, concepts,

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[5]A broad definition of authentic human accomplishment might not always illustrate disciplined inquiry as suggested by academic study (Gardner, 1983; 1993). For example, feats of wilderness survival that depend largely on ingenuity and courage, forms of athletic prowess, or selfless acts of caring, devotion, and personal sacrifice might all be considered authentic; but they may not illustrate much disciplined inquiry. Since schooling, at a minimum, should promote academic study, this conception of human accomplishment is admittedly limited to achievements that depend upon the use of formal knowledge. Formal knowledge itself, of course, encompasses an enormous diversity in the liberal arts, applied professions and crafts, along with fields of literature, discourse. and practice that may not be recognized as "disciplines" in schools or universities. From our point of view, a field of expertise that has accumulated a formal knowledge base and that functions as a community of discourse to advance the knowledge, can be considered a discipline, even though it may not have been institutionally established (e.g. through awarding of advanced degrees). Examples might include stamp collecting, model railroads, specialized computer user groups, or sky diving.

theories, algorithms and conventions for the conduct and expression of inquiry itself. Most cognitive work of school consists in transmitting prior knowledge to students.

In-depth understanding. Disciplined inquiry tries to develop in-depth understanding of a problem, rather than only passing familiarity with or exposure to pieces of knowledge. Prior knowledge is mastered, therefore, not primarily to become literate about a broad survey of topics, but to facilitate complex understanding on discrete problems. In-depth understanding requires more than knowing lots of details about a topic. Understanding occurs as one looks for, tests, and creates relationships among pieces of knowledge that can illuminate a given problem or issue. In contrast, many of the cognitive tasks of school ask students to show only superficial awareness of a vast number of topics.

Elaborated Communication. Scientists, jurists, artists, journalists, designers, engineers, and other accomplished adults working within disciplines rely upon complex forms of communication both to conduct their work and to express their conclusions. The language they use -- verbal, symbolic, and visual -- includes qualifications, nuances, elaborations, details, and analogs woven into extended expositions, narratives, explanations, justifications, and dialogue. In contrast, much of the communication demanded in school asks only for brief phrases: true or false, choosing from multiple choices, filling in blanks, or short sentences (e.g., "Prices increase when demand exceeds supply.")

Value Beyond School

The third distinction between authentic human achievement and conventional school achievement is that authentic achievements have *aesthetic*, *utilitarian*, or *personal value* apart from documenting the competence of the learner. When adults write letters, news articles,

insurance claims, poems; when they speak a foreign language; when they develop blueprints; when they create a painting, a piece of music, or build a stereo cabinet, they try to communicate ideas, to produce a product or to have impact on others beyond the simple demonstration that they are competent. Achievements of this sort have special value which is missing in tasks contrived only for the purpose of assessing knowledge (such as spelling quizzes, laboratory exercises, or typical essay exams). The cry for "relevant," "student-centered" curriculum, is, in many cases, simply a less precise expression of this desire that student accomplishment should have value beyond being an indicator of success in school.

Connections to Constructivism

The perspective known as constructivism itself embraces different points of view, but these share a general understanding of how students learn. This understanding challenges prior renditions of the learning process as transmission of information to passive receivers. We summarize this conception of learning, its implications for teaching, and we then indicate how constructivist perspectives are related to the three criteria for authentic academic achievement.[6]

Learning. Learning, even of apparently quite simple material, such as the definition or spelling of a word, is a complex, active mental process. It is not achieved merely by transmitting information to a student who reproduces what has been transmitted. Instead, the student works on, processes, interprets, and negotiates the meaning of the information encountered. The student's understanding or expression of the information "taught" is

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[6]This synthesis of the principles of constructivist learning and teaching relies on Becker and Varelas (1995), Brooks and Brooks (1993), Bruer (1993), Cohen, McLaughlin, and Talbert (1993), Driver (1995), Marshall (1992), Newmann (1992), Nystrand and Gamoran (1991), Resnick (1989), Resnick, Levine, and Teasley (1991), Wells and Chang-Wells (1992), Wood et al. (1995).

profoundly influenced by several factors: the student's prior knowledge, which itself is often far more substantial than previously assumed; the social context of values, expectations, rewards and sanctions in which the information is initially communicated and later expressed by the student; and the student's self-monitoring the process of learning. In short, students are constantly working to "make sense" of what they encounter, but how they do it depends much upon their own prior experience and the nature of social interaction that surrounds presentation of information and its later expression by the student.[7]

Teaching. As a descriptive theory of learning, constructivism may imply no logically direct prescriptions for how teachers should help children to learn. But the literature suggests several principles for practice that would seem to facilitate the learning process just described.

First, teachers must be familiar with, respect and actively use students' prior knowledge as they teach. Students' assimilation of new information will depend upon the extent to which the information helps them explain or meaningfully extend their known experience. Second, realizing that students are complex thinkers trying to make sense of the world, teachers must emphasize opportunities for higher order thinking and in-depth understanding, rather than only rote learning and superficial coverage of information. Third, instruction must offer multiple opportunities for students to use conversation, writing, and other forms of expression to process information. Without substantial efforts in extended expression, students' efforts to make and negotiate meaning will be stifled. Fourth, rather than taking the role of authoritative dispenser of information and truth, the teacher becomes a coach, facilitator, guide, a mentor in a

[7]Von Glaserfeld (1989) explains that constructivism is rooted in the epistemological principle that knowledge consists not in the discovery of a separate objective ontological reality, but in adaptive cognition which individuals use to organize their unique experiential worlds.

"cognitive apprenticeship," who inspires and nudges the student to do the active work of learning. Finally, if students are to devote the effort required for understanding, participants in the social setting for learning, students and teachers alike, must exemplify norms of collaboration, trust, and high expectations for intellectual accomplishment.

Links to authentic academic achievement. Our emphasis on construction of knowledge is consistent with the constructivist perspective of the student as a meaning-making person continuously negotiating prior experience with new information, even within the most traditional classrooms. But our vision extends this descriptive claim. We stipulate that authentic achievement requires "construction" to reach beyond retrieval and imitation of knowledge previously produced by self or others. Authentic construction of knowledge involves application, manipulation, interpretation or analysis of prior knowledge to solve a problem that cannot be solved simply by routine retrieval or reproduction.

Our concern for disciplined inquiry is less evident in the constructivist perspective, because that perspective generally does not prescribe better ways of constructing meaning, or suggest that some kinds of meanings might be more powerful or adequate than others. Richardson (1994) explained that constructivist principles fail to offer guidance on the role of formal knowledge in teaching, or when students should arrive at reasonably common, rather than idiosyncratic meanings. In contrast, we see disciplined inquiry as an essential source of intellectual quality. For academic achievement to be authentic, the meanings that students construct cannot be completely idiosyncratic; they must make sense to or be verified by a larger public. While disciplined inquiry offers no foolproof route to "truth" or to public acceptance,

it does offer standards that help to establish some understandings as intellectually more worthy than others.

Our criterion of value beyond school is consistent with the constructivist position that learning will be more adaptive or powerful when students can connect new information to their own experiences. Students construct meaning largely in response to rewards and sanctions in the sociocultural context (Resnick et al., 1991, Steffe & Gale, 1995). When students' achievements are valued only because they contribute to a record of success in school, success in these tasks often carries no adaptive value, because large numbers of students consider school to be only a restricted, even insignificant, arena of personal experience. In educational philosophy, Dewey (1916) has offered perhaps the most articulate case for aiming education toward achievement that has value beyond school. But this point has also been well supported through recent research on the nature of learning (Resnick, 1987).

We may find support for these criteria in prior literature, but we believe this formulation is necessary to sharpen two critical distinctions. First, techniques or procedures such as having students talk more or promoting independent research, offer no assurance that students will produce work of high intellectual quality. As explained in the beginning of this article, any technique, whether student-centered or otherwise, must be aimed toward standards of intellectual quality. Our three criteria define intellectual standards essential for authenticity, but they do not offer a comprehensive set of standards for intellectual quality or for grading students. For example, judgments about the quality of pedagogy and student learning will also depend on at least on two other standards for intellectual quality: the accuracy of what is taught and learned and the appropriateness of what is taught and learned. Accuracy refers to the extent to which

the material reflects the best authoritative expertise for answering the questions asked. Appropriateness refers to the extent to which the material is considered significant and important by those with authority to exercise some control over curriculum (e.g., government officials, parents, professional associations). Criteria for grading may also include student cooperative behavior, following instructions, or completing assigned work, regardless of quality. Articulating more specific standards for accuracy and appropriateness of content or for student grading was beyond the scope of this study. Bruer's (1993) careful examination of learners' cognitive activity seems consistent with this point. His emphasis upon general intellectual skills, metacognition, domain specific knowledge, and transfer call primary attention to the intellectual quality of classroom work rather than to techniques. His summary of insights from cognitive science clearly supports our concern for construction of knowledge and disciplined inquiry, with at east implicit support for "value beyond school." Second, to maximize the probability that students' school achievements have adaptive benefit, they must have some value beyond certifying success in school. But this criterion alone is not sufficient for intellectual quality. Construction of meaning through disciplined inquiry is what makes some solutions to real life problems more authentic than others.

Implications for School Vision and Pedagogy

All three are necessary, but not sufficient. Construction of knowledge, through disciplined inquiry, to produce discourse, products or performance that have value beyond success in school, can serve as standards of intellectual quality for assessing the authenticity of student performance. All three criteria are important. Students might confront a complex calculus problem demanding complex construction of knowledge and disciplined inquiry, and

solving the problem may be interesting. But if the solution has no value beyond proving competence to pass a mathematics course, its authenticity is diminished. Or, a student may write a letter to the editor, saying she opposes a newly proposed welfare plan. This may meet the criteria of constructing knowledge to produce discourse with value beyond school, but if it shows significant errors, or only shallow understanding of the issues, it would be less authentic because of shortcomings in disciplined inquiry.

The conception of authentic academic achievement is demanding in its insistence on all three standards. The ideal is to strive for all three, but one would not expect all instruction and assessment activities to meet all three standards all of the time. For example, repetitive practice, retrieving straightforward information, and memory drills may be necessary to build knowledge and skills necessary for authentic performance, or to prepare for inauthentic tests required for advancement in the current educational system. The point is not to abandon all traditional forms of schoolwork, but to keep authentic achievement clearly in view as the valued end.

The three criteria serve as standards of quality that transcend specific practices or activities. That is, any particular lecture, classroom discussion, cooperative group activity, computer assignment, set of portfolio entries, essay question, student's oral presentation, video or graphic design could be evaluated on the extent to which it promoted or manifested construction of meaning, disciplined inquiry, and value beyond success in school. Since the standards can be applied across grade levels and subject areas, they may serve as a focus for school-wide consensus on educational mission.

Specific standards for pedagogy and student performance. How might the three general criteria for authentic academic achievement be translated into standards to guide classroom

practice? To ascertain the degree of authentic pedagogy and student performance in 24 restructured schools, staff of the School Restructuring Study (SRS, described below) constructed more specific standards to assess the level of authentic academic work observed in daily lessons, in assessment tasks that teachers used to evaluate student performance, and in students' written responses to the tasks. We considered pedagogy to be a combination of teachers' daily instruction and their assessment tasks. Student performance was indicated by their responses to the assessment tasks. The standards for pedagogy and performance are summarized in Table 1.[8]

INSERT TABLE 1 ABOUT HERE

III. Authentic Pedagogy and Student Performance in Restructured Schools: The Empirical Study

Having formulated standards for authentic intellectual quality that can be applied to both pedagogy and student performance, we now examine the actual distribution of authentic pedagogy and its connection to student performance in a set of restructured schools.

Central Questions

We focus on three central issues: the quality of and variability in observed authentic pedagogy and student performance, the link between pedagogy and performance, and the equitable distribution of authentic pedagogy and authentic student performance.

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[8]For both instruction and assessment tasks, specific standards were constructed for each of the three general standards. However, for student performance, a standard for value beyond school was not developed. The reason for this omission is that within the SRS, it was not possible to collect valid information on the actual meaning or value of each student's performance to the student or to an audience beyond school. Judgments of this sort would have required interview or survey data from students that was not obtainable for logistical reasons.

1. Quality and variability. To what extent do teachers in restructured schools offer authentic pedagogy according to these standards, and how much variation is there between teachers, schools, grade levels, and subjects? As explained below, the SRS searched for and studied elementary, middle and high schools nationwide that had made significant progress in school restructuring and that seemed committed to aspects of authentic instruction. Other research has indicated great difficulties in the implementation of teaching consistent with some of these standards (e.g., Cohen, 1990; Peterson, McCarthey, & Elmore, in press), but the SRS offered the first opportunity to examine the question across all three grade levels and two different subjects (mathematics and social studies).

2. Links to student achievement. To what extent does authentic pedagogy contribute to authentic student performance? The case for the benefits of constructivist or authentic teaching has relied more on analytic and philosophical arguments than extensive empirical evidence, and so answering this question is critical. The relationship of constructivist teaching to student achievement has been studied in disparate contexts, but primarily in lower elementary school in mathematics and language arts. Some of these studies have used both conventional and more authentic measures of achievement (e.g., Carpenter, Fennema, Peterson, Chiang, & Loef, 1989; Tharp, 1982). But we know of no study that has explored the connection of authentic pedagogy to achievement through an integrated set of indicators for instruction, assessment and student performance across the three grade levels.

3. Equity. A major goal for reform is to enhance educational opportunity for students from educationally disadvantaged backgrounds. To explore this, we ask (a) to what extent are students from certain social and academic backgrounds more likely to receive authentic

pedagogy? (b) to what extent does authentic pedagogy bring different achievement benefits to students of different social and academic backgrounds? and (c) regardless of the effects of authentic pedagogy, to what extent is student authentic academic performance influenced by their social and academic background?

Methodology

The School Restructuring Study studied 24 restructured schools intensively, each for one year, to understand how organizational features of schools can contribute to six valued outcomes: authentic pedagogy and authentic academic performance; equity for students; empowerment of teachers, parents, and principals; sense of community among staff and students; reflective professional dialogue; and accountability. This section summarizes the methodology and findings relevant to relationships between authentic pedagogy and authentic academic performance.[9]

Sampling

Schools. Twenty four public schools, equally divided among elementary, middle and high schools, that had demonstrated substantial departures from typical organizational features were selected through a national search. Innovations common to many of these schools were school-based governance councils, teachers working in teams with common planning time, heterogeneous ability grouping for students, instructional periods lasting from one to two hours, extensive use of small groups in instruction, and special programs to address students' social/emotional needs. The schools included those that had begun anew and had hired new staff

[9]More detailed documentation dealing with variable construction, inter-rater reliability, and statistical results not reported here can be found in Marks, Newmann, and Gamoran (1995).

to fit a particular mission, as well as long-established schools trying to restructure around a newly defined mission. The schools were located in 16 states and 22 districts. Due to incomplete data from one middle school, this report includes only 23 schools.[10] The number of classrooms and students varies somewhat for different analyses, because, depending on the analysis, we limited the sample to classrooms with full data on authentic pedagogy and to students with full data on authentic academic performance, social background, and academic background. Measurement of these variables is explained below.

Subjects, grade levels, and classes. Mathematics and social studies were studied in grades 4-5 for elementary schools, 7-8 for middle schools, and 9-10 for high schools. Within these grades, three classes each for mathematics and social studies were selected. For each subject, at least one of the three teachers was to have been clearly involved in the school's innovative efforts, and the classes were to reflect the range of student achievement in the grade as a whole. Each of the classes was observed four times during one year, during two one-week research visits. This report includes data from 504 observed lessons.

Assessment tasks. Each of the mathematics and social studies teachers was asked to send from the observed class, two examples of assessment tasks that they considered valid and

[10]Compared to a national sample of schools of all grade levels, the 24 SRS schools generally enrolled more students (average 777 students per school) and higher percentages of African American (20.6 percent) and Hispanic students (21.7 percent). About 37 percent of the students were on free or reduced lunch. Comparisons within grade level indicated pronounced demographic differences from a national sample. For example, the SRS elementary schools enrolled three times more Hispanics than other public elementary schools; the SRS high schools enrolled about twice as many African Americans; the SRS middle schools enrolled somewhat lower proportions of both African Americans and Hispanics.

important indicators of students' proficiency and understanding of the subject.[11] One task was sent in the fall and one in the spring. The teacher was also asked to complete a short questionnaire describing the conditions under which the task was administered. This report includes data from 234 assessment tasks which represent about 73 percent of all the tasks we requested. Ninety-five percent of the teachers included in this analysis provided at least one assessment task; 65 percent provided at least two.

Student performance. The mathematics and social studies teachers were also asked to send a complete class set of student work completed in response to the assessment tasks they sent. Thus, the study tried to obtain two samples of student performance for each student in each observed class. Each student was also asked to complete a short questionnaire describing his/her perceptions of the task and the work. All students in these analyses submitted at least one sample of performance. At least two samples of performance were received from 45 percent of the students. This report includes data from 2128 students and 3128 samples of student performance.

Major Variables and Scoring Procedures

1. Authentic pedagogy. Authentic pedagogy is a composite of two measures: instruction and assessment.

Each class received an instruction score based on the sum of the 4 standards of instruction (each standard rated on a scale from 1-5) over 4 classroom observations. Each lesson was scored by a CORS researcher trained to apply the standards. About 25 percent of the

[11]Teachers in six schools studied during the first phase of research were asked to send in three assessment tasks.

lessons were observed by a second CORS researcher who made independent ratings on the standards. The overall level of agreement between two raters is estimated as a correlation of .78.

Using the standards for assessment tasks, each assessment task was scored in Madison by a CORS researcher and by a teacher currently teaching the subject, trained by CORS staff who also had experience teaching the subject. To make judgments about the teachers' demands and expectations for students, the raters also examined the teacher task description and teacher comments on samples of student performance. If the two-person team did not agree on their initial independent ratings, they discussed the matter until consensus was reached for each standard. Each class received an assessment score based on the sum of the 7 assessment standards (rated on scales of 1-3 or 1-4) averaged over two tasks.

The authentic pedagogy score for a class (which could range from 11-43) was computed by adding the instruction score (which could range from 4-20) to the assessment score (which could range from 7-23). Thus, the assessment part of this composite is slightly more heavily weighted than the instructional part. The internal consistency of the 11 item scale was .79 (Cronbach alpha).

2. Authentic academic performance. Each sample of student work was scored in Madison according to the 3 standards for student performance by a practicing teacher in the subject, trained by CORS staff. Each standard was scored separately (scaled from 1-4) for each subject and grade level. About 37 percent of the papers were scored independently by a second rater, randomly assigned. The overall level of precise agreement between two raters was 54 percent, and agreement within one point was 92 percent. Each student received a total

performance score based on the sum of the three standards averaged across two samples of performance. For some analyses, individual student scores were averaged to produce class means on student performance.

3. Student academic and social background. Since the effect of pedagogy on student achievement often depends on factors in students' backgrounds that influence achievement, we included measures of students academic background and social background.

Academic background. All students in the observed classes were asked in the Fall to complete tests of basic knowledge. Students in observed mathematics classes were given a test composed of selected items from the National Assessment of Educational Progress (NAEP) for the appropriate grade level. Students in observed social studies classes were given a grade level appropriate test composed of selected items from the NAEP reading tests, along with a short test of writing scored by CORS staff according to NAEP standards. The overall response rate for these tests was about 85 percent.[12]

Social background. Students completed surveys in which they reported their gender, race, and whether they were of Hispanic background. They also reported on household resources associated with socioeconomic status, and secondary students also reported their parents' level of education. These indicators were combined into a measure of socioeconomic status.

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[12]Student scores on these NAEP tests at the elementary level were at the national average in mathematics, slightly above in reading; at the middle level, above the national average in both subjects; at the high school level, below national averages (but this could be due to the fact that the high school NAEP norms used were based on 12th grade and most SRS students were not above grade 10). Students also reported on their recent grade point averages in school. These correlated highly with the NAEP measure. Since the NAEP measure offered a more standardized indicator across schools, we used this instead of grade point average in statistical analyses.

Findings

Quality and Variability in Authentic Pedagogy and Achievement

At the time of entry into the study, all schools had demonstrated clear progress in organizational restructuring and had shown some evidence to CORS visitors of authentic practice in mathematics or social studies. Nevertheless, after collecting data systematically during one year in each school, we found that schools varied substantially in their success on these standards for authentic pedagogy. In some schools, our researchers found many examples of high quality authentic practice in both mathematics and social studies, but in others, very few.

The degree of authentic pedagogy observed is indicated in Table 2. The overall means are lower than the midpoint of our index (27). Even the most successful teachers and schools scored well below the highest levels of authenticity. In short, even in restructured schools, pedagogy was rarely rated at the higher levels of our standards. This is consistent with other findings that the promotion of authentic teaching is enormously difficult.[13]

INSERT TABLE 2 ABOUT HERE

Regardless of the overall level of success on our standards, we found tremendous variation within the observed range. That is, both individual teachers and schools as a whole varied substantially relative to one another. The most successful teacher scored 33.5 and the least successful 12.5. The most successful school scored 54.7 (averages for the two subjects are added) and the least successful 33.3. Overall, about 60 percent of the variability in classroom scores on authentic pedagogy was due to differences between classes within schools, and about

[13]Ball (1990), Cohen (1990), Peterson (1990a, 1990b), McCarthey & Peterson (1993), Peterson et al. (in press), Prawat (1992), Wiemers (1990), Wilson (1990).

40 percent of the variability was due to differences between school averages.[14] Levels of authentic pedagogy were similar in mathematics and social studies and across the three grade levels.

What are the implications of these numbers? If our standards of intellectual quality are appropriate goals, then there is good news and bad news. The good news is that some teachers and schools have been reasonably successful, signaling hope that authentic pedagogy can be achieved. The bad news is that overall levels of authentic pedagogy remain low according to these standards, even in highly restructured schools, and that some teachers and schools have barely begun the journey toward authentic pedagogy.

Similarly, for student performance, overall means in each subject (Table 2) were below the midpoint (7.5) of the range between the lowest (3) and highest (12) possible scores, and even the most successful students scored below the highest levels on our measures. Yet, student performance varied considerably. For example, at the high school level, the most successful student in mathematics scored 11, the least successful 3, and in social studies the most successful student scored 12, while the least successful scored 3. Most of the variability in student achievement occurred within classes (53 percent), but variability between classes accounted for 36 percent, and variability between schools accounted for 11 percent of total variance in students' authentic academic performance. Social studies performance exceeded mathematics at the middle and high school levels. Across the three grade levels, mathematics performance remained stable. In social studies, middle school performance was significantly higher than both

[14]Estimates of variance were computed using Hierarchical Linear Modeling (HLM) (Bryk & Raudenbush, 1992).

elementary and high school, and high school performance was higher than elementary school performance.[15]

Links Between Authentic Pedagogy and Authentic Student Performance

Why worry about quality and variability in authentic pedagogy unless it has consequences for student learning? Only if authentic pedagogy actually enhances student performance does the variability we found have significant implications. Teachers and schools rating high on these standards can be assured they're on the right track, and the less successful ones could legitimately be urged to direct their work toward standards like these.

An estimate of the effect of authentic pedagogy on student performance is provided in Table 3, which combines the results for students in mathematics and social studies. After controlling for students' social background (i.e. gender, race, ethnicity, socioeconomic status) and academic background (NAEP achievement), the effect of authentic pedagogy is .37 ($p < .001$), and the analysis, using all predictors, explains about 35 percent of the variance among classes in student performance.

INSERT TABLE 3 ABOUT HERE

We examined the link between pedagogy and performance for each subject across grade levels as well as separately for each subject within each grade level. Comparing the two subjects across grade levels, we found virtually identical coefficients for authentic pedagogy (.39 for math, .38 for social studies). The size of the authentic pedagogy effect from elementary to middle to high school remained stable for social studies (.39, .44, .45). The effect of authentic

[15]Since student performance was scored according to expectations within each grade level, one would not necessarily expect the scores to increase from elementary to high school.

pedagogy in mathematics was high in elementary and high schools (.38 and .62 respectively), but lower in middle schools (.20). We have no explanation for the lower effect of pedagogy in mathematics in middle schools, compared to high schools, but the sample size may be too small to allow proper comparisons. Except for this anomaly, the effect of authentic pedagogy was robust across grade levels and subjects.

The design of the study did not allow the strongest possible test of the link between pedagogy and performance. Ideally, performance would be judged on a common set of authentic tasks that gave all students an opportunity to show high levels of performance. In this study, however, each student's performance was a response to the teachers' unique assessment tasks, and the authenticity scores of those tasks contributed to the value of the independent variable (authentic pedagogy was constructed as the sum of the instruction and assessment task scores). Students of teachers with low-scoring assessment tasks did not have the same opportunity to demonstrate high performance as students with teachers who assigned high scoring assessment tasks. As might be expected, assessment tasks of lower quality were associated with lower student performance and also a narrower range of student performance than tasks of high quality.[16]

We examined the relationship of task, instruction and performance in a way that could reduce the dependence of student performance on the quality of the task. With two samples of

[16]HLM regression analyses indicated that assessment task quality was the major contributor to the strong correlation between the composite pedagogy variable and student performance. Observed instructional quality alone had almost no effect in social studies and in mathematics, a larger, but still relatively small effect. This finding supports the maxim that "what you test is what you get," -- as teachers' expectations for authentic performance increase, so will the quality of student performance.

student performance (fall and spring), two assessment tasks (fall and spring) and four classroom observations (two fall, two spring), we divided the sample into two patterns that disconnected specific assessment tasks from student performance scores; namely, fall performance, fall instruction, spring task; and spring performance, spring instruction, and fall task. These analyses showed the same general pattern as indicated in Table 3. But if the measure of authentic performance were based on set of common tasks for all students, we suspect the link between pedagogy and performance would be reduced.

Using data from the analysis in Table 3, we computed the consequences for statistically "average" students (i.e. those of average socioeconomic status who scored at the mean on NAEP achievement) of being in a class where the quality of pedagogy was average, low (1 sd below the mean) or high (1 sd above the mean). For example, in a class with average pedagogy the average white male student would score 6.1. In the low pedagogy class, he would score 5.4, but in the high pedagogy class, he would score 6.8. Figure 1 shows the performance consequences of receiving low, medium, and high pedagogy for comparable female and non-white students. These increments in the raw test score may seem small relative to the absolute scale of 3 to 12 points, but they reflect substantial improvements in these students' rankings relative to their peers on authentic academic performance. Regardless of race or gender, an average student would increase from about the 30th percentile to about the 60 percentile as a result of receiving low versus high authentic pedagogy. This illustrates the major contribution that authentic pedagogy makes to authentic academic performance.

INSERT FIGURE 1 ABOUT HERE

Equitable Distribution of Pedagogy and Student Performance

In our view, effective instruction must promote authentic student achievement not just on average, but in a way that does not discriminate among students on the basis of their diverse backgrounds. Does authentic pedagogy promote high achievement for all students? We addressed this question in three ways. First, we considered whether students from traditionally advantaged backgrounds have more access to authentic pedagogy than students from disadvantaged groups. Second, we examined whether advantaged students benefit more from authentic pedagogy than other students. Does authentic pedagogy pay off more for some students than others? Third, we asked whether using authentic performance as our outcome measure introduces new biases against students from disadvantaged groups.

Distribution of authentic pedagogy. Is authentic pedagogy more commonly experienced by certain categories of students? The results in Table 4 respond to this question. In step 1, we show that differences within schools in gender, race, ethnicity, and socioeconomic status (SES) are unrelated to variation in authentic pedagogy. In step 2, we observe that students' NAEP scores are modestly associated with the extent of authentic pedagogy: students who start out with higher achievement are somewhat more likely to encounter more authentic pedagogy. Because authentic pedagogy builds on what students know and can do, there may be some tendency for teachers to use it more extensively with higher-performing students. Although the restructured schools had substantially reduced their uses of ability grouping, most (especially high schools) had not eliminated it, and this may also be reflected in the results. However, the findings also indicate that the restructured schools had attained one important criterion for

equity: students from different gender, racial, ethnic, and socioeconomic backgrounds have equal access to high-quality instruction.

INSERT TABLE 4 ABOUT HERE

Differential effects of authentic pedagogy. Even though authentic pedagogy is equally distributed on most criteria we examined, it could still promote inequality by raising achievement more for some students than others. Critics of traditional instruction frequently charge that it serves advantaged students better than disadvantaged students (e.g., Quality Education for Minorities Project, 1990). Is this also the case with authentic pedagogy? To address this question we first tested whether the effects of social and/or academic background on authentic academic achievement differed across classes. Regardless of the level of authentic pedagogy, we found that gender, race, ethnicity, and SES exerted the same effects on performance in all classes. However, the effects of NAEP achievement scores on authentic academic achievement did vary significantly across classes. This led us to examine whether variation in authentic pedagogy across classes tended to boost or depress the effect of a student's NAEP score on authentic academic achievement. As indicated by the interaction coefficient of .08 ($p < .05$) in Table 3, the contribution of authentic pedagogy is slightly greater for students with higher NAEP scores. For example, if a low-achieving student (one standard deviation below the mean) moved from a class that was low in authentic pedagogy (one standard deviation below the mean) to a class that was high in authentic pedagogy (one standard deviation above the mean), he or she would gain about .58 standard deviations on our outcome measure. However, a high-achieving student making the same transfer would gain about .90 standard deviations. Although the difference is noteworthy, it is worth emphasizing that the main effect of authentic pedagogy

(.37) is more salient than the interaction (.08). Overall, authentic pedagogy helps all students substantially, and it gives an extra boost to high-achieving students.

Background effects and authentic student performance. A final concern of critics is that tests of authentic student performance may introduce new biases against students from disadvantaged backgrounds (Feinberg, 1990; Wolf, Bixby, Glenn, & Gardner, 1991). Our analysis in Table 3 shows that whereas Hispanics and low-SES students did not score significantly lower than whites or high-SES students, respectively, African Americans did score lower than whites, and girls scored significantly higher than boys. How large are these gaps? As a standard of comparison, we present in Table 5 the differences on our test of authentic performance alongside differences on the NAEP achievement test, a more traditional measure. (Both outcomes are in standard deviation units.) This comparison indicates that inequality in authentic performance is no greater, and quite possibly less, than inequality on a traditional standardized test. The advantage for females is slightly larger on the authentic assessment, but the difference between .20 and .16 is not statistically significant. Differences in the coefficients for Hispanic and SES, both of which favor the authentic assessment as being less differentiating, are also insignificant. Moreover the coefficient of -.23 for African Americans in authentic performance is significantly lower than the coefficient of -.45 on the traditional test. Hence, while inequalities have not been eliminated, the assessment of authentic performance does not seem to have exacerbated the problem.[17]

INSERT TABLE 5 ABOUT HERE

[17]Less inequality on the measure of authentic academic performance is not simply a reflection of possibly lower test reliability here than on standardized tests. If that were the case, female-male inequality would also be reduced here which did not occur.

IV. Summary and Implications

Proposals for innovative teaching consistent with a constructivist perspective emphasize practices to make students more active learners. However, these more participatory practices, such as student discussions, small group exercise, hands-on activities, or independent research projects can be conducted without emphasizing deep understanding or meeting high intellectual standards. The research reported here developed standards of intellectual quality that can be applied to a wide range of daily lessons, teachers' assessment tasks, and the evaluation of student written work. The standards represent three characteristics of authentic academic achievement observed in significant accomplishment by adults: (a) construction of knowledge (b) through disciplined inquiry (c) to produce discourse, performances or artifacts that have value beyond certifying success in school.

An important empirical question is whether teaching that approximates these standards for intellectual quality actually improves students' authentic academic performance. A study of about 130 classrooms in 23 restructuring public schools, equally divided among elementary, middle and high schools examined the quality of pedagogy and student performance in both mathematics and social studies. Three main findings emerged.

First, while some classrooms and schools were far more successful than others, the overall levels of authentic pedagogy observed, even in this sample of highly innovative schools, fell well below the highest levels on the proposed standards. This is consistent with prior research on the difficulty of enhancing intellectual rigor in American classrooms. The good news is that, in spite of considerable obstacles, some teachers and schools have made considerable progress toward such standards of quality. This suggests that standards of this sort

might be useful in helping the profession move beyond the adoption of techniques and procedures as the focus for innovation.

Second, authentic pedagogy does pay off in improved authentic academic performance for students at all grade levels and in both mathematics and social studies. It has been difficult to interpret the cumulative significance of prior research on the link between authentic pedagogy and student achievement, because previous studies have used disparate frameworks, and the most systematic investigations seem to have been concentrated largely at the elementary level in mathematics. By using a common, integrated set of standards to examine pedagogy at the three grade levels and in two subjects, this study adds significant empirical knowledge on this question. Limitations in the design of the study may cast some doubt on the extent to which we have established a clear causal relationship; we have not shown that interventions which deliberately set out to use these standards will boost student performance. On the other hand, the robust relationship between authentic pedagogy and student performance suggests reasonable grounds for working toward more deliberate use of the standards.

Finally, we found that it is possible to deliver authentic instruction reasonably equitably, and that its effect on students' academic achievement is reasonably equitable. At least in this sample of highly restructured schools, neither gender, race, ethnicity, nor socioeconomic status determined which students received high or low levels of authentic pedagogy. And neither gender, race, ethnicity, nor socioeconomic status affected the impact of authentic pedagogy on authentic academic achievement, once students' prior NAEP achievement was taken into account. Although females performed better than males, and whites better than African Americans on the measure of authentic academic performance, these disparities were no greater

(and some were possibly less) than those commonly observed in conventional test performance. Whether all schools can achieve the levels of equity observed in this special sample remains to be seen, but at least we have an "existence proof" that authentic pedagogy can be distributed equitably to students from all social backgrounds, with reasonably equitable benefits. Additional work is necessary to eliminate the disadvantage to African Americans and to males on this particular measure of authentic achievement and on conventional measures as well.

As a whole, the findings support the pursuit of authentic pedagogy to help cultivate authentic academic performance for students. But findings on the generally low levels (and considerable within-school variability) of authentic pedagogy indicate that even in restructuring schools, the task is enormously difficult. How to enhance authentic pedagogy is beyond the scope of this report, but it is being addressed by studies of governance, professional community and the role of external agencies in the schools of this sample.[18]

The main purposes of this study were to articulate standards of authentic intellectual quality that can be applied to a variety of teaching practices and to examine the extent to which pedagogy consistent with these standards enhances authentic student performance. Theoretically, almost any technique, however traditional (e.g., lecture, textbooks, multiple choice tests) or innovative (e.g., student discussion, primary sources, portfolios) can be applied in ways that stimulate high or low levels of authentic intellectual activity. The strong empirical relationship between these standards of quality and authentic student performance suggests that the distinction between practice or technique and intellectual quality may indeed deserve attention. If quality is more fundamental than specific technique in promoting student achievement, teachers and

[18]Findings will be reported in Newmann (in progress).

parents may at times resist innovations in teaching such as "active learning," because they fail to see how these enhance the intellectual quality of student experience. On the other hand, if the implementation of student-centered, or constructivist practices were guided by explicit standards for authentic intellectual quality, this study indicates that student performance would benefit.

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Table 1

Standards for Authentic Pedagogy and Student Academic Performance[1]

Authentic Pedagogy

A. Classroom Instruction

1. Higher Order Thinking: Instruction involves students in manipulating information and ideas by synthesizing, generalizing, explaining, hypothesizing, or arriving at conclusions that produce new meanings and understandings for them.

2. Substantive Conversation: Students engage in extended conversational exchanges with the teacher and/or with their peers about subject matter in a way that builds an improved and shared understanding of ideas or topics.

3. Deep Knowledge: Instruction addresses central ideas of a topic or discipline with enough thoroughness to explore connections and relationships and to produce relatively complex understandings.

4. Connections to the World Beyond the Classroom: Students make connections between substantive knowledge and either public problems or personal experiences.

B. Assessment Tasks

1. Organization of Information: The task asks students to organize, synthesize, interpret, explain, or evaluate complex information in addressing a concept, problem, or issue.

2. Consideration of Alternatives: The task asks students to consider alternative solutions, strategies, perspectives, or points of view as they address a concept, problem, or issue.

3. Disciplinary Content: The task asks students to show understanding and/or use of ideas, theories, or perspectives considered central to an academic or professional discipline.

4. Disciplinary Process: The task asks students to use methods of inquiry, research, or communication characteristic of an academic or professional discipline.

5. Elaborated Written Communication: The task asks students to elaborate their understanding, explanations, or conclusions through extended writing.

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[1]Taken from Newmann, Secada, & Wehlage (forthcoming).

6. Problem Connected to the World: The task asks students to address a concept, problem, or issue that is similar to one that they have encountered or are likely to encounter in life beyond the classroom.

7. Audience Beyond the School: The task asks students to communicate their knowledge, present a product or performance, or take some action for an audience beyond the teacher, classroom, and school building.

C. Authentic Academic Performance

1. Analysis:

(a) Mathematical Analysis: Student performance demonstrates and explains their thinking with mathematical content by organizing, synthesizing, interpreting, hypothesizing, describing patterns, making models or simulations, constructing mathematical arguments, or inventing procedures.

(b) Social Studies Analysis: Student performance demonstrates higher order thinking with social studies content by organizing, synthesizing, interpreting, evaluating, and hypothesizing to produce comparisons/contrasts, arguments, application of information to new contexts, and consideration of different ideas or points of view.

2. Disciplinary Concepts:

(a) Mathematics: Student performance demonstrates an understanding of important mathematical ideas that goes beyond application of algorithms by elaborating definitions, making connections to other mathematical concepts, or making connections to other disciplines.

(b) Social Studies: Student performance demonstrates an understanding of ideas, concepts, theories, and principles from the social disciplines and civic life by using them to interpret and explain specific, concrete information or events.

3. Elaborated Written Communication:

(a) Mathematics: Student performance demonstrates a concise, logical, and well articulated explanation or argument that justifies mathematical work.

(b) Social Studies: Student performance demonstrates an elaborated account that is clear, coherent, and provides richness in details, qualifications and argument.

Table 2
Levels of Authentic Pedagogy and Student Authentic Academic Performance by Grade and Subject

		Elementary		Middle		High		Total	
		Pedagogy[1]	Performance[2]	Pedagogy	Performance	Pedagogy	Performance	Pedagogy	Performance
Math	$\bar{X}$	22.5	6.0	20.7	6.2	20.3	6.0	21.2	6.1
	SD	5.7	1.7	4.8	1.4	5.0	1.8	5.2	1.6
	N	22	437	21	385	21	294	64	1116
Social Studies	$\bar{X}$	22.0	6.1	22.2	7.3	22.4	6.9	22.2	6.7
	SD	5.1	1.9	4.1	1.9	4.0	2.1	4.4	2.0
	N	24	531	20	403	23	348	67	1282
Total	$\bar{X}$	22.2	6.1	21.4	6.7	21.4	6.5	21.7	6.4
	SD	5.3	1.8	4.5	1.8	4.6	2.0	4.8	1.9
	N	46	968	41	788	44	642	131	2398

	All Schools	
	Pedagogy[3]	Performance[4]
$\bar{X}$	21.4	6.3
Min, Max	16.7, 27.3	4.5, 8.0
SD	3.0	.91
N	23	23

[1] Class scores.
[2] Student scores.
[3] Class scores averaged for each school, math and social studies combined.
[4] Student scores averaged for each school, math and social studies combined.

Table 3
The Relationship of Authentic Pedagogy to Authentic Academic Performance for Mathematics and Social Studies Combined[a]

Variables	Dependent Variable Authentic Academic Performance
Intercept[b]	-.07
Female	.10 **
African American	-.16 *
Hispanic	-.10
Socioeconomic Status	.05
NAEP Achievement	.27 ***
Class Average NAEP Achievement	-.01
Class Authentic Pedagogy	.37 ***
NAEP Achievement-by-Authentic Pedagogy[c]	.08 **
Percentage of Between-Class Variance Explained:	
In Average Authentic Academic Performance	34.7%
In Effects of NAEP Achievement on Authentic Academic Performance	28.5%

[a] Estimates from a 3-level multilevel model computed with the HLM program (Bryk and Raudenbush, 1992). Level 3 (school level) has no predictors. Cases with missing values are deleted from the analysis. The final analytic sample includes 2,110 students in 128 classrooms in 22 schools.

[b] All continuous variables are standardized. Female, African American, and Hispanic are indicator variables, coded 1=Yes, 0=No. The coefficients for the indicator variables represent the increment added to the intercept, i.e., average authentic academic performance, for female gender, African American race, and Hispanic ethnicity. The coefficients for the continuous variables represent the increment added to the intercept for a standard deviation increase in the independent variable.

[c] Multilevel interaction of student NAEP Achievement by class authentic pedagogy.

* $P \leq .05$ ** $P \leq .01$ *** $P \leq .001$

Table 4
Social Distribution of Authentic Pedagogy[a]

	Step 1	Step 2
Intercept	-.13	-.11
Female	.04	.02
African American	-.02	.05
Hispanic	.07	.11
SES	-.02	-.04 *
NAEP Achievement		.14 ***
% Within-School Variance Explained	0.0%	2.2%

[a] Mathematics and social studies combined: A within-school HLM analysis with effects fixed. Cases with missing values are deleted from the analysis. The final analytic sample includes 2,899 students in 23 schools. Authentic pedagogy is measured on 130 teachers.

Table 5
Students' Social Background and Achievement: SRS and NAEP Achievement Compared[a]

	Dependent Variables	
	SRS Achievement	NAEP Achievement
Intercept	-.18	-.15
Female	.20 ***	.16 ***
African American	-.23 *	-.46 ***
Hispanic	-.13	-.25
SES	.11 ***	.18 ***
% Within-School Variance Explained	2.7%	6.5%

[a] HLM within-school analyses with effects fixed. Cases with missing values are deleted from the analysis. With SRS achievement as the dependent variable, the sample includes 2244 students; with NAEP achievement as the dependent variable, the analysis includes 2899 students. Both analyses include 23 schools.

* $P \leq .05$ *** $P \leq .001$

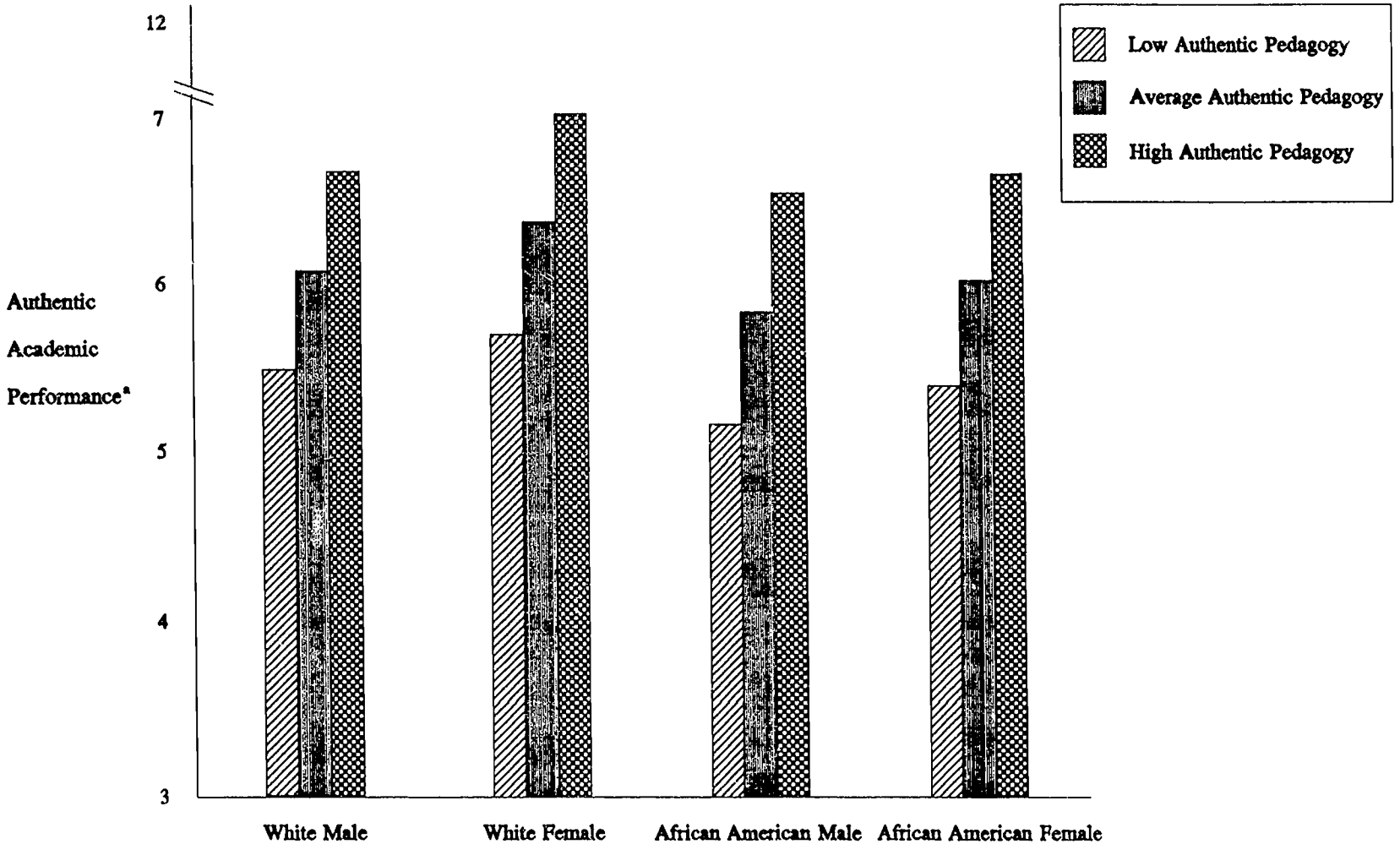

Figure 1
Authentic Academic Performance for "Average" Students Receiving Low, Average or High Authentic Pedagogy[b]

[a] Figures are derived from regression estimates identical to those in Table 3, but authentic academic performance is expressed here in raw scores..

[b] An average student is one with mean score on NAEP Achievement and mean socioeconomic status in the SRS sample. Authentic academic performance scores include students in both math and social studies. Low authentic pedagogy is 1 S.D. below mean pedagogy; high is 1 S.D. above mean pedagogy in SRS sample classes.