Authentic Instruction AND Assessment

Common Standards for Rigor and Relevance in Teaching Academic Subjects

Fred M. Newmann, M. Bruce King, Dana L. Carmichael

Prepared for the Iowa Department of Education, 2007

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F.M.N., M.B.K., D.L.C., July, 2007

Introduction: Purpose and Background

What should be the main goals for student learning across academic subjects in a school? This report is for teachers and administrators considering whether to invest in sustained professional development on instruction and assessment that emphasizes the goal of student production of authentic intellectual work (AIW). Reading and discussing this report is intended as a first step in an extended adventure in professional development for schools to increase rigor and relevance in teaching academic subjects to diverse students.

The framework sets standards for teaching academic subjects that

- maximize expectations of intellectual rigor for all students,
- increase student interest in academic work,
- support teachers' taking time to teach for in-depth understanding rather than superficial coverage of material,
- provide a common conception of student intellectual work that promotes professional community among teachers of different grade levels and subjects, and
- most important, equip students to address the complex intellectual challenges of work, civic participation, and managing personal affairs in the contemporary world.

From 1990 to 2003, researchers completed studies at the Wisconsin Center for Education Research at the University of Wisconsin-Madison (Center on Organization and Restructuring of Schools—CORS and Research Institute on Secondary Reform for Youth with Disabilities—RISER), the University of Minnesota, and at the Consortium on Chicago School Research which demonstrated that students who experienced higher levels of authentic instruction and assessment showed higher achievement than students who experienced lower levels of authentic instruction and assessment. The results were consistent for grades 3-12, across different subject areas (mathematics, social studies, language arts, science), and for different students regardless of race, gender, or socioeconomic status.

Most of the research has not evaluated the impact of programs deliberately trying to implement the AIW framework. Rather than training teachers to use the framework and then evaluating their success, we used the framework as a research tool to measure the quality of education provided in many schools, regardless of the specific approaches to curriculum and instruction the schools had adopted. The framework allowed us to describe the quality of instruction, teachers' assignments, and student work across grade levels and subjects, but in conducting the research we did not share the language of the framework or the specific rubrics for evaluating instruction and achievement. In describing their teaching, teachers used language such as "inquiry," "teaching students to think," "teaching for understanding," and helping students to "apply their learning," but they did not use the language of the framework or its specific standards to describe their work. However, the powerful research results that emerged in several studies led us to conclude that if the framework for AIW and the scoring rubrics were *deliberately* used by teachers to guide instruction, students and teachers alike should benefit.[1]

We realize that the AIW framework focuses exclusively on only one aspect of instruction, authentic intellectual quality. As such, it does not address many other issues important to teachers. A broader, more complete look at the quality of instruction would probably also include other concerns such as what specific curriculum content to include, how to achieve coherence among daily lessons that connect to a larger unit of study and to other grade levels, and how to generate a positive climate in classrooms. Such concerns, while legitimate, can often override attention to intellectual quality. Our purpose here is to support a systematic focus on intellectual rigor and relevance, as defined by criteria for authentic intellectual work.

Education in the U.S. and efforts to reform it face persistent obstacles that undermine emphasis on rigor and relevance: low expectations for intellectual challenge and academic excellence, especially for students from educationally disadvantaged backgrounds; lack of student engagement in their courses; demands for extensive coverage of subject matter; proliferation of incoherent reform projects and professional development initiatives; and testing programs that emphasize only basic skills and recall of knowledge. All these leave teachers, administrators, parents, students, and the public at large without a clear sense of the core intellectual mission of schooling.

[1] Avery, Freeman and Carmichael-Tanaka (2002) and Ladwig, et al. (2007) present positive results of such training.

Since the 1980s, national commissions with representation by public officials, the business community, higher education, private foundations, and the K-12 education profession have tried to address some of these issues through state and national standards for curriculum and assessment. Improvement has been demonstrated for some students in some subjects or grade levels within some districts and states, but on a national scale, the movement toward standards has not significantly alleviated the main problems.

Many reasons are offered for lack of success: inadequate political support and funding for reforms which lead to only short-term rather than sustained effort, controversy over the mission of curriculum and schooling, lack of coordination among key actors that influence classroom activity, and inequity in the power of socio-economic groups that deprives lower-income students of educational opportunity. Unless these social and political issues are addressed more comprehensively, the standards movement alone is unlikely to improve education on a large scale. Whether policy makers and larger institutions will successfully tackle these systemic problems remains to be seen, but even with these issues unresolved, individual schools and districts can increase student achievement for all socio-economic groups with curriculum, classroom instruction, and assessment of student work guided by a framework of authentic instruction and assessment.

Part I

The Framework and Research

Chapter 1
Authentic Intellectual Work: Criteria and Rationale

For most students, the usual work demanded in school is rarely considered meaningful, significant, or worthwhile. Learning tasks call for specific memorized information, retrieval of given information, or application of routine computational procedures, but rarely do they call for higher-level thinking, interpretation, or in-depth conceptual understanding. Schoolwork is regarded largely as a series of contrived exercises necessary to earn credentials (grades, promotions) required for future success, but for many, especially poor students of color, this work leads to disengagement and dropping out. The challenge for students is to figure out how to comply with teachers' and tests' requirements, rather than to use their minds to solve important meaningful problems or answer interesting challenging questions.

What is meaningful intellectual work? To define it more specifically, we analyzed the kinds of mastery demonstrated by successful adults who continually work with knowledge; for example, scientists, musicians, childcare workers, construction contractors, health care providers, business entrepreneurs, repair technicians, teachers, lobbyists, and citizen activists. Adults in these diverse endeavors face a common set of intellectual challenges that can serve as guidelines for education that extends beyond basic skills to more complex academic work.

We do not expect children to achieve the same level of mastery accomplished by skilled adults, but identifying the nature of intellectual work in these professions can help to define criteria for intellectual performance necessary for success in contemporary society. Consider, for example, an engineer designing a bridge. To complete the bridge design successfully, the engineer relies on extensive factual knowledge from engineering, architecture, science, and mathematics. But the particular context for the bridge, such as its length, height, peak points of stress and load, and the impact of local variation in weather conditions, require the engineer to organize, analyze, and interpret all this back-

ground information to make a unique product. Consider also a citizen trying to make an informed decision about whether an elected officeholder has done a good enough job to be reelected over the challengers, or trying to make a convincing public statement to increase local funding for school security. Finally, consider a single mother of pre-school children who calculates the costs and benefits of working outside the home, paying for childcare, and deciding how to choose among childcare providers. The examples illustrate how diverse endeavors of work, citizenship, and personal affairs present adults with intellectual challenges that differ from those commonly experienced by students in schools. Such challenges can serve as guidelines for curriculum, instruction, and assessment that extend beyond the basics and extensive lists of content standards to more complex intellectual work.

Compared to the work of students in school, which often seems contrived and superficial, the intellectual accomplishments of adults in diverse fields seem more meaningful. As a short-hand phrase that signifies the difference between the intellectual accomplishment of skilled adults and the typical work that students do in school, we refer to the more complex adult accomplishments as "authentic" intellectual work. "Authentic" is used here not to suggest that students are always unmotivated to succeed in conventional academic work, or that basic skills and proficiencies should be devalued, but only to identify some kinds of intellectual work as more complex and socially or personally meaningful than others. More specifically, authentic intellectual work involves original application of knowledge and skills, rather than just routine use of facts and procedures. It also entails careful study of the details of a particular problem and results in a product or presentation that has meaning beyond success in school. We summarize these distinctive characteristics of authentic intellectual work as ***construction of knowledge,*** through the use of ***disciplined inquiry,*** to produce discourse, products, or performances that have ***value beyond school.***

CRITERIA

Construction of Knowledge

Skilled adults in diverse occupations and participating in civic life face the challenge of applying basic skills and knowledge to complex problems that are often novel or unique. To reach an adequate solution to new problems, the competent adult has to "construct" knowledge because these problems cannot be solved by routine use of information or

skills previously learned. Such construction of knowledge involves organizing, interpreting, evaluating, or synthesizing prior knowledge to solve new problems. Teachers often think of these operations as higher order thinking skills. We contend, however, that successful construction of knowledge is best learned through a variety of experiences that call for this kind of cognitive work, not by explicitly teaching a set of discrete "thinking skills."

Disciplined Inquiry

Constructing knowledge alone is not enough. The mere fact that someone has constructed, rather than reproduced, a solution to a problem is no guarantee that the solution is adequate or valid. Authentic adult intellectual accomplishments require that construction of knowledge be guided by disciplined inquiry. By this we mean that they (1) use a prior knowledge base; (2) strive for in-depth understanding rather than superficial awareness; and (3) develop and express their ideas and findings through elaborated communication.

- ***Prior knowledge base.*** Significant intellectual accomplishments build on prior knowledge accumulated in an academic or applied discipline. Students must acquire a knowledge base of facts, vocabularies, concepts, theories, algorithms, and other conventions necessary to conduct rigorous inquiry. Transmitting a knowledge base, along with basic skills, is usually the central focus of direct instruction in content areas.
- ***In-depth understanding.*** A knowledge base of value to students involves more than being familiar with a broad survey of topics. To be most powerful, students must have a complex understanding of that knowledge that helps them gain deeper understanding of specific problems. Such understanding develops as one looks for, imagines, proposes, and tests relationships among key facts, events, concepts, rules, and claims in order to clarify a specific problem or issue.
- ***Elaborated communication.*** Accomplished adults in a range of fields rely upon complex forms of communication both to conduct their work and to present its results. The tools they use—verbal, symbolic, graphic, and visual—provide qualifications, nuances, elaborations, details, and analogies woven into extended narratives, explanations, justifications, and dialogue. Elaborated communication

may be most often evident in essays or research papers, but a math proof, CAD drawing, complex display board, or musical score could also involve elaborated communication.

Value Beyond School

Finally, meaningful intellectual accomplishments have utilitarian, aesthetic, or personal value. When adults write letters, news articles, organizational memos, or technical reports; when they speak a foreign language; when they design a house, negotiate an agreement, or devise a budget; when they create a painting or a piece of music—they try to communicate ideas that have an impact on others. In contrast, most school assignments, such as spelling quizzes, laboratory exercises, or typical final exams are designed only to document the competence of the learner, and lack meaning or significance beyond the certification of success in school.

The call for "relevant" or "student-centered" curriculum is, in many cases, a less precise expression of the view that student intellectual accomplishments should have value beyond simply indicating school success. While some people may regard the term "authentic" as equivalent to education that is "relevant," "student-centered," or "hands-on," we do not. Value beyond school is only one component of authentic intellectual work. Further, for this criterion we deliberately do not use any of the three adjectives just mentioned. We use it to emphasize not simply activity or topics that may be interesting to students, but those involving particular intellectual challenges that when successfully met would have meaning to students beyond complying with teachers' requirements. Intellectual challenges raised in the world beyond the classroom are often more meaningful to students than those contrived only for the purpose of teaching students in school.

The three criteria—*construction of knowledge, through disciplined inquiry, to produce discourse, products, and performances that have meaning beyond success in school*—provide a foundation of standards for the more complex intellectual work necessary for success in contemporary society. All three criteria are important. For example, students might confront a complex calculus problem demanding much analytic thought *(construction of knowledge and disciplined inquiry),* but if its solution has no interest or value beyond proving competence to pass a course, students are less likely be able to use the knowledge in their *lives beyond school.* Or a student might be asked to write a letter to the editor

about a proposed social welfare policy. She might say she vigorously opposes the policy but offer no arguments indicating that she understands relevant economic and moral issues. This activity may meet the criteria of *constructing knowledge to produce discourse with value beyond school,* but it would fall short on the criterion of disciplined inquiry, and thereby represent only superficial awareness, not deep understanding, of the issue. As a final example, students might be asked to interview family members about experiences during wartime, or to conduct a survey of peer opinion on job conditions or musical preferences. These activities would connect schoolwork to *students' lives beyond school,* but if students only reported what the interviewees said, without summary or analysis or drawing connections to disciplinary content, there would be virtually no *construction of knowledge or disciplined inquiry.* Judgments about the extent to which intellectual work is "authentic" should be made on a continuum, from less to more, depending on how fully all three criteria are met.

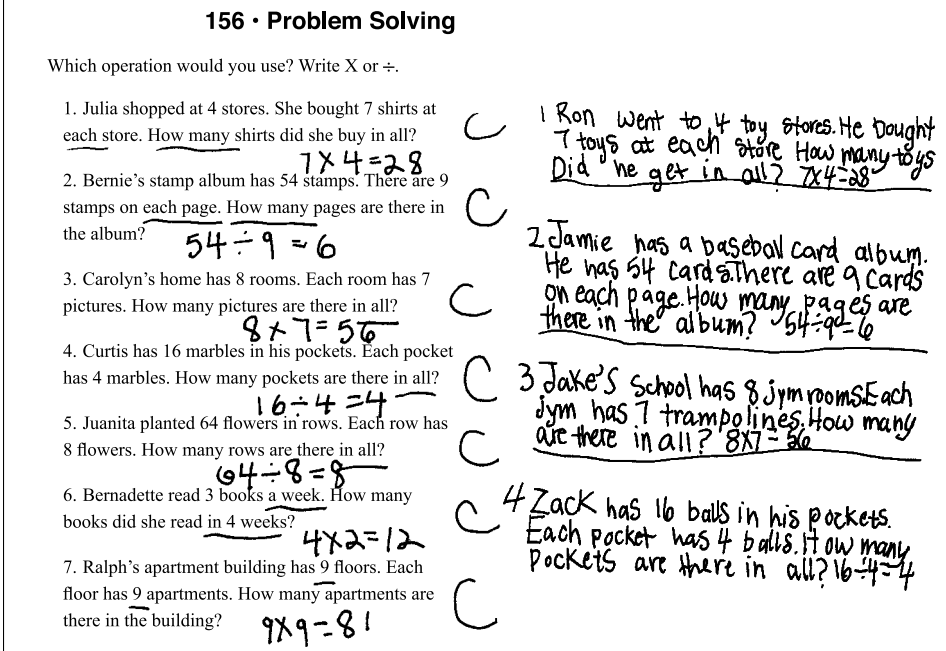
EXAMPLES

What does authentic intellectual work by students look like? The following examples illustrate, in different subjects and grade levels, students constructing knowledge through disciplined inquiry to produce intellectual work that has meaning and value beyond completing tasks in school. This report is intended primarily for high schools, and all examples in Part II (which includes specific standards and scoring rubrics for evaluating instruction, assignments, and student work according to the main criteria) are drawn from high schools or eighth grade, but in this section we include examples from earlier grades to illustrate the framework's applicability from elementary school through high school.

Student Authentic Intellectual Work Example, Third Grade Mathematics.[2]

Assignment: "We have been working on looking for clues in word problems all year. Let's take a look at these word problems. Let's read the directions. We know that these word problems will be either multiplication or division problems. Read the first problem silently. Look for a clue word or words that will tell you if this is multiplication or division. Do the number problems in the work space. Does this answer make sense? Underline any clue words that helped you decide on dividing or multiplying. Do the rest of the problems in this manner."

After checking the answers and discussing clue words, students were told:
"Write five word problems of your own on a separate sheet of paper for homework. We will read these problems in class tomorrow, looking for clue words. If we hear your clue words and your problems make sense, you will win a prize (sticker)."



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Which operation would you use? Write X or ÷.

1. Julia shopped at 4 stores. She bought 7 shirts at each store. How many shirts did she buy in all? 7 X 4 = 28
2. Bernie's stamp album has 54 stamps. There are 9 stamps on each page. How many pages are there in the album? 54 ÷ 9 = 6
3. Carolyn's home has 8 rooms. Each room has 7 pictures. How many pictures are there in all? 8 x 7 = 56
4. Curtis has 16 marbles in his pockets. Each pocket has 4 marbles. How many pockets are there in all? 16 ÷ 4 = 4
5. Juanita planted 64 flowers in rows. Each row has 8 flowers. How many rows are there in all? 64 ÷ 8 = 8
6. Bernadette read 3 books a week. How many books did she read in 4 weeks? 4 X 2 = 12
7. Ralph's apartment building has 9 floors. Each floor has 9 apartments. How many apartments are there in the building? 9 X 9 = 81

1 Ron went to 4 toy stores. He bought 7 toys at each store How many toys Did he get in all? 7x4=28

2 Jamie has a baseball card album. He has 54 cards. There are 9 cards on each page. How many pages are there in the album? 54÷9=6

3 Jake's school has 8 jym rooms. Each jym has 7 trampolines. How many are there in all? 8x7=56

4 Zack has 16 balls in his pockets. Each pocket has 4 balls. How many pockets are there in all? 16÷4=4

[2] From Newmann, Lopez, & Bryk, 1998, p. 22.

The student constructed knowledge by inventing word problems illustrating concepts of multiplication. Correct answers on the worksheet and in the student-constructed problems indicated understanding of the concept, and the details offered in the word problems indicated elaborated writing. The problems posed extended beyond the classroom and their solution required application of mathematics.

Student Authentic Intellectual Work Example, Fifth Grade Language Arts.[3]

Students were instructed, "Write a fable. Choose two animal characters. Think of some advice that will work as the moral of a fable. Then write a short fable that illustrates the moral. The fable must include conversation (dialogue)."
One student wrote,

> ***The Bear's Decision***
>
> *There once was a bear who ruled the forest of animals. He was looking for helpers to help him with the land's decisions. A dog, sparrow, rat and monkey became the bear's helpers.*
>
> *One day a hyena came to the forest. He heard that the lord was looking for one more helper for the king. He went to the bear's castle. He spoke to the bear. He said, "Is it true that you seek help to govern the land?" The bear said, "You have heard correctly." The hyena then said, "You must let me become your helper, because if you don't, I will destroy you, and I will become king!" The bear, upset about the hyena said, "You think I'm scared? Guards, take this lunatic away from my sight! He does not deserve anything for threatening me!" That was what the guards did.*
>
> *A cat also heard of this and spoke to the king. The cat told the king he was without a job because he was blamed of something he didn't do. The cat said, "I have looked for jobs, only to find nothing. I will be of use for the rest of your life." The bear said, "You are noble and good. You will become my helper."*
>
> *The hyena heard of the cat. He learned this lesson too late. Persuasion is better than getting what you want through force.*

[3] From Newmann, Lopez, & Bryk, 1998, p. 20.

By inventing and organizing the story's different parts, the student constructed knowledge. The details of the story, coherently developed, illustrate elaborated writing and in-depth understanding of the concepts of fable and moral/lesson of a fable. The intellectual work was directed to a persistent problem relevant to lives of students and others outside of school—the use of force verses reason to solve problems.

Student Authentic Intellectual Work Example, 12th Grade History.[4]

Students were instructed to develop a "position paper" on a controversial issue. The following excerpts are from one student's longer paper justifying U.S. intervention in Kuwait in the Persian Gulf in 1991.

> *There have been numerous instances when the world has witnessed what happens when aggressors are not stopped. Let us look back to 1935 when Mussolini decided to invade and annex Ethiopia. Ethiopia's emperor appealed to the League of Nations, but nothing was done.*
>
> *Soon afterwards, in 1936, Adolph Hitler reoccupied the Rhineland, thereby violating the Treaty of Versailles. Again, the world ignored these blatant displays of hostility and power…*
>
> *When Emperor Hirohito of Japan attacked Manchuria in 1931, and then China in 1937, he was simply scolded by the League of Nations…*
>
> *In 1938, Hitler united Austria and Germany. The world protested, but then gave in to Hitler who said he only wanted to unite the German people. Then, Hitler took the Sudentenland from Czechoslovakia. As before, concessions were made to appease the aggressor…*
>
> *In all the examples of unchecked aggression, the moral is the same. The school bully who demands lunch money from other children will not stop until someone stands up to him. If the bully is allowed to harass, intimidate, and steal from other children, it is giving him silent permission to use power against the weak…*

[4] From Newmann, Secada, & Wehlage, 1995, pp. 55-56.

Those who complain about the United States acting as a "police nation" would do well to remember that Desert Storm has been a United Nations effort, not solely a U.S. effort. The U.N. Security Council condemned Iraq's invasion and annexation of Kuwait, as did the Arab League. The U.N. imposed mandatory sanctions, forbidding all member states from doing business with Iraq. The European Community, the United States and Japan froze Kuwaiti assets. The United States, Britain, France, Canada, Australia, West Germany, the Netherlands, and Belgium; acted in accordance with the United Nations and with the support of its many members.

There is a time for peace and a time for war. War is a horrible situation, but it is imperative that countries learn to recognize when it is necessary. Perhaps someday the world will be able to solve its problems without violence. In the meantime, we would endanger international security to allow people like Saddam Hussein and his terrorist goons to threaten and overpower independent countries such as Kuwait.

By organizing an argument for intervention to stop international aggression, especially when international support for the action is evident, the student constructed knowledge. Elaboration was offered by citing historical instances where aggression, if not stopped, led to a chain of negative consequences. In addressing an important policy issue of the day, the student produced intellectual work connected to issues beyond school.

RATIONALE

Why Should Schools Promote Authentic Intellectual Work?

With schools being called upon to meet a myriad of purposes (e.g., teach basic skills in literacy and mathematics, prepare students for higher education and democratic civic participation, encourage responsible social behavior, celebrate cultural diversity, provide information on health and consumer success, and develop workplace technical and human relations skills), why add an apparently additional educational goal?

Strong cases can be made for the purposes above, but schools, teachers, and students can be overwhelmed, especially when topics, standards, and courses are taught as separate, unconnected items, and when there is so much to cover within a limited time frame

that students and teachers rarely have opportunities to reflect carefully on what they are learning. Since the 1980s the comprehensive high school has been aptly described as a "shopping mall" of fragmented learning opportunities of wide-ranging quality that fails to serve many students.

Promoting authentic intellectual work should not be seen as a project that adds yet a new or different educational goal. Instead, authentic intellectual work provides a framework for teaching and assessing any goal that relies on knowledge from an academic or applied discipline. The framework does not recommend how schools should arrive at priorities among the many tasks they are asked to perform. These issues must be resolved through democratic processes in communities, states and the federal system. The framework does insist, however, that whenever a school or teacher is involved in teaching knowledge or skills from an academic or applied discipline, serious effort should be devoted to helping students to produce authentic intellectual work. The rationale for this position rests on three main points.

Better Preparation for Intellectual Demands of the Workplace, Citizenship, and Personal Affairs

Studies of cognitive demands in modern workplaces document the importance of workers' problem-solving skills, in-depth understanding of problems and specific vocational content on the job, and elaborated nuanced forms of communication.[5] While thousands of jobs continue to require only low-level skills, as a matter of fairness, all students deserve the opportunity to be educated for the demands of more intellectually challenging workplaces.

Public investment in education is justified not only for its contribution to individual economic success, but also for building civic competence and skills in managing personal affairs. From Aristotle to Jefferson to Dewey to contemporary political scientists, the argument for democracy assumes that citizens are capable not only of basic literacy, but also of exercising principled and reasoned judgment about public affairs. Arriving at defensible positions on controversial public issues—from local disposal of toxic waste to national regulation of campaign financing, whether to support a school referendum, whether to vote for a candidate who most consistently agrees with your

[5] See Cappelli, Bassi, Katz, Knoke, Osterman, & Useem (1997); Decker, King Rice, Moore, & Rollefson (1997); Murnane and Levy (1996); National Center on Education and the Economy (1990).

positions but is not likely to win, or how to best allocate scarce personal time to participate in local volunteer organizations—all require interpretation, evaluation, in-depth understanding, and elaborated communication that extends well beyond traditional tests of knowledge.[6]

Finally, education should reinforce intellectual competence needed to maximize individual health, safety, and personal fulfillment. Consider the intellectual competence required in contemporary society to care for one's family and friends, to be safe and maintain health, to manage one's time and resources, and to develop rewarding hobbies and relationships. Coping with escalating and often conflicting information in each of these areas presents daunting challenges of interpretation, analysis and synthesis, in-depth understanding of specific problems, and working with elaborate forms of written, oral, and electronic communication.

Increased Opportunities for Student Engagement in Learning

Participation in authentic intellectual activity is more likely to motivate and sustain students in the hard work that learning requires. Teachers report that authentic intellectual work is often more interesting and meaningful to students than repeated drills aimed at disconnected knowledge and skills.

Almost 50% of high school dropouts leave because school is not interesting for them and almost 70% say they are not motivated to work hard.[7] Research indicates that students exposed to authentic intellectual challenges are more engaged in their schoolwork than students exposed to more conventional schoolwork.[8]

When students have opportunities to construct knowledge, rather than only reproduce what they have been given, to understand topics in depth instead of only superficially, to express themselves by explaining their ideas, and to study topics that have some significance beyond the classroom, they are more likely to care about and be interested in learning and willing to devote the serious effort that learning requires. Increased opportunities for student engagement offered through authentic intellectual work not only make schooling more "fun;" they lead to more effort which pays off in increased

[6] Aristotle (trans. 1946), Barber (1984), Dewey (1916/1966), and Jefferson (1939 version).

[7] Bridgeland, DiIulio, & Morison (2006).

[8] For evidence of the connection between authentic intellectual work and student engagement, see Newmann and Associates (1996); Kane, Khattri, Reeve, Adamson, & Pelavin, Research Institute (1995); Marks (2000); Avery (1999).

student achievement on both basic skills and more complex intellectual challenges which are likely to be recalled as valuable parts of one's education.

Intellectual Mission Strengthens Professional Community

The criteria for authentic intellectual work, along with more specific standards described next, provide a common, substantive language for teachers and administrators to use in describing the intellectual mission of the school, in selecting curricular content and instructional activities, and in evaluating their progress and their students' accomplishments. By defining the kinds of intellectual work to be nurtured in common across subjects and grade levels, this framework transcends lists of specific content and skills unique to different subjects and grade levels, thereby strengthening unity on the academic purpose within a school.[9]

The concepts embodied in the criteria and specific standards for evaluating instruction and student work stimulate teacher dialogue and cooperative planning within and across grade levels and subjects, whether the school is engaged in curriculum mapping, backwards planning, school improvement plans, interdisciplinary teaming, the vertical articulation of content, or other efforts to improve. Because the dialogue is grounded in generic intellectual activities, the framework itself becomes more meaningful to professionals than school missions expressed, for example, as "success for all students," or "proficiency in each content area." Because the latter missions usually depend on students at each grade level in each content area mastering discrete lists of skills and content, teachers in the different subjects and grades share no explicit intellectual goals. But if the mission is to promote authentic intellectual work, they can meaningfully collaborate to devise ways to teach the skills and content in their area according to the criteria for authentic intellectual work.

[9] Louis, Kruse, & Marks (1996) showed that schools with higher levels of professional community were more likely to show higher levels of authentic pedagogy.

Chapter 2
Research Summary

Overview

We conducted research on authentic intellectual work throughout the United States from 1990 to 2003. Data on instruction and student achievement were collected in hundreds of schools in different communities with diverse student populations in grades 3-12, and in the subjects of mathematics, social studies, language arts, and science. The first purpose of the research was to find out whether students who experienced higher levels of instruction and assessment that promoted authentic intellectual work showed higher achievement than students who experienced lower levels of instruction and assessment aimed toward authentic intellectual work. The second purpose was to find out what conditions within schools and beyond seemed to help and hinder schools' promotion of authentic intellectual work.

All of the studies assessed the extent to which teachers promoted authentic intellectual work through classroom instruction and/or assignments given to students. The studies varied in the subject areas and grade levels examined. Some studies measured student performance according to criteria for authentic intellectual work demonstrated in student writing submitted in response to teachers' assignments. Other studies measured student performance on conventional tests of basic skills and retention of knowledge. All studies addressed the issue of equity by estimating, and usually statistically controlling for, the influence of students' social backgrounds (socio-economic status, race, gender) and prior school achievement on the connection between classroom promotion of authentic intellectual work and student performance.

Focus on Intellectual Demands Rather than Teaching Practices

When educators, the public, or researchers want to improve teaching they typically try to identify "best practices," or "what works," and then attempt to implement those through professional development or pre-service education. Examples of practices considered effective include direct instruction, thematic or interdisciplinary learning, cooperative learning, student journals, the project method, hands-on activities, tutoring, portfolio assessment, role-playing/simulation, multi-media presentations, web-based learning programs, or student discussions.

Research may have shown some practices to be more effective than others for teaching specific skills or content to a specific group of students, but no single practice or set of practices have been shown to be most effective for varied intellectual outcomes for most students across several grade levels and subjects.

Further, any given teaching method can usually be used to cultivate different kinds of intellectual work, but knowing only the method used offers no assurance that authentic intellectual work is involved. A teacher might replace lecture-recitation with small group discussion, or short-answer worksheets with essay questions. But even with these changes, students might still devote most of their effort to remembering and listing isolated pieces of information, rather than thinking critically about how the information helps them to understand a powerful idea or to solve an important problem. A portfolio that shows a variety of student work over a semester might replace the final examination taken in one sitting, but the portfolio itself could be filled with entries that failed to demand in-depth understanding of the subject. Conversely, a high quality lecture/discussion or a carefully constructed short-answer homework question could lead students to use a few key ideas to develop in-depth and complex understanding of an issue.

According to the AIW framework, the merit of any practice or technique, whether conventional or innovative, should be judged on the extent to which its use includes intellectual demands consistent with the production of authentic intellectual work. Therefore, to study the extent of authentic intellectual work in schools and what teachers do to promote it, we developed standards and rubrics for describing not the use of specific teaching techniques, but the quality of intellectual work (Chapters 3 and 4). Some practices will undoubtedly give more opportunity for certain kinds of intellectual work to occur. For example, discussions and essays give more opportunity for students to explain themselves than lectures or multiple-choice questions, but knowing only that

discussion occurred or essays were assigned gives no assurance that the teacher used these practices to generate elaborated student explanations.

Results

Combining results from several studies, research indicated that students who experienced higher levels of instruction and assessment that promoted authentic intellectual work showed higher achievement than students who experienced lower levels of instruction and assessment aimed toward authentic intellectual work. The achievement benefits occurred on both direct assessments of authentic intellectual performance and conventional standardized tests of basic skills and curriculum content. The studies examined promotion of authentic intellectual work throughout the United States in grades 3-12, across the subjects of mathematics, social studies, language arts, and science. Results were positive and consistent, regardless of students' race, gender, or socioeconomic status, and across all grades and subjects studied.

In reporting results, all of the studies compared the performance of students taught by teachers who received higher scores on promotion of authentic intellectual work according to their scores on our criteria for instruction and teachers' assignments (e.g., teachers who scored in the highest quartile of the group of teachers studied) with the performance of students whose teachers received lower scores on promotion of authentic intellectual work (e.g., teachers who scored in the lowest quartile of the group of teachers studied). Tables 1 and 2 summarize the results.

Table 1. Research Measuring Student Achievement with Standards for Authentic Intellectual Work

Study Name and Dates	# and Types of Schools, Classes, Students	Subjects Grade Levels	Instruction Observed (O), Surveyed (S)	Assignments Collected	Achievement Measure	Achievement Benefit of Higher vs. Lower Scoring Teachers' Classes
Center on Organization and Restructuring of Schools (CORS) Field Study, 1990-94[10]	24 elementary, middle, and high schools, 130 classrooms, 2,100 students, schools mostly urban, some non-urban	Math, Social Studies, grades 4-5, 7-8, 9-10	O	Yes	AIW rubrics	30 percentile points higher than lower scoring
Chicago Annenberg Research Project Field Study, 1996-97[11]	12 Chicago elementary schools, 74 teachers, about 700 students, all urban	Language Arts (writing), Mathematics, grades 3, 6, 8	No	Yes	AIW rubrics	34-56 percentile points higher than lower scoring
Minnesota Observed Instruction Study, 1998[12]	1 urban high school, 5 teachers, 12 classes, 116 students	Social Studies, grade 11	O	No. All classes had same high scoring authentic assignment.	AIW rubrics	66% higher scores on rubric than lower scoring
Research Institute on Secondary Education Reform for Youth with Disabilities (RISER) Study, 1999-2003[13]	4 high schools, 32 teachers, 32 classes, 650 students, schools urban, rural, small city	English, Math, Social Studies, Science, grades 9-12	O	Yes	AIW rubrics	51-58% higher scores on rubric than lower scoring

[10] Newmann, F.M., Marks, H.M., & Gamoran, A. (1996). Authentic pedagogy and student performance. *American Journal of Education, 104*(4), 280-312.
[11] Newmann, F.M., Lopez, G., & Bryk, A.S. (1998). *The quality of intellectual work in Chicago schools: A baseline report.* Chicago: Consortium on Chicago School Research. Available at www.consortium-chicago.org.
[12] Avery, P. G. (1999). Authentic instruction and assessment. *Social Education, 65*(6), 368-373.
[13] King, M. B., Schroeder, J., & Chawszczweski, D. (2001, September). Authentic assessment and student performance in inclusive schools. *Brief No. 5*. Madison, WI: Research Institute on Secondary Education Reform for Youth with Disabilities. Available at http://www.wcer.wisc.edu/riser/briefs.htm

Table 2. Research Measuring Student Achievement with Conventional Standardized Tests

Study Name and Dates	# and Types of Schools, Classes, Students	Subjects Grade Levels	Instruction Observed (O), Surveyed (S)	Assignments Collected	Achievement Measure	Achievement Difference Between Higher/Lower Scoring Teachers (Classes)
National Education Longitudinal Study, 1988-1992[14]	1,000 high schools, national representative sample, 10,000 students	Math, Science, grades 10, 12	S	No	NAEP, multiple choice	Grade 8-10 gain 60-80% higher; grade 10-12 gain 100% higher on test score scale
Chicago Annenberg Research Project. Authentic Assignments and Standardized Test (ITBS) Gains, 1997-1999[15]	46 Chicago elementary schools, 124 teachers, about 1,600 students per grade per subject	Math, writing, reading	No	Yes	Iowa Tests of Basic Skills	early gains 40% higher on test score scale

[14] Lee, V. E., Smith, J., & Croninger, R. (1995). Another look at high school restructuring. *Issues in Restructuring Schools, No. 9.* Madison, WI: Center on Organization and Restructuring of Schools, Wisconsin Center for Education Research, University of Wisconsin. Available at www.wcer.wisc.edu, completed projects, educational policy, Center on Organization and Restructuring of Schools.
Lee, V. E., Smith, J., & Croninger, R. (1997, April). How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education, 70,* 128-150.

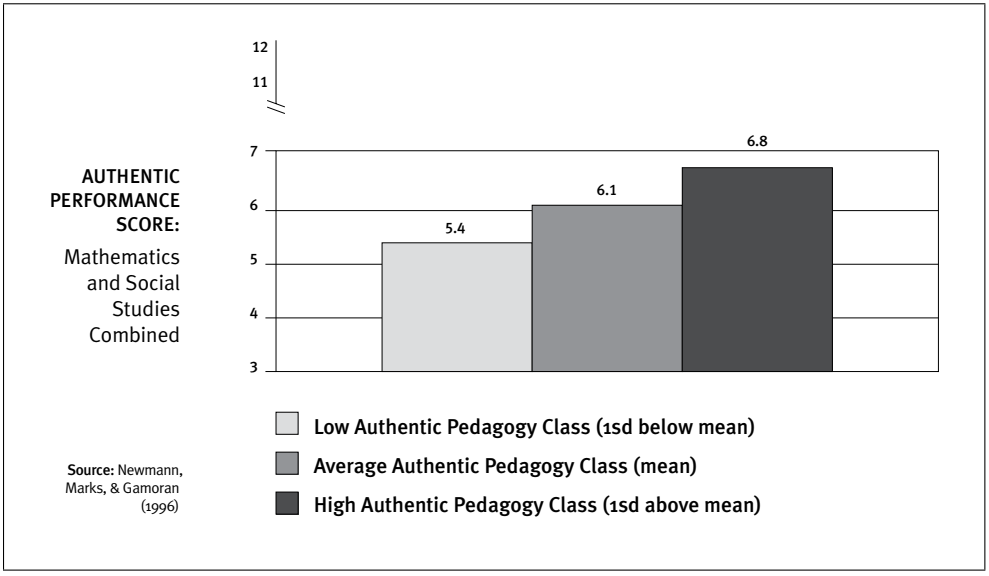
[15] Newmann, F.M., Bryk, A.S., & Nagaoka, J. (2001). A*uthentic intellectual work and standardized tests: Conflict or coexistence.* Chicago: Consortium on Chicago School Research. Available at www.consortium-chicago.org.

A Closer Look at Two Studies of Authentic Achievement

The CORS 24-School Study (Elementary, Middle, and High Schools)

From 1990-1995, CORS studied three mathematics and three social studies classes in eight elementary, eight middle, and eight high schools across the U.S. that were making significant efforts in "restructuring" their schools. For each teacher, four lessons per year were observed and rated on standards for authentic instruction. Each teacher also submitted four assignments that the teacher considered to pose challenging assessments of the students' understanding of the subject. The teachers also submitted the students' written work in response to the assignments. Researchers and practicing teachers not participating in the study scored the quality of assignments and student work according to standards for authentic assignments and for authentic student work. Thus, each class received an "authentic pedagogy" score based on lesson observations and assignment quality. Each class also received an average authentic performance score based on the quality of student work. Figure 1 indicates the average performance score of students, on a scale of 3-12, whose classes received low, average, and high authentic pedagogy scores. The difference in scores between 5.4 and 6.8 represents 30 percentile points in the full distribution of scores.

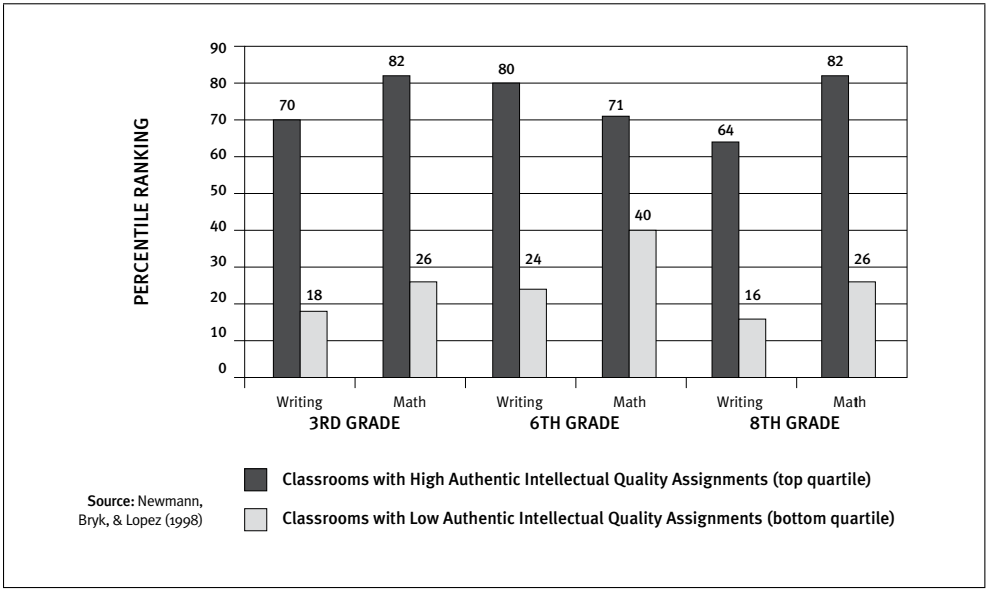
Figure 1. Mathematics and Social Studies Authentic Student Performance in Classes with Low, Average, and High Authentic Pedagogy in 24 Restructuring Elementary, Middle, and High Schools



The Chicago 12-School Study (K-8)

In spring semester of 1997, 74 teachers of Language Arts and Mathematics in grades 3, 6, and 8 in 12 Chicago elementary schools that scored below the average of all Chicago elementary schools submitted four student assignments, two of which they considered to pose challenging assessments of the students' understanding of the subject. They also submitted students' written work in response to the assignments. Chicago Language Arts and Mathematics teachers at these grade levels not participating in the study scored the quality of demands for authentic intellectual work in the assignments and the quality of authentic achievement evident in students' responses. Figure 2 below compares the percentile ranking of average student scores with teachers whose assignments scored in the lowest versus highest quartiles among all the classes. Students receiving the highest quality assignments scored from 30 to 56 percentiles higher than students of teachers who gave the lowest quality assignments.

Figure 2. Writing and Mathematics Authentic Student Performance According to Authentic Intellectual Quality of Teachers' Assignments in 12 Chicago Schools



These and the other two studies included in Table 1 show consistent benefits in authentic intellectual performance across grade levels and subjects of teachers' making demands for authentic intellectual work.

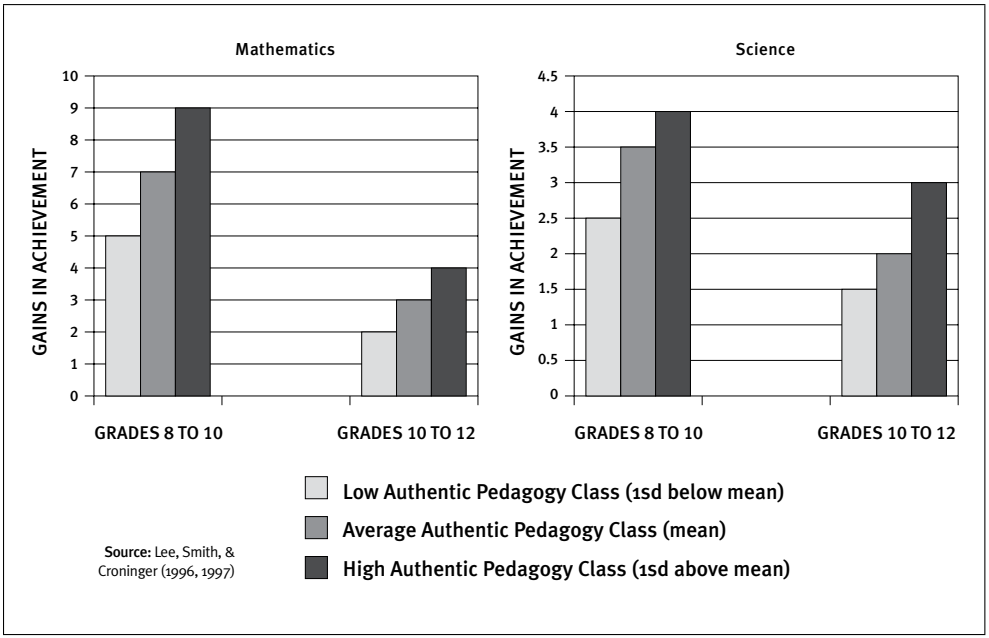
A Closer Look at Two Studies of Conventional Academic Achievement

The NELS 1,000-High School Study

From 1988 to 1992 the National Educational Longitudinal Study included surveys and testing that followed 10,000 students in 1,000 U.S. schools from 8th grade through 12th grade. Some items in the teacher and student surveys of instruction in mathematics and science were consistent with our standards for authentic instruction. We used these items to estimate the degree of authentic intellectual demands that students experienced. All students were tested in these and other subjects using items, usually multiple-choice, from the National Assessment of Student Progress (NAEP). Most of these items required only recall or simple application of previously learned information,

rather than construction of knowledge, in-depth understanding, or elaborated communication. Figure 3 shows the differences in test score gains from 8th to 10th and 10th to 12th grades between students receiving below average versus above average levels of authentic instruction.

Figure 3. High School Mathematics and Science Conventional Achievement Gains According to Levels of Authentic Instruction in 1,000 Schools (NELS Survey)



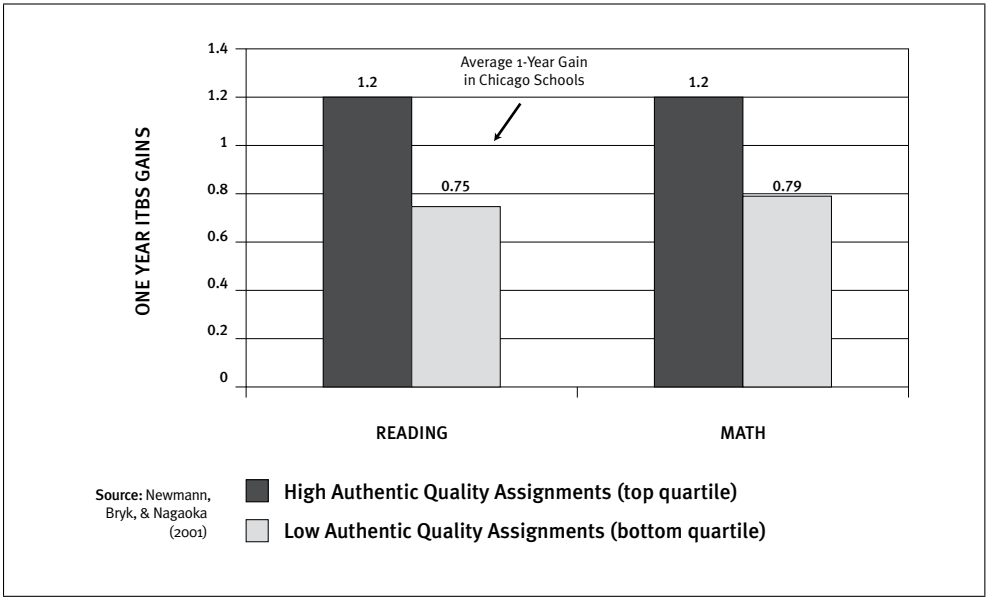
Gains in achievement are reported here as standardized scores of gains in items answered correctly, on scales which adjust the percentage of correct items according to the difficulty of the items. While the scales are not easily interpreted in terms of percentile gains or other common measures, the advantage of high versus low quality instruction is substantial in both subjects and both two-year comparison periods.

The Chicago 46-School Study (K-8)

From 1996-1999, two teachers of language arts and mathematics in grades 3, 6, and 8 in 46 Chicago elementary schools submitted six student assignments per year, two of

which they considered to pose challenging assessments of the students' understanding of the subject. They also submitted students' written work in response to the assignments. Chicago teachers of language arts and mathematics at each of the grade levels who did not participate in the study scored the quality of teachers' assignments and student written work according to the standards for authentic assignments and authentic student work. For the Iowa Test of Basic Skills, given to all students in Chicago, students' gain scores for each of three years were averaged for each of the teachers' classes. Using the average gain in basic skills across all Chicago schools in each subject and grade as the reference point (one year ITBS gain), Figure 4 below compares the gains in basic skills for students receiving assignments scored in the highest versus lowest quartile of the 46 schools. Students receiving higher quality assignments gained about 20% more in basic skills than the Chicago average gain and almost 40% more than students receiving the lowest quality assignments.

Figure 4. Elementary Students' Gains in Reading and Mathematics on the ITBS According to Authentic Quality of Teachers' Assignments in Writing and Mathematics in 46 Chicago Schools with Gain Scores Averaged Across Grades 3, 6, 8 for 96-97, 97-98, and 98-99



Source: Newmann, Bryk, & Nagaoka (2001)

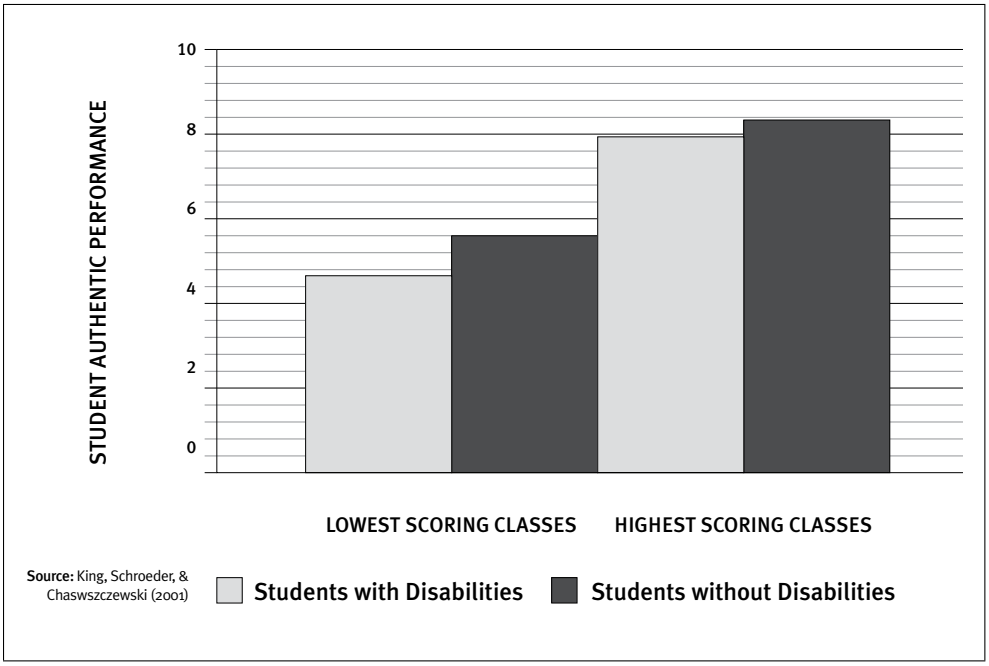
Authentic Instruction Enhances Equal Educational Opportunity

Evidence from the studies supports five major findings related to equal opportunity in education.

1. Authentic instruction and assignments bring significant benefits to students from any racial, ethnic or socioeconomic group, or gender. Although students with higher prior academic achievement derive slightly greater benefit from authentic instruction and assignments, these benefits are minimal compared to the robust benefits that students from all racial, SES, and gender groups experience.
2. Secondary students with mild to moderate learning disabilities within inclusive classes (from 11-22% of students included in the study) benefit substantially from authentic assignments on assessments of authentic intellectual performance. According to the RISER study summarized in Table 1, students without disabilities did better across all classes. But importantly, students with disabilities who received higher levels of authentic pedagogy (teachers' scores on instruction plus assignments) produced more authentic work than students with disabilities who received lower levels of authentic pedagogy. Figure 5 presents the findings.
3. Student exposure to high levels of authentic instruction can be distributed equally to students from any racial, ethnic or socioeconomic group, or gender. In the group of schools studied, whether students received higher or lower levels of authentic instruction was not related to any of these student background factors.
4. Authentic instruction can help to reduce the link between students' social background and academic achievement. The large national study of high school students (NELS) found that in schools with higher levels of authentic instruction, the connection between students' socioeconomic status (SES) and scores on conventional achievement tests (NAEP) was weaker than in schools with lower levels of authentic instruction. It also found that *the gap in achievement gains from 8th to 12th grade between high and low SES students decreased substantially in schools with high levels of authentic instruction, but the achievement gap between SES groups increased in schools with low levels of authentic instruction.* While stronger demands for authentic intellectual work did not eliminate the achievement gap, it decreased it. For example in science, in high schools with low levels of authentic instruction, high SES students gained about 6 points on a

standardized scale from grades 8-12 while low SES students gained only 1 point. In high schools with high levels of authentic instruction, high SES students gained about 8 points, but low SES students gained 6 points.[16] Further, the CORS study found that the effect of students' social background on measures of authentic achievement seems to be less than the effect of social background on conventional achievement tests.[17]

Figure 5. Authentic Performance for Students with and without Disabilities in Classes with Low and High Scoring Authentic Assignments in Four Schools, Grades 9-12, 32 Teachers, Four Academic Subjects



[16] Gains derived from data presented in Lee & Smith (1996), Lee, Smith, & Croninger (1995, 1997).

[17] Newmann, Marks, & Gamoran (1996, p. 304) found that on the measure of authentic achievement across the elementary, middle, and high school sample, Hispanics and low SES students did not score significantly lower than whites or high SES students, while African Americans scored lower than whites, and girls scored higher than boys. But inequality in authentic performance between African Americans and whites or between boys and girls was no greater, and quite possibly less, than inequality on the more traditional NAEP measure that was used as a pre-test.

These findings show that for equity in student outcomes, authentic instruction offers the good news that it does not exacerbate, and often helps reduce, educational inequality. However, using the standard that high levels of authentic instruction should be available to all students, the news is bad. Most of the studies found wide variation between classes within schools and wide variation between schools in the levels of authentic instruction offered.[18] Since high levels of authentic instruction were rarely offered, student opportunity to experience it was quite limited. In this sense, we are a long way from achieving equality of educational opportunity.

Explaining the Findings

The findings can be explained in part by other research showing that the more teachers expect from students, the better the students' performance, and this might seem self-evident. However, given a pervasive skepticism that educationally disadvantaged students of limited academic ability can meet the intellectually complex and rigorous challenges suggested by criteria for authentic intellectual work, it was particularly instructive (and for some surprising) to learn that students of all social backgrounds and levels of prior academic success benefit from demands for authentic intellectual work.

Explaining the positive results on standardized tests is more problematic. According to conventional wisdom, basic skills and key information in subject areas are best taught through traditional drill and practice, and if not explicitly taught and memorized, students, especially those from disadvantaged backgrounds, are unlikely to succeed on tests of basic skills, or on standardized tests of subject matter content. These assumptions make teachers reluctant to demand construction of knowledge and in-depth understanding through elaborated communication, because it takes time away from explicitly covering all the material that might be required on a test. How then do we explain the fact that students of teachers who make higher demands for authentic intellectual work actually perform *better* on conventional tests of basic skills and knowledge than students of teachers who make lower demands for AIW?

[18] Variation in promotion of AIW between teachers within schools was greater than variation between schools. The studies did not include research on individual teacher characteristics that might account for teacher variation in promotion of authentic intellectual work. Research indicated that promotion of authentic intellectual work was more likely in schools with stronger levels of professional community and stronger principal leadership consistent with AIW (Louis, Kruse, & Marks, 1996).

Our explanation has two parts. The first derives from the fact that conventional standardized tests make substantial demands for mastery of vocabulary. These tests are in large part assessments of students' knowledge of the meaning of words. This is most apparent in conventional tests of reading, but it applies to other subjects as well. For example, writing tests assess students' proper use of words in sentences and paragraphs to convey the students' intended meaning, tests of writing skills can be seen as tests of student understanding of words. Tests of mathematics and science, in essence, ask students to show they understand the meaning of concepts and symbols such as add, divide, perimeter, percent, velocity, and temperature. When teachers demand authentic intellectual work, they may not consistently use extensive drills and recitation to teach the meaning of words. Instead, they require students to think about and use words and concepts to solve problems that have personal meaning, rather than asking them to use words only to complete routine school exercises.

When students construct knowledge through disciplined inquiry, they must often consider alternative solutions, justify their conclusions with reasons and evidence, apply their knowledge to new contexts, develop deep understanding of topics, rather than only superficial awareness, and express themselves through elaborated communication (rather than in terse linguistic fragments). These intellectual tasks emphasize, in one way or another, extensive use and application of words and ideas in varied contexts. As students study a topic in some depth, the rules, algorithms, and words they learn are less likely to be memorized as disconnected skills and facts, and more likely to be integrated within larger cognitive schema that connect new bits of information to one another and to students' prior knowledge. Since cognitively integrated knowledge is more likely to be internalized and retained by students, it is more likely to be remembered and correctly applied on standardized tests than knowledge memorized as discrete items only for the purpose of repeating it when called upon.

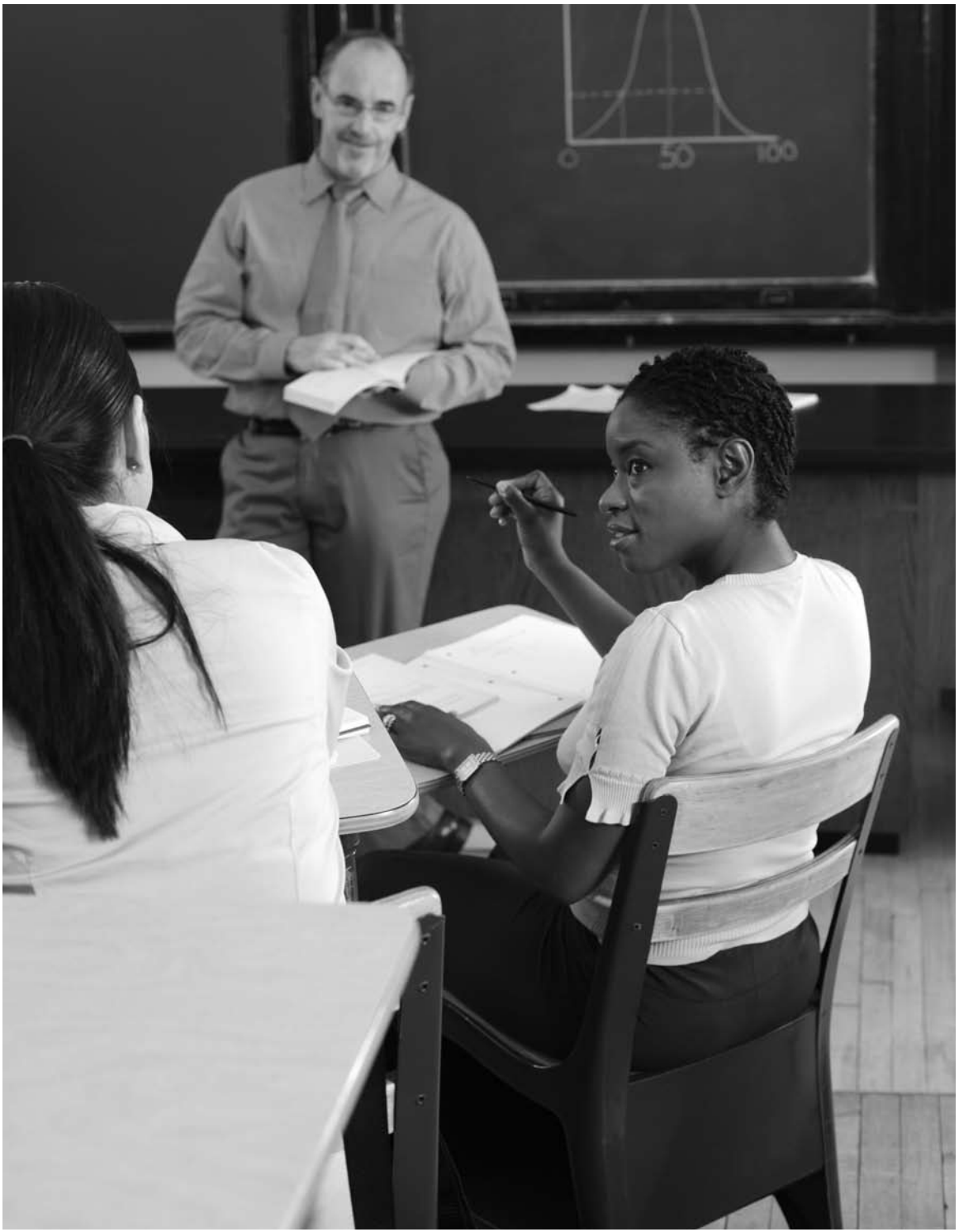
Illustration: *A substitute showed up to teach eighth grade math, only to find most of the students had gone on a three-day retreat. Those remaining were the students who had either lost the field trip privilege or had never earned it in the first place. The lesson plan called for the substitute to show a movie, but the students immediately complained that they had already seen it. So she decided to teach math. At first the students complained and the teacher discovered they had no understanding of percent or fractions. But she persisted. By using a hypothetical budget and discount coupons, she had them calculating what they could and couldn't purchase based on the percent discounts. By the end of the week, the students created a "test" that accurately measured understanding of percent and fractions, drawn from problems they had developed at home with family members. The substitute teacher reported that students appeared not only to have mastered the concept of percent, but also to have developed a stronger confidence in mathematics, neither of which were cultivated through the basic skills worksheets that the regular teacher appeared to rely upon.*

The illustration conveys the second part of our explanation: participation in authentic intellectual activity helps to motivate and sustain students in the hard work that learning requires. Since demands for authentic intellectual work pose questions of interest to students in their lives beyond school, students are more likely to care about both the questions they study and the answers they learn. Thus, such assignments enhance a student's willingness to put forth serious effort in learning the material, as compared to exercises that have no personal meaning beyond completing an assignment to please the teacher or to attain a promotion. In sum, assignments that demand more authentic intellectual work elicit intensive thinking about and a deeper engagement in varied applications of words, concepts, and ideas. This can help students to internalize understandings as their own, and to use this knowledge to respond to items on conventional tests that may not have been explicitly covered in class.

Significance and Limitations

The research was unique and significant within educational literature, because it focused on the nature of intellectual work that teachers demand and students carry out in classrooms rather than specific teaching practices, because it used common rubrics to describe intellectual demands across several subjects and grade levels, and because the positive findings were consistent for students from diverse social backgrounds in many communities across several subjects and grade levels. These features justify using the framework and rubrics to increase authentic intellectual work by students.

Yet, because of important limitations, we do not offer an easily adoptable program. Teachers and administrators will have to work hard to apply the framework successfully. First, the research did not include development of curriculum or standardized assessment exercises that could be adopted to implement AIW in schools. As a result, teachers and administrators must continue to make decisions about what curriculum content to include and how to find or develop appropriate materials and activities for instruction and assessment. Second, because the rubrics for scoring instruction, assignments, and student work were designed mainly for research purposes, they may need to be modified for productive use by teachers in specific school contexts. Educators should feel free to adapt the rubrics to meet their needs, while retaining the rigor intended to guide teacher reflection on student intellectual work. Third, because the research did not develop and test particular in-service training programs to implement the framework, educators themselves will need to develop and fine-tune teacher development programs for their schools.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Part II

Teaching to Promote Authentic Intellectual Work with Standards and Rubrics

We believe the key to teaching for authentic intellectual work is for teachers to use standards and rubrics to guide instruction in lessons, assignments for students, and evaluation of the work that students produce. This section presents for each of these main teaching activities the standards, rubrics, and examples of lessons, assignments, and student work meeting the standards to varying degrees.

The main point of using the standards and rubrics is to help teachers reflect upon and define **more explicitly** criteria for *construction of knowledge, disciplined inquiry, and value beyond school,* not to have them adopt the precise language of each scoring rule and apply it in a uniform way. Some teachers may prefer to approach the standards without much collegial interaction, but the standards are more likely to be used effectively, when applied collaboratively with colleagues. As teachers attempt to apply the rubrics, they will not likely always reach consensus on the precise score for every lesson, assignment, or piece of student work considered. The rubrics should be used mainly as tools for teachers to assess the extent to which particular classroom activities and assignments

make demands for authentic intellectual work, and the extent to which students succeed in meeting them. To develop common understanding of the meaning of the standards and rubrics, teachers should try to reach agreement on scores. At the same time, disagreement over interpretations of the rubrics is not only acceptable, but can be very helpful, especially when the dialogue helps to clarify teachers' intellectual priorities among the standards (e.g., when deep knowledge in a subject may be considered more important than value beyond school) and when it leads groups of teachers to change the wording of a rubric to facilitate agreement in scoring within a subject or grade level. In short, the standards and rubrics should not be applied mechanistically, but used to provoke more careful discussion and shared understanding of the extent to which authentic intellectual work should be emphasized and what that will mean in a particular school, grade level, or subject.

Practitioners using the rubrics for staff development have found that discussing and using the rubrics, rooted in the common language of the AIW framework, can reduce faculty conflicts based on allegiances to different "best practices" and divisions between teachers of Advanced Placement classes and teachers who teach "lower-track" classes or between more and less experienced teachers.

The standards are organized according to the three criteria for authentic intellectual work—**Construction of Knowledge, Disciplined Inquiry, and Value Beyond School.** As indicated in Table 3, the wording of specific standards for each criterion varies somewhat for instruction, assignments, and evaluation of student work.

Standards for construction of knowledge and disciplined inquiry place special emphasis on cognitive complexity, or "teaching for understanding." As such these two standards can signify intellectual rigor. Standards for value beyond school emphasize transfer and application of academic understanding to issues faced beyond school, which can be construed as relevance. Activities scoring high on connections may or may not involve substantial cognitive complexity. The standards are elaborated below as they apply to classroom instruction, assignments, and student work.

Meeting these standards demands consistent classroom support for all students to master challenging work. The instructional climate should communicate high expectations for all students and should cultivate, through the teacher and student peers, enough trust and respect to reward serious intellectual effort. For example, mistakes should be treated as opportunities for positive growth, not as occasions for negative judgments of personal worth.

Table 3. Criteria and Standards for Authentic Pedagogy and Student Work

CRITERIA	STANDARDS		
	Instruction	**Assignments**	**Student Work**
Construction of Knowledge	Higher Order Thinking	Construction of Knowledge	Analysis
Disciplined Inquiry	Deep Knowledge	Elaborated Written Communication	Disciplinary Concepts for Writing, Grammar, Usage, Mechanics, Vocabulary, see Appendix B
	Substantive Conversation		Elaborated Written Communication
Value Beyond School	Connections to the World Beyond the Classroom	Connections to Students' Lives	

Authentic intellectual work should demonstrate reasonably accurate, up-to-date, authoritative knowledge as represented in the disciplines taught. Rubrics used in performance assessment often specify the specific knowledge and skills to be demonstrated to reach different levels of proficiency in a subject at a given grade level. Since rubrics in the AIW framework were intended to be used across subjects and grade levels, and designed to identify general qualities of intellectual work, it was not possible to describe in advance precisely what content must be included or criteria for whether its representation in the lesson, assignment, or piece of student work was sufficiently authoritative or accurate. In our research, instead of pre-specifying content knowledge in scoring lessons, assignments, and student work, we chose to rely on the professional judgment of teachers and others with knowledge of the relevant discipline and grade level. As implementation proceeds in a school, teachers will need to determine, depending upon

the grade level and topic of the lesson, assignment, or piece of student work, whether the knowledge and skills demonstrated are acceptable.

When we used the rubrics in research, we did stipulate that high scores should not be given for lessons, assignments, or student work that included significant errors in representation of knowledge or application of skills. In using generic standards and rubrics applicable to the teaching of almost any topic at any grade level, our general rule was that to score high, lessons, assignments, and student work must not include significant or major errors in content or application of skills, according to teachers' judgment. Conversely, scores need not be reduced for every mistake or error. High scores could be justified when non-significant errors were present, but when major errors existed, or when less significant mistakes dominated, scores must be reduced.[19] Because of dominant concerns that student production of precisely correct answers is more important that the nature of intellectual work done to arrive at answers, many teachers may have difficulty implementing this general rule.

[19] Appendix A contains other general rules, not included in Chapters 3, 4, or 5, for using the rubrics.

Chapter 3
Instruction

Standard 1: Higher Order Thinking

Instruction involves students in manipulating information and ideas by synthesizing, generalizing, explaining, hypothesizing, or arriving at conclusions that produce new meaning and understandings for them.

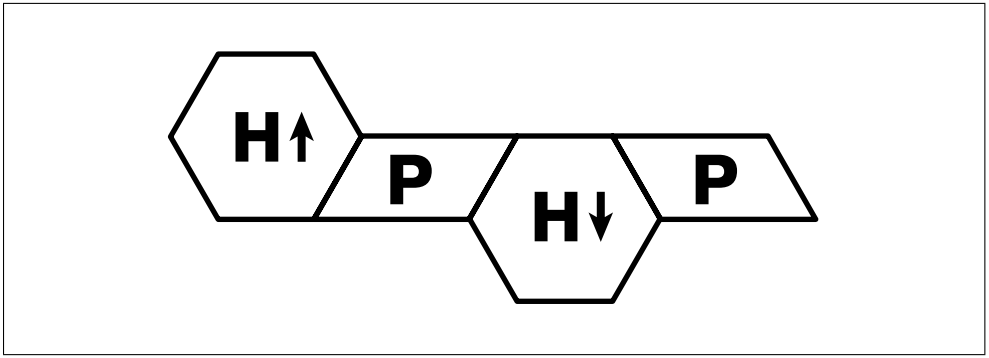
Higher order thinking (HOT) requires students to manipulate information and ideas in ways that transform their meaning and implications. This occurs when students combine facts and ideas in order to synthesize, generalize, explain, hypothesize, or arrive at some conclusion or interpretation. Lower order thinking (LOT) occurs when students are asked to receive or recite factual information or to employ rules and algorithms through repetitive routines. As information receivers, students are given pre-specified knowledge as facts, rules, and definitions to be remembered.

Rubric

5 = Almost all students, almost all of the time, are performing HOT.
4 = Students are engaged in at least one major activity during the lesson in which they perform HOT, and this activity occupies a substantial portion of the lesson and many students are performing HOT.
3 = Students are primarily engaged in routine LOT operations a good share of the lesson. There is at least one significant question or activity in which some students perform some HOT operations.
2 = Students are primarily engaged in LOT, but at some point they perform HOT as a minor diversion within the lesson.
1 = Students are engaged only in LOT operations; i.e., they either receive, or recite, or participate in routine practice, and in no activities during the lesson do students go beyond LOT.

Mathematics Lesson Example for Higher Order Thinking[20]

In a secondary school algebra class, students were asked to recognize, describe, and predict patterns. The teacher began the lesson by showing patterns (of train cars) created by placing hexagons and parallelograms in alternate order on the board.



Students spent much of the class discussing:

- Whether it was possible to link two identical trains that had cars of alternating shapes where each train had a length of five cars. The students decided that the final answer was "no," because to build two identical trains would break the overall pattern of alternating hexagons with parallelograms.
- What the shape at the end of the 10-car train would be. The students finally decided that it had to be a parallelogram since the pattern alternates hexagons (odd-numbered cars) with parallelograms (even-numbered cars).
- What the pattern was when one also considered the orientation of the hexagons. The first hexagon pointed up; the second hexagon pointed down; the third, up; and so forth.
- The orientation of the last hexagon that would be found on a train length of 57 cars.

[20] From Newmann, Secada, & Wehlage (1995, pp. 31-33).

One student noted that the last figure on the train had to be a hexagon since the train's length was an odd number (since in the earlier problem, they had decided hexagons fell on the odd numbers). Another student then asked what direction (up or down) the last hexagon pointed. This got the class into a discussion of patterns inside other patterns. After an extended discussion about the different ways of approaching this problem, one student noted that a larger pattern which included the hexagon orientation repeats every four cars (as opposed to every two for the pattern where orientation does not matter). Since 4 x 14 = 56, the next hexagon had to point in the same direction of the very first hexagon in the pattern, i.e., it had to point up.

The discussion continued as students tried to determine the total number of hexagons used to make a train. Students generated two equations. One equation applied if the train had an even length (i.e., an even number of cars), and the second equation applied if the train had an odd length. This led to a discussion about how to generate a single equation which also did not "use so many words." Finally, the students arrived at a single inequality which would encompass all cases. The teacher asked students, "Why do we sometimes get into the letter stuff? Why not just write it out?" Students generated many reasons for the efficiency of using letters over words.

This lesson scored high on Higher Order Thinking because almost all of the students were involved in generating their own predictions and explanations about geometric patterns and testing them with drawings and mathematical expressions. The lesson also scored high on deep knowledge, because the students explored a variety of possible relationships between hexagons and parallelograms connected in different series.

Standard 2: 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.

Knowledge is deep when, instead of trying to learn or expressing only fragmented pieces of information, students encounter and express details, distinctions, nuances, and different applications of central concepts aimed toward integrated or holistic understandings. Knowledge is superficial or thin when it does not deal with significant concepts or central ideas of a topic or discipline or when important, central ideas have been trivialized, presented only superficially or non-problematic.

Rubric

5 = Almost all students sustain a focus on a significant topic; or demonstrate their understanding of the complex or problematic nature of information and/or ideas; or express reasoned conclusions.

4 = *Either* the teacher or the students provide information, arguments, or reasoning that demonstrate the complexity of an important idea. Many students sustain a focus on a significant topic; or demonstrate their understanding of the complex or problematic nature of information and/or ideas; or express reasoned conclusions.

3 = Deep understanding of something is countered by superficial understanding of other ideas. At least one significant idea may be presented in depth and its significance grasped, but in general the focus is not sustained.

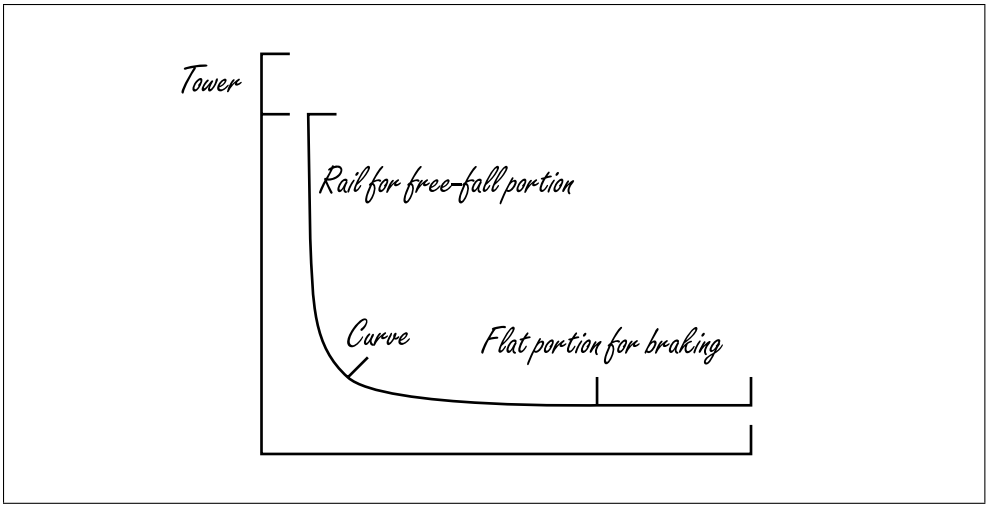
2 = While some key concepts and ideas are mentioned or covered, only a superficial acquaintance or understanding of these complex ideas is evident.

1 = The lesson does not deal with significant topics or ideas; teacher and students are involved only in the coverage of simple information.

Science Lesson Example for Deep Knowledge[21]

In a high school class combining mathematics and physics, the teacher and students worked together to design a "free-fall ride" for an amusement park. In the class previous to the one observed, students had designed a free-fall ride 125 meters high. They had worked on determining the design characteristics of the ride, such as distance, time, acceleration, and velocity. The teacher asked students to consider the height of the ride they had designed (125 meters) and the *actual* speed the rider would be going at the bottom of the free-fall portion of the ride. Would such a ride be reasonable? Initially, the students saw no problems with the ride.

[21] From Newmann, Secada, & Wehlage (1995, pp. 35-37).



The teacher asked the students to look at the data from their field trip to a nearby amusement park with a similar free-fall ride. They found that the park's ride was only 14 meters high and yet the resulting speed was quite fast. They concluded that the 125-meter ride would produce an uncontrollable and unsafe speed.

In response to several students' questions about the curved part of the ride, the teacher noted that one usually assumes that there is no acceleration through the curve. An alternative is to assume that the ride is free-fall to the horizontal and that, at the horizontal, it immediately begins to decelerate.

The teacher and students discussed assumptions of various drawings and other ways of representing their rides; the fact that the speed at the end of the free-fall portion of the ride would be the initial speed during the deceleration portion; the relationships among the initial velocity, the acceleration during the ride's deceleration, the amount of time needed to stop, and the length of the track needed to stop; the fact that deceleration can be thought of as a negative acceleration; and the relationship between force and acceleration.

During one typical interchange, students and the teacher were exploring the interrelationships among distance, velocity, acceleration, and time for the ride to stop. They had already talked about the relevance of Newton's second law of physics (F = m*a) and written relevant equations, such as:

$a =$ $v_i = 50$ $D_1 =$
$t =$ $v_f = 0$ $D_2 =$

$a^a \quad \frac{v}{-t} = \frac{-50}{2}$

$a^a \; -25 \; m/s^2$

$D_f = \frac{1}{2}at^2 + v_i t + D_i$ [Since $D_i = 0$, it could be ignored.]

$D_f = \frac{1}{2}(-25)(2^2) + (50)(2)$

The exchange began when a student asked about D_f (distance to stop the ride) and admitted that he just made one up. The teacher asked, "*Can* you just make one up?" The discussion included the following points. First, if you make up a stopping time, like 2 seconds, can you also make up a stopping distance? After looking at the equation for D_f, and realizing that the velocity (v_i) and deceleration (a) are related to the distance through time (t), the students decided that "if you make up a stopping distance, it's OK, but then you have to figure the time." Moreover, they concluded that "you can't make up *both* a stopping time and a stopping distance, but you can make up whichever one you want."

One student asked, "Why not just let a=0?… Since the ride is stopping, it is not accelerating; therefore, couldn't acceleration (a) just be 0?" With the teacher's questioning them about "what it means to slow down," students realized that "zero acceleration means it (the ride) is *neither* slowing down or speeding up." In other words, they concluded that "the ride would just go on forever at constant speed. It would never stop."

Next the teacher and about two-thirds of the students discussed what it really means to slow down at $25 m/s^2$. The teacher pointed out that this was about $2.5g$ (2.5 times the force of gravity). They talked about how many *g*s the human body can stand and what they would have to do to the ride to make sure no one would die.

As an extension to the concept of deceleration, the teacher asked students about the television show "Star Trek." "What does it mean to travel at warp 9, then stop in two

seconds as is done on the show?" Together, they decided warp 9 probably means nine times the speed of light. After remembering that the speed of light is 186,000 miles per second, everyone realized how ridiculous and impossible the maneuvers of the Starship Enterprise are. It was still OK, however, since in science fiction, "they have figured out how to overcome these things."

At this point, students and the teacher got involved in many smaller conversations, including one in which several students discussed the effects of gravity on the human body. They talked about what a *g* is, what it feels like, and what it is mathematically. The teacher joined the discussion and reminded them of when they had calculated their weights on other planets. The students then talked about how this is related to the force of gravity and, mathematically, what *g*s mean. Students, in their pairs and groups, were having similar conversations throughout the class.

This lesson scored high on Deep Knowledge, because almost all students were involved in expressing reasoned conclusions about application of concepts such as deceleration, gravity, and velocity. The lesson also scored high on Substantive Conversation because almost all students and the teacher created shared meanings on these topics, and the conversation consisted mainly of non-scripted sustained exchanges throughout the entire two-hour class period.

Standard 3: Substantive Conversation

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

Sustained teacher-student and/or student-student interaction is reciprocal, and it promotes coherent shared understanding about disciplinary content. Substantive conversation has three features:

a) talk is about subject matter in the discipline and includes higher order thinking;

b) the conversation includes sharing ideas and is not completely scripted or controlled by one party (as in teacher-led recitation);

c) the dialogue builds coherently on participants' ideas to promote improved collective understanding of a theme or topic.

To recognize substantive conversation, we identify an interchange as a statement by one person and a response by another. *Sustained* conversation is defined as at least three consecutive interchanges. The interchanges need not be between the same two people, but they must be linked substantively as consecutive responses.

Rubric

Note: To score 2 or above, conversation must focus on subject matter as defined in feature (a).

5 = All three features (a, b, c) of substantive conversation occur, with at least one example of sustained conversation, and almost all students participate.
4 = All three features of substantive conversation occur, with at least one example of sustained conversation, and many students participate.
3 = Features b (sharing) and/or c (coherent promotion of collective understanding) occur and involve at least one example of *sustained* conversation (i.e., at least three consecutive interchanges).
2 = Features b (sharing) and/or c (coherent promotion of collective understanding) occur briefly and involve at least one example of two consecutive interchanges.
1 = Virtually no features or substantive conversation occur during the lesson.

Social Studies Lesson Example for Substantive Conversation[22]

This class for eleventh- and twelfth-graders focused on events in South Africa in the early 1990s. The teacher began class by asking students to comment on a recent *New York Times* article they had been assigned to read about the recent election in South Africa. The following exchanges occurred during the discussion:

> ***Student 1:*** *Mandela says he will grant amnesty to individuals who supported apartheid in the past. If he does, that should lead to peace after the election. The article makes it sound like everything is positive in the country. It seems to say that democracy can really work.*

[22] From Newmann, Secada, & Wehlage (1995, pp. 38-40).

Student 2: *Yes, but I think the media image we get is only half the story. A lot of problems remain. Just because there is an election and democracy doesn't mean that race-hatred has disappeared. There are also big problems with the economy.*

Teacher: *Let's hear from some others on the topic. Should there be amnesty for those who ran apartheid? Should there be reconciliation? Should there be retribution or punishment for those who ran the old system?*

Student 3: *You can never start out new, like nothing in the past matters. There's a lot of pain that people aren't going to get over. It will take a lot of time, maybe a couple of generations.*

Teacher: *So, are you saying that people who feel the pain should engage in retribution? Should there be punishment like they did to the Nazi war criminals at Nuremberg?*

Student 3: *No, I don't believe that's a good idea. In the U.S. the segregationists were not tried or punished. It would just start things up again. So I think amnesty is a good thing. There should be no punishment.*

Student 4: *What does amnesty actually mean? Does it mean forgiving the people for apartheid?*

Teacher: *Who can define amnesty?*

Student 5: *It's a form of pardon, like when a criminal is pardoned for a crime they committed.*

Student 6: *Only in this case those who ran apartheid would not be guilty of anything. They would be pardoned in advance.*

Student 7: *I think the article also said that amnesty means people would not be publicly identified. A person who favored apartheid would not be named by the government. No one would actually know them.*

> ***Student 4:*** *That's a hard one to swallow. It seems like black people have to do all the forgiving. They have to find a way in their hearts to forgive. But maybe that's what he (Mandela) is trying to do. He's trying to break the cycle of hatred that was there under apartheid. It's a problem, because if you are beat down by someone, you want to go after them when you get the chance.*
>
> ***Teacher:*** *In addition to amnesty, the article used the word "reconciliation." What might be Mandela's motive for trying to bring about reconciliation?*
>
> ***Student 7:*** *I think he wants to get the support of the whites. If he loses industry, the country will be poor. He has to keep the white people in the country at least for a while…He can't do anything without money.*

This dialogue scored high on Substantive Conversation, because the talk focused on important social studies content such as amnesty, retribution, and apartheid. The students made distinctions and helped each other clarify their thinking by responding to previous statements. The dialogue was not scripted by the teacher, and through the discussion students seemed to develop a better shared understanding of the complexities in the justification of granting amnesty. The dialogue included at least one example of "sustained" conversation (three interchanges).

Standard 4: Connections to the World Beyond the Classroom

Students make connections between substantive knowledge and public problems or personal experiences they are likely to have faced or will face in the future.

Lessons can have value for students beyond simply achieving success in school by a) addressing an actual public problem of some contemporary significance; b) building on students' personal experiences to teach important ideas in the disciplines; and c) having students communicate their knowledge to others beyond the classroom in ways that assist or influence others.

Rubric

5 = Students recognize the connection between classroom knowledge and situations outside the classroom and the connection leads them to try to influence a larger audience beyond their classroom by communicating knowledge to others (including within the school), advocating solutions to social problems, providing assistance to people, and/or creating performances or products with utilitarian or aesthetic value.

4 = Students study or work on a topic, problem, or issue that the teacher and students explicitly recognize as connected to their personal experiences or actual contemporary public situations, and they explore the implications of these connections. However, there is no effort to use the knowledge in ways that go beyond the classroom to actually influence a larger audience.

3 = Students recognize some connection between classroom knowledge and situations outside the classroom, but they do not explore the implications of these connections which remain abstract or hypothetical, and there is no effort to actually influence a larger audience.

2 = Students encounter a topic, problem, or issue that the teacher *tries* to connect to students' experiences or to contemporary public situations, but the teacher's explanation is too brief, general, or unconvincing for students to see or value the connection.

1 = Lesson topics and activities have no clear connection to anything beyond the classroom, and the teacher offers no justification for learning the material beyond students' needs to perform well in school.

Social Studies Lesson Example for Connections to the World Beyond the Classroom[23]

In a 10th grade history class taught in the early 1990s, students were studying nationalism, militarism, and the origins of World War I. The teacher began by asking students to identify the causes of World War I. The nations involved were named; their alignment with one another was also discussed, along with the specific conflicts that preceded open warfare.

In the course of the discussion the teacher stated a few facts about Serbia during the early part of the twentieth century and asked what else students knew about Serbia. One

[23] From Newmann, Secada, & Wehlage (1995, pp. 41-42).

student replied that, "the Serbs wanted to escape rule by the Austro-Hungarian Empire and start their own country." Another student pointed out the similarity between this movement and more recent issues of the 1990s involving Serbs, Croats, and Muslims as they battle for independence and the control of regions in the former Yugoslavia. Another said that today, much like 1914, "the Russians have an interest in the region."

From these observations, a discussion developed in which several students became concerned that "the world might be headed for another world war" if Russia and other European countries began to intervene in the situation. Comparisons between 1914 and the 1990s were made, and one said, "Students always say, `Why do we have to study history?' This is why. If we didn't know these connections, we could go through this again."

At this point, the teacher asked what policy makers in Washington should do to prevent events from taking the course of another world war. He urged them, "Write to them about your concerns, and I'll give you 20 points. I guarantee they will write back." A number of students indicated they would write to their Senators about the issue.

The lesson scored high on Connections to the World Beyond the Classroom, because the students initiated a discussion of connections between the historical ethnic conflicts for independence and the possible outbreak of war in contemporary times. While not required, the teacher pressed students to take action on their concerns, and several indicated they would try to influence policy by writing public officials regarding their concerns for the Balkan region.

Chapter 4
Teachers' Assignments

The standards and rubrics for assignments presented here use language that can be adapted to different academic subjects by slight changes in wording or additional elaboration relevant to the discipline.

Standard 1: Construction of Knowledge

The assignment asks students to organize and interpret information in addressing a concept, problem, or issue relevant to the discipline.

Consider the extent to which the assignment asks the student to organize and interpret information, rather than to retrieve, report, or reproduce information. Asking students to repeatedly apply previously learned information, rules, and procedures is usually an indication of reproduction, not construction of knowledge.

Rubric

3 = The assignment's dominant expectation is for students to interpret, analyze, synthesize, or evaluate information, rather than merely to reproduce information.
2 = There is some expectation for students to interpret, analyze, synthesize, or evaluate information, rather than merely to reproduce information.
1 = There is very little or no expectation for students to interpret, analyze, synthesize, or evaluate information. Its dominant expectation is for students to retrieve or reproduce fragments of knowledge or to repeatedly apply previously learned information and procedures.

Literature Assignment Example Illustrating Construction of Knowledge[24]

In a high school literature class, students were given the following assignment:

> *We have discussed in class different interpretations of Shakespeare's* ***The Tempest.*** *Below are summaries of some of the opinions we've considered. Choose one of these views or develop your own coherent interpretation of the play's meaning. Support your claims with evidence from the play (relevant quotations). You may include other references to the sonnets or* ***Romeo and Juliet,*** *if you think they are appropriate. Indicate your choice of interpretation in your title.*
>
> *[Interpretations presented in the assignment are abbreviated here.]*
>
> 1. ***The Tempest*** *mirrors the expansion of the English empire and the colonization of other people…*
> 2. ***The Tempest,*** *the last play written solely by Shakespeare before he left London for Stratford-on-Avon, is clearly intended to be his last good-bye to the theatre…*
> 3. ***The Tempest*** *is primarily and most forcefully about the human desire for revenge and what we do with that desire…*
> 4. ***The Tempest*** *is a romantic comedy, full of fantasy, magic and faraway places…*
> 5. ***The Tempest*** *is Shakespeare's way of providing a glimpse into what we would now call "altered states of consciousness."*

The assignment scored high on Construction of Knowledge, because students were instructed to make and defend their own choices regarding which interpretation they prefer and to build a supporting argument using evidence they select from the play.

[24] From An Online Portfolio, Student Learning in Small Schools, What Kids Can Do with support from the Bill and Melinda Gates Foundation, Urban Academy, available at http://www.whatkidscando.org/specialcollections/student_learning/Urban/literature.html

Standard 2: Elaborated Written Communication

The assignment asks students to elaborate on their understanding, explanations, or conclusions through extended writing in the relevant discipline.

Assignments can ask for elaboration through prose, graphs, tables, diagrams, equations, or sketches. The assignment must ask for articulation of and support for generalizations in the relevant discipline.

Rubric

4 = Analysis / Persuasion / Theory. Explicit call for generalization AND support. The assignment requires the student to show his/her solution path, AND to explain the solution path with evidence such as models or examples.

3 = Report / Summary. Call for generalization OR support. The assignment asks students, using narrative or expository writing, either to draw conclusions or make generalizations or arguments, OR to offer examples, summaries, illustrations, details, or reasons, but not both.

2 = Short-answer exercises. The assignment or its parts can be answered with only one or two sentences, clauses, or phrasal fragments that complete a thought. Students may be asked to show some work or give some examples, but this is not emphasized and not much detail is requested.

1 = Fill-in-the-blank or multiple-choice exercises. The assignment requires no extended writing, only giving solutions or definitions.

Science Assignment Example Illustrating Elaborated Written Communication[25]

In a 9th-10th grade biology class students were studying different ecosystems and reasons that some species that are becoming extinct. Instructions to students were as follows:

[25] From staff at International High School (New York, NY) for in-service workshop on authentic pedagogy (2006).

Choose an endangered species to research from the continent assigned to your group. After completing the research, write a 1-2 page letter that will convince the World Wildlife Federation (WWF) that they should make all efforts to educate the public about your species and save you from extinction. The letter should be creative and persuasive, but to do so, you must include, in your own words, the following information: physical characteristics of your species, habitat, special adaptations that help you survive in your environment, your role in the ecosystem, whether you provide any benefits to humans and how you affect other living things, reasons that you are endangered, what actions humans can take to save you, and why we should try to save you.

Make sure your letter has:

Introduction: *state the reason for your letter and who you are;*

Few paragraphs: *separate your ideas and the information into a few paragraphs;*

Summary: *summarize the purpose of your letter and make a concluding statement to persuade them to help your species.*

The assignment scored high on elaborated written communication in biology, because it called for students to make generalizations regarding the role of their species in the ecosystem and to support their plea to be saved with detailed information about the species, and by identifying actions that could be taken and reasons they should be taken.

Standard 3: Connection to Students' Lives

The assignment asks students to address a concept, problem, or issue in the relevant discipline that is similar to one that they have encountered or are likely to encounter in their daily lives outside of school.

Consider the extent to which the assignment presents students with a question, issue, or problem that they have actually encountered or are likely to encounter in their daily lives and that can be addressed by applying knowledge or skills from the relevant discipline.

Certain kinds of school knowledge may be considered valuable in social, civic, or vocational situations beyond the classroom (e.g., knowing the water cycle). However,

assignment demands for "basic" knowledge will not be counted here unless the assignment requires applying such knowledge to a specific discipline-relevant problem likely to be encountered beyond the classroom.

Rubric

3 = The question, issue, or problem clearly resembles one that students have encountered or are likely to encounter in their lives. The assignment asks students to connect the topic to experiences, observations, feelings, or situations significant in their lives.

2 = The question, issue, or problem bears some resemblance to one that students have encountered or are likely to encounter in their lives, but the connections are not immediately apparent, and the assignment does not explicitly call for students to make the connections.

1 = The problem has virtually no resemblance to questions, issues, or problems that students have encountered or are likely to encounter in their lives. The assignment offers very minimal or no opportunity for students to connect the topic to experiences, observations, feelings, or situations significant in their lives.

Mathematics Assignment Example Illustrating Connections to Students' Lives[26]

High school students were given the following geometry task:

> *Design packaging that will hold 576 cans of Campbell's tomato soup (net weight, 10-3/4 oz.) or packaging that will hold 144 boxes of Kellogg's Rice Krispies (net weight, 19 oz.). Use and list the individual package's real measurements; create scale drawings of front, top, and side perspectives; show the unfolded boxes/containers in a scale drawing; build a proportional, three-dimensional model.*
>
> *Finally, students were told to write a short explanation of how they did the project and to do an oral presentation. Based on this activity, students were also to answer the question, "How does space involve geometry?"*

[26] From Newmann, Secada, & Wehlage (1995, pp. 24-25).

This assignment scored high on Connections to Students' Lives. While most students are not likely to face this specific type of packaging problem, it represents a type of problem, requiring math skills and concepts, that most people face—designing or selecting the type of package or container to hold goods, such as gifts or supplies, that need to be transported or stored.

Chapter 5
Evaluating Student Work

We judged the quality of student performance only according to the standards of construction of knowledge and disciplined inquiry. The criterion of value beyond school was not used to score student work because it was not logistically possible to collect valid information on the meaning or value of each student's performance to the student or to an audience beyond school. Although examining the student work alone could not inform us of the actual meaning beyond school to the student, the scoring of "connections to students' lives" in the assignments did give an indicator of that criterion.

Since the research project did not have resources to score non-written discourse (e.g., debates or small group discussion), products (e.g., graphic designs or physical models), or performances, the standards for student performance were applied to students' writing, completed in response to the teachers' assignments. High quality written performance, critical to success in further education, in work, and in civic participation, is an important indicator of students' ability to produce authentic intellectual work, but teachers might adapt the standards to non-written work as well.

Standard 1: Construction of Knowledge (Analysis)

Student performance demonstrates thinking about disciplinary, for example mathematics, content through organizing, synthesizing, interpreting, hypothesizing, describing patterns, making models or simulations, constructing arguments, or considering alternative points of view.

Student performance demonstrates thinking about mathematics content by using mathematical analysis.[27] That is, the student demonstrates mathematical thinking that goes

[27] These rubrics should be adapted for the relevant discipline by inserting the name of the relevant discipline where appropriate. Since the example used here is from mathematics, that discipline is the focus of the rubric.

beyond mechanically recording, reporting, or reproducing fragments of knowledge, facts, rules, and definitions or repeatedly applying algorithms.

Rubric

4 = Mathematical analysis was involved throughout the student's work.
3 = Mathematical analysis was involved in a significant proportion of the student's work.
2 = Mathematical analysis was involved in some portion of the student's work.
1 = Mathematical analysis constituted no part of the student's work.

Mathematics Student Work Example[28]

In response to the following high school assignment, we reproduce here the first excerpt from one student's response that extended to seven pages.

[28] From data submitted in the RISER project (2001).

INTEGRATED MATH 2

Systems of Equations and Graphing Inequalities Assessment
Linear Programming

COMPUTER PRODUCTION

Imagine that you are running a small business that assembles and sells two types of computers: Model A (the business version) and Model B (the personal version). You are only able to manufacture 360 computers in a given week and you want to find out how many of each model to produce each week to maximize your profit.

The following table shows all the relevant data concerning the employees at your company:

Job Title	Number of people doing this job	Job description	Pay	Hours worked
Assembler	100	This job involves putting the computers together	$500 per week	36 hours per week
Inspector	4	This job involves testing and correcting and faults in the computers before they are sold	$600 per week	35 hours per week

The next table shows all the relevant data concerning the production of the outfits:

	Model A	Model B
Total assembly time in man-hours for each computer	12	6
Total inspection and correction time in man-minutes for each computer	10	30
Component costs for each computer	$400	$320
Selling price for each computer	$600	$440

OBJECTIVE: To determine how many of each model to produce that will maximize your profits and then make a detailed presentation to the board of directors thoroughly explaining how you reached your solution.

Step 1: Assume you produce 100 Model A's and 200 Model B's in one week.

- How much do you pay in wages?

First we had to multiply the number of assemblers by the wages per week. (100 assemblers x $500 = 50,000) Then multiply the number of inspectors by the wages per week. (4 inspectors x $600 = 2,400) After this is completed you add the wages of the assemblers plus the wages of the inspectors. (50,000 + 2,400 = $52,400 total wages)

- How much do you pay for components?

For model A's component cost we multiplied 100 Model A's by $400 in component cost and got $40,000. For model B's component cost we multiplied 200 Model B's by $320 in component cost and got $64,000. We then added the total component cost from model A's (40,000) and the total component cost from the model B's (64,000) and we got $104,000 total cost for components.

- How much is your company's weekly income?

First you multiply Model A selling price for each computer by 100 Model A's. ($600 x 100 = $60,000) Then you multiply Model B selling price for each computer by 200 Model B's. ($440 x 200 = $88,000) You have to add the to totals to find the total income for the week. ($60000 + $88000 = $148,000 total income for week)

- What profit do you make?

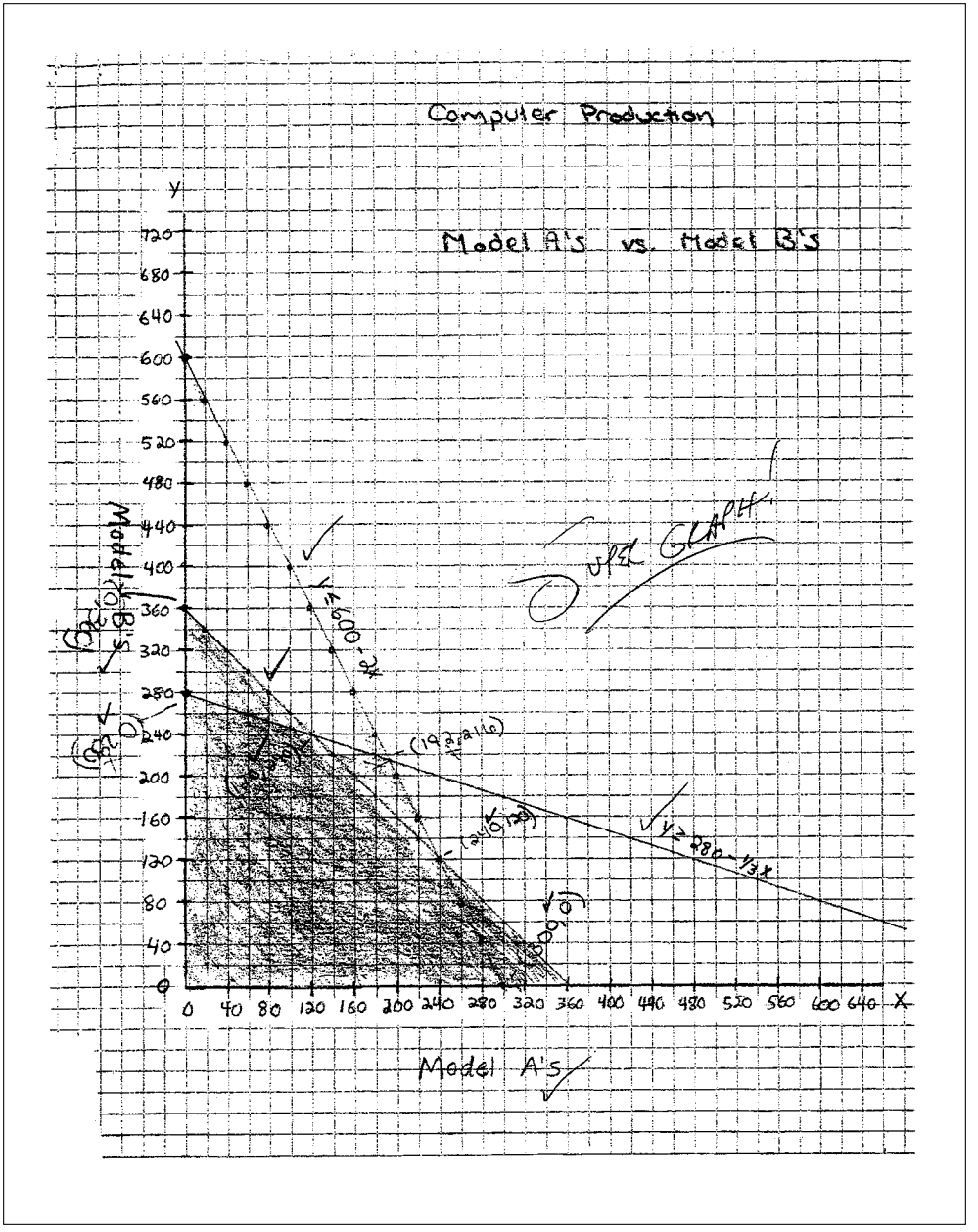
You have to go back and look what you got for total wages and add it to total cost for components. (52,000 + 104,000 = 156,400) You have to subtract that total from total income for the week to get the profit for the week. (148,000 – 156,400 = $-8,400 profit for the week)

Super.

Step 2: The above solution of 100 Model A's and 200 Model B's will not maximize your profit

- Write 3 inequalities (use x = # of Model A's and y = # of Model B's with the following topics:

~ The number of computers that can be made.


Computer Production
Model A's vs. Model B's
y
x
Model A's
Model B's
0
40
80
120
160
200
240
280
320
360
400
440
480
520
560
600
640
680
720
y = 600 - 2x
y = 480 - 2x
y = 280 - 1/3 x
(192, 216)
(240, 120)
(360, 0)
(0, 280)
(0, 480)
(0, 600)
UPSL GRAPH

Add x (# of Model A's) + y (# of Model B's). This equals 360 computers because you are only able to manufacture 360 computers in a given week. So the final equation looks like $x + y \leq 360$

~ The amount of time in takes (in hours) to assemble the computers.

Multiply total assembly time in man-hours for each computer for Model A (12) by x (# of Model A's). You add this total assembly time in man-hours for each computer for Model B (6) by y (# of Model B's). This equals 100 assemblers multiplied by 36 hours worked per week. (100 x 36 = 3,600) The whole inequality is $12x + 6y \leq 3,600$.

~The amount of time it takes (in minutes) to inspect the computers.

Multiply total inspection and correction time in man-hours for each computer for Model A (10) by x (# of Model A's) add this to total inspection and correction time in man-hours for each computer for Model B (30) by y (#of Model B's). This equals inspectors (4) multiplied by hours worked per week (35). (4 x 35 = 140 hours) But this equation is in minutes so you have to multiply 140 hours by 60 min. (140 x 60 = 8,400 min) The final equation is $10x + 30y \leq 8400$.

Step 3:

- Graph your system of 3 inequalities.

We had our graph go up to 600 on the Y-axis and up to 150 on the X-axis. The first equation we plotted was $Y \leq 600-2x$. The second line we plotted was $Y \leq 360-x$. The next line we plotted was $Y=280-1/3x$.

- Why can the graph be limited to the first quadrant only?

The graph is limited to the first quadrant because you cannot have negative computers. Good!

- What is the religion that that satisfies all 3 inequalities? REGION

Point one (0, 280) point two is (120, 240) point three is (240, 120) point four is (300, 0) and point five is (0, 0).

The work scored high on mathematical analysis, because throughout the work, even though responding to teacher prompts, the student organized, interpreted, hypothesized about, and created patterns (through graphing and equations) of production costs, sales, and profits, using addition, subtraction, and division in equations constructed by the student. The work also scored high on elaborated mathematic communication.

Standard 2: Disciplinary Concepts

Student performance demonstrates understanding of important disciplinary concepts, for example scientific concepts, central to the assignment.

Possible indicators of understanding important disciplinary concepts are expanding upon definitions, representing concepts in alternate ways or contexts, making connections to other concepts in the discipline or to other disciplines, and using concepts to organize and explain real-world situations.

Rubric

4 = The student demonstrates exemplary understanding of the scientific concepts that are central to the assignment.
3 = The student demonstrates significant understanding of the scientific concepts that are central to the assignment.
2 = The student demonstrates some understanding of the scientific concepts that are central to the assignment.
1 = The student demonstrates no or very little understanding of the scientific concepts that are central to the assignment, i.e., does not go beyond mechanical application of a procedure.

Science Student Work Example[29]

In a 10th grade science class, students did a field study of biodiversity of trees in a quadrat (a plot on the ground that represents a sample for biological study of vegetation in a plant community). They were instructed to take a census of the trees in the quadrat and to observe, record data on, report on, and draw conclusions about various features in the quadrat. The last part of the assignment is quoted below, and one student's report

[29] From data submitted in the RISER project (2001).

follows. In addition to the prose report, the student included drawings (not included here) in graph form showing location of different species and their height.

Results

In this section, you will present the data you collected during your study. Using text, tables, and diagrams, the following should be presented:

- What species of trees did you identify in your quadrat? Discuss the species diversity (richness, distribution, evenness)
- What is the dominance, or total DBH of each species? How does each species rank, in terms of dominance?
- How tall are the trees in your quadrat? Present your *vertical profiles*.
- What is the canopy density? ground cover %?
- What wildlife did you detect in or near your quadrat?
- Present a ***map of your quadrat*** showing the locations of the trees, as well as other significant features, such as the presence of shrubs and saplings, dead logs, human disturbance, etc.
- What was the average temperature and humidity for the days you were in the field?

Conclusions

Based on the species of trees you identified, what can you say about the habitat of your quadrat? Use your understanding of where these species of trees grow best (dry or wet soils, sun or shade, etc.). How might these trees provide good habitat for the wildlife you detected in your quadrat?

Compare your quadrat to the other two quadrats studied by your class. How is it similar? How is it different? Why do you think these similarities and differences exist?

Appendix

Results

I noticed that our quadrat had a large quantity of Pinstr. We barely had any other kind of tree. We had one Rigida, one Querub, one Hemlock, two Easternwood, and two Quercus, the rest were Pinstr. Even though there was diversity it wasn't distributed evenly, there were only one or two of the some species and then the rest were Pinstr. The Pinstr was located in almost every spot in the quadrat always near one another. The other species of trees except the Easter Wood were separated from each other. The thing that really stood out when I looked at the graph was that there were no trees located in the upper left corner of the quadrat. My thesis of that happening is that there was probably no sunlight reaching that area of the quadrat.

The dominant species is Pinstr because there are fourteen of them. The next two down from that are Quercus and Eastern Wood, which there were two of each. The next there were all one of and it was the Rigida, Querub and the Hemlock. The Pinstr has a diameter range of 13-47.8, my thesis of such a wide range is probably because the tree has been around the forest for a long time giving it longer to time to grow. The Quercus has diameter range of 12-14.8 this shows that the forest doesn't contain as many of these because they are just starting to grow. The Eastern Wood has a range of 16.2-17.5, this shows that this type of tree has had a longer time to develop than the Quercus but not as much as the Pinstr because the Pinstr has taken the majority of the sunlight and isn't giving enough to the other trees. The range of the Hemlock was 15 because there was only one of them; my thesis on this is because the Hemlock doesn't grow as fast or as tall as the other trees. The range of the Querub was 13.8, this shows that this particular tree doesn't spread as fast as the others because there's only one of them its hard to start spreading because the taller trees take up the sunlight. The Rigida is the last one there are only one of this type of tree its diameter is 25.5 and I think its as big as the other Pinstr is because its right on the edge of the quadrat near the river giving plenty of sun and water.

The canopy density is 74% this is because of the tops of the Pinstr spread out and have very long reach covering must of the quadrat. The ground cover was 68% which is surprising to me because it's almost winter and the green is still around on the ground. I would of thought it would have been a much lower number.

We didn't find much wildlife in our quadrat. We found many acorns that were opened and ate possible by squirrels or chipmunks. We found a dead log with possible life in it, such as bugs that we could not specify. We also found pinecones that were fully pealed down and sparingly pealed, that mean that there were squirrels and chipmunks around. I also saw a chipmunk running around in our quadrat one day. We also set up an investigation to see if we had any wildlife, we found as many pinecones as we could and set them up all in one spot. The next day we found them eaten. That's how we know there are squirrels and chipmunks in our quadrat.

The work scored high on scientific disciplinary concepts, because the student used the concepts of species dominance and diversity, along with conditions of weather and vegetation that affect survival and longevity to explain observations of the characteristics of trees and wildlife in a specific quadrat.

The thoroughness, clarity, and coherence of writing would also warrant a high score on elaborated written communication, which is described next.

Standard 3: Elaborated Written Communication (discipline specific)

Student performance demonstrates an elaboration of his or her understanding or explanations of disciplinary concepts through extended writing.

When the assignment calls for understanding in substantive concepts in an academic discipline, consider the extent to which the student presents a clear, coherent, and convincing explanation or argument for generalizations and conclusions. In addition to prose, elaborated written communication can be expressed through diagrams, drawings, or graphic representations.

Rubric

4 = Scientific explanations or arguments are clear, convincing, and accurate, with no significant errors.
3 = Scientific explanations or arguments are present. They are reasonably clear and accurate, but less convincing.
2 = Scientific explanations, arguments, or representations are present. However, they may not be finished, may omit a significant part of an argument/explanation, or may contain significant errors. Generally complete, appropriate, and correct work or representations (e.g., a graph or diagram) should be scored a 2 if no other part of the student's work on the task warrants a higher score.
1 = Scientific explanations, arguments, or representations are absent or, if present, are seriously incomplete, inappropriate, or incorrect. This may be because the task did not ask for argument or explanation, e.g., fill-in-the-blank or multiple-choice questions, or reproducing a simple definition in words or pictures.

Standard 4: Elaborated Written Communication (writing)

Student performance demonstrates an elaborated, coherent account that draws conclusions or makes generalizations or arguments and supports them with examples, summaries, illustrations, details, or reasons.

Elaboration consists of two major parts: a conclusion, generalization, or argument AND support for it, in the form of at least one example, summary, illustration, detail, or reason. Elaboration is coherent when the examples, summaries, illustrations, details, or reasons provide appropriate, consistent support for the conclusions, generalizations, or arguments.

Rubric

4 = Substantial evidence of elaboration. Almost all of the student's work comprises an elaborated, coherent account.
3 = Moderate evidence of elaboration. A moderate portion of the student's work comprises an elaborated, coherent account.
2 = Some evidence of elaboration. A small portion of the student's work comprises an elaborated, coherent account.
1 = No evidence of elaboration. No portion of the student's work comprises an elaborated, coherent account.

English Student Work Example[30]

In a 10th grade English course, students were given the following assignment. One student's response follows.

Humanities 10:

In what ways do we learn about humanity from people living during the 1930's?

You will be writing a compare *or* contrast essay for the 1930's, using The Grapes of Wrath, Out of the Dust, and Of Mice and Men. You will work with only two, based on what you have read.

We have talked about many themes throughout the past few weeks. **Choose one of the following themes that can be found in both works, compare or contrast how this theme (ONLY ONE) is developed through the characters in the book.**

- ✘ Loyalty
- ✘ Loneliness
- ✘ Forgiveness
- ✘ Fear

What does the idea that a theme is developed mean?

✘ Themes evolve throughout a literary work. You may see it evolve as the plot evolves, or you may see it evolve through the author's use of point of view, or tone. The author will develop several or few themes throughout his or her writing.

✘ Think about creating your own story. What would you want the overall affect to be? Do you want the reader to see the theme of challenges faced by students? Do you want to focus on the role of understanding yourself in your greater community, or in your family? HOW WOULD YOU CONVEY THIS?

You are only writing a FOUR PARAGRAPH ESSAY. Yes, this is different from the five-paragraph essay that you have gotten to know so well! However, because you are only comparing OR contrasting two books, you will be expected to write a paragraph about each.

[30] From data submitted in the RISER project (2001).

Hope

Pandora's curiously got the better of her. She could no longer wait to see what was in the box given to mankind. So while her husband, Epimetheus, was out, she decided that a harmless peek would cure her of the desire to see what the beautifully carved box contained. She cautiously lifted the lid and peered in. Out flew a black torrent of maladies and evils. Disease and pain escaped, followed by hatred, greed and jealousy, and they gleefully spread across the world to do their handiwork. A guilt stricken and horrified Pandora gingerly glanced back into the seemingly empty box. There, down at the very bottom, lay Hope. Gracefully, it glided into the room and told Pandora, "Whatever evils are abroad, hope never entirely leaves you; and while we have that, no amount of other ills can make us completely wretched."

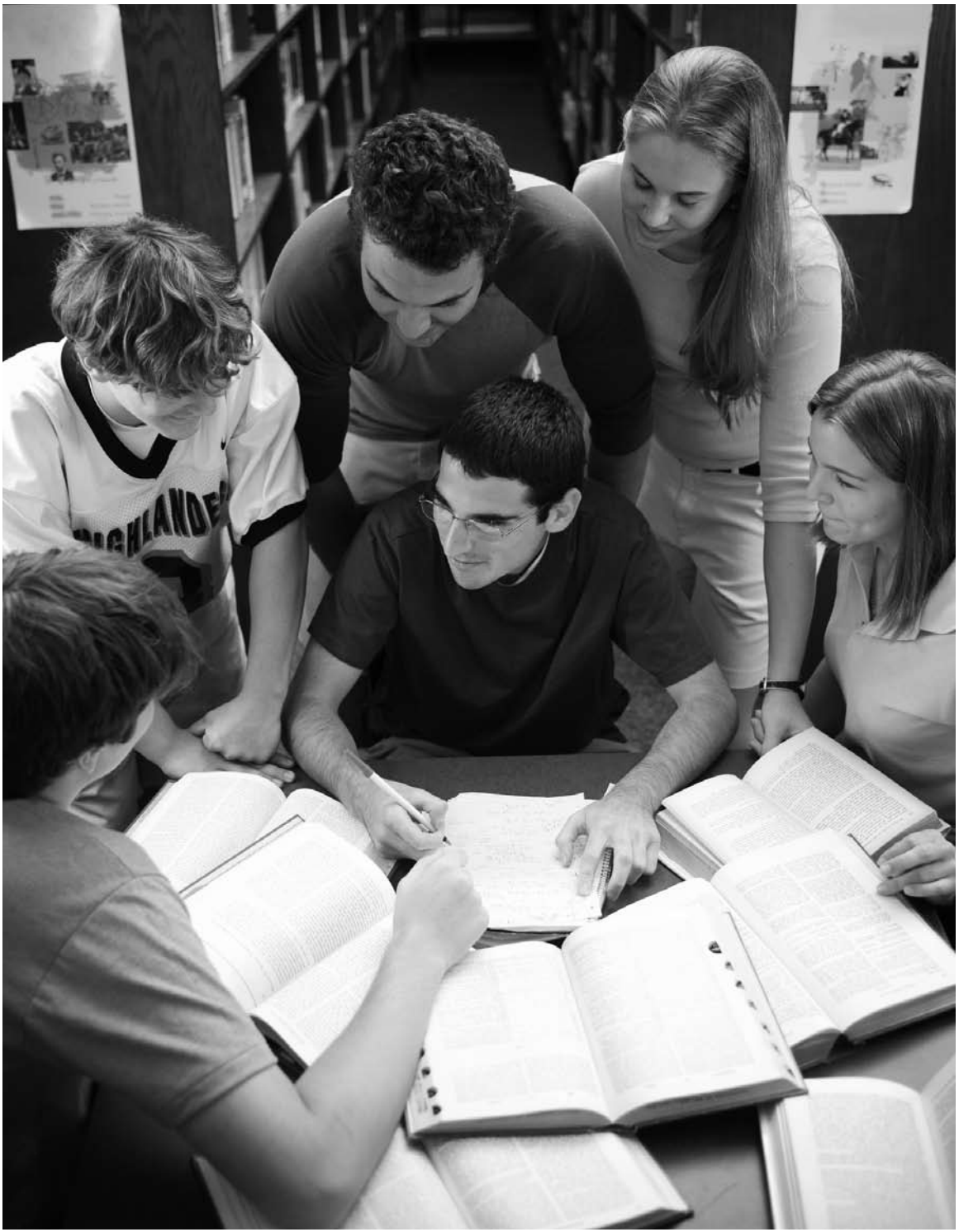
The Great Depression was one of the most trying times in American history, stretching every man to his absolute limits. But at every downfall, at every dead-end, they still had hope; hope that things would get better, hope that maybe around the next bend there would be a job or that this dust storm would be the last. When all the evils of life had been thrown at them, like Pandora they looked back into the box and found hope waiting for them there. This feeling of hope is often not said, but felt, an emotion that is written in between the lines using specific imagery and language ~~to portray it~~. Karen Hesse's novel, Out of the Dust, and John Steinbeck's, The Grapes of Wrath, capture the emotion of hope through the use of imagery.

Hesse's novel portrays this hope as a desperate need for rain to come and the crops to grow by creating specific images of what occurs. "If Daddy gets five bushels to his acre / it'll be a miracle," Billie Jo says in June of 1934 (45). Here Hesse uses the desperation of her situation to amplify the hope that she has for these five bushels because we know that five acres can produce much more. "Quarter inch of rain / is nothing to complain about. It'll help the plants above ground, and start the new seeds growing" (55). During May of 1935 it rains for three days and "The rain has brought back some grass/. Joe De La Flor is singing in his saddle again" (180). She hopes that this will be the last dust storm, that the rain will dampen the dust and the plants will hold the soil down. Even Joe De La Flor believes that the rain will stop the storms and sings for it. Billie Jo's telling of Joe singing gives the feeling that he is hopeful for the future, that things are looking better. Hope is written into each vignette as a mood, created through her use of language and the way that each is structured. The feeling that she describes, that desperate need or hope for the dust to stop, is not blatantly said, but rather felt through the emotion that she conjures by choosing what to depict.

The Grapes of Wrath also depicts hope as a deep emotion, using images to create the feeling of hope. The Joad family arrives over the mountains and is able to see the luscious, fertile land of California "The grain fields golden in the morning, and the willow lines, the eucalyptus trees in rows. Pa sighed, 'I never knowed there was anything like her [California]'"(310). Depicted in the image Steinbeck describes, the golden grain fields in the morning, is the sense of hope. When the Joads arrive in the Weedpatch Government Camp, Steinbeck uses the imagery of order and cleanliness to conjure the security of the camp and hope for the future, "Side-meat tonight, by God! We got money for side-meat!" a man tells to another (557). Because his situation is so desperate the side meat seems like a holy thing, so full of hope. The excitement that is packed into this quote shows how this man is finally getting what he had hoped for, a good meal. Steinbeck's choice of what he describes is used to depict hope.

Both Hesse's and Steinbeck's novels have a common thread of hope that is depicted through their use of imagery. In Out of the Dust Billie Jo just wishes for five bushels, that's all, and the man in The Grapes of Wrath is ecstatic over side meat. Using simple imagery both Hesse and Steinbeck show the desperateness their situation is and how they still are willing to hope for even the smallest things. When Billie Jo chooses to tell about Joe De La Flor and Steinbeck gives us the image of the golden field, they give us the feeling of hope through the image they create. Singing and gold are both words associated with hope. And when Hope is described as glowing in "Pandora's Box," this also gives the feeling of warmth and security, and therefore hope. By creating the tone of hope Steinbeck and Hesse tell us that no matter how hard things get, hope will always be at the bottom of the box.

Student work scored high on elaborated written communication, because throughout the work, the student stated conclusions or generalizations related to the theme of hope, and supported them by details from the novels about the Great Depression. If one wanted to evaluate the student's understanding of hope as a substantive theme in literature and the humanities, the writing would also score high on understanding of disciplinary concepts. The writing would score high as well on an additional standard we used to evaluate writing: **Forms and Conventions: Grammar, Usage, Mechanics, and Vocabulary** which is presented in Appendix B. Notice that even while the student did not choose one of the themes stipulated in the teacher's assignment, the example is a high scoring instance of authentic intellectual work.



Part III
Implementation

As explained in the introduction, this report is intended to help school staff members decide whether they wish to undertake further planning and ongoing professional development to implement instruction and assessment focused on student production of authentic intellectual work. Since the research was first published in the mid-1990s, we have conducted orientation sessions with many schools and districts nationwide and worked intensively with a few schools. A strong theoretical and empirical case can be made for schoolwide implementation, but in reality, comprehensive implementation is complex, labor intensive, and requires significant amounts of staff time, supported by strong, continuous administrative leadership. Central office and building-based staff developers, curriculum specialists, and learning coordinators should have advanced opportunity to understand the framework since many teachers will look to them for affirmation and assistance during initial stages of AIW implementation.

To maximize success, school, district, and state resources should be allocated for two general forms of support:

1. Significant time for a critical mass of teachers within a school, if not the entire staff, to study, discuss, and implement the framework, with data collection and de-briefing on their efforts. The discussions must nurture honest critical inquiry and a culture of collegial help. Only if teachers have ample opportunity to interrogate the framework, try it, and observe benefits to students, will they "buy in." Otherwise it will be viewed only as another reform imposed from above. One useful approach is to have building administrators analyze student work according to the standards, working as participants with, not observers of, the teachers.
2. Strategic planning that sets limited, incremental benchmarks toward a more comprehensive longer-term vision of the desired level of implementation in various subjects and grades. Strategic plans should detail what should be accomplished, by whom, according to a timetable, including what resources within and beyond the school are needed to make it happen. The planning should address how to deal with obstacles such as existing curriculum and testing requirements that require coverage of so much content that little time is available to spend on authentic teaching; parental concerns that authentic teaching will not adequately prepare students for standardized college entrance exams; or possible student resistance to the challenge of more complex intellectual work. Ongoing feedback and formative evaluations are important for mid-course adjustments and sustaining the efforts.

Chapters 6 and 7 discuss specific issues and approaches related to these forms of support.

Chapter 6
Issues and Activities for the Classroom Teacher

In considering whether to commit to this framework, teachers are likely to raise questions that should be thoroughly discussed. The three most common questions we hear from teachers are addressed below.

Why do we need this?

Some teachers who perceive they teach as effectively as possible may see no need to learn another framework. Others, without careful study of this approach, may assume that they already teach according to the framework, because they favor student-centered classrooms and discussion, because they emphasize student portfolios or rubrics, independent and cooperative student projects, or because they use "the inquiry method," Bloom's taxonomy, or some other approach that seems consistent with the authentic intellectual work framework. Other instructional activities or programs may share common elements with AIW, but careful analysis will usually point out critical differences. Such distinctions between current practice and what AIW calls for should be recognized and informed judgments made on whether the staff is willing to accept the AIW approach. For example, student-centered classrooms and AIW both emphasize problems of interest to students, but student-centered classrooms don't necessarily insist upon the degree of intellectual rigor that AIW demands.

Teachers may be convinced of the wisdom of the AIW approach, but see their students as incapable of succeeding with more complex intellectual work. Teachers may believe that students first need to learn more basic knowledge and skills through traditional presentations and practice. This widespread concern is usually indefensible, for three main reasons:

1. The belief that students should not be challenged to think until they have learned all the relevant facts can prevent students from ever being challenged with more complex work, because the supply of knowledge relevant to complex questions is continually growing, and in essence, is infinite. Not even the most educated, experienced person will ever master all relevant knowledge before being called upon to think and draw conclusions. The persisting intellectual challenge for students and adults alike is to reach defensible conclusions, in spite of usually incomplete knowledge.
2. Research described earlier shows that in many cases it is unnecessary to teach basic knowledge and skills before posing authentic intellectual challenges. Improvement on basic knowledge and skills is greater for students of teachers who most emphasize authentic intellectual work.
3. At the same time, it is realistically impossible and probably educationally unwise for even the most gifted teachers with the most gifted students to abandon all traditional teaching and to replace it with authentic teaching for every part of every lesson. Sufficiently enriched instructional materials do not exist, and some knowledge and skills are more efficiently learned through traditional teaching. Furthermore, traditional intellectual demands for recall, routine application of algorithms, and simple reporting of what has been learned can be both engaging and educative for students and teachers alike. In presenting the case for authentic intellectual work, our goal is not to rule out traditional teaching or totally abandon it. The point is to significantly increase the amount of time that students are engaged in authentic intellectual work, and to strive for a more reasonable balance between traditional teaching and authentic intellectual work.

In setting goals for their strategic plans, teachers should discuss options for increasing this balance. For example, if students currently spend only about 15-20% of their time doing authentic intellectual work, over a three-year period of development, would it be reasonable to try to increase that percentage to, say, 50%?

How will the framework help me with problems in teaching that I'd like to solve?

Teachers commonly face difficult challenges such as large class sizes, unmotivated students, demands to teach too much material and/or material that bores the teacher,

lack of time to share expertise with colleagues, students with such diverse needs and skills within a class that it is difficult to respond well to all, and pressure to ensure that students score well on external tests that don't adequately tap what teachers think is most important for students to learn. Before committing time and effort to a proposed initiative, teachers need some assurance and hope that the program will help them address some of their difficulties.

The authentic intellectual work framework offers no panacea for all of these problems. Large classes, lack of planning time, grouping of diverse students into classes, and external demands for content coverage must be addressed by school, district, and state leadership and policies. But the AIW framework does address some problems common to many teachers.

As explained earlier, its use should help to motivate students by offering more opportunities for them to think about, understand, and apply academic knowledge to real-world concerns, instead of only mechanically memorizing and reproducing isolated bits of knowledge used only in school. As teachers engage students in this kind of learning, teachers themselves are likely to find teaching more interesting.

The AIW framework does not specify what curriculum content ought to be taught in a subject or a grade level, but the importance it places on depth of understanding, along with research indicating benefits to achievement on standardized tests, should support teachers' decisions to cover less content in order to teach in greater depth, even while the officially prescribed curriculum and the tests may include more material than explicitly covered in class. In choosing from the vast array of curriculum content which knowledge to include for in-depth study, we recommend that teachers select content which a) is significant within a discipline or essential to studying a significant issue or topic; b) is of interest to the teacher and which the teacher understands in depth; c) has high potential for teaching authentically; and d) is aligned with course or department learning outcomes.

What might a strategic plan look like that aims toward a balance between AIW and traditional teaching?

In discussing the above issues, two main questions should guide discussion: (1) "To what extent will we aim to implement AIW and over what time period?" and (2) "What steps will we take to get there?" Since it can be difficult to answer the first question without

considering the second, discussions will probably move from one to the other. These discussions should occur with teacher groups such as grade-level or subject teams, and among the school as a whole.

A useful way to begin is to use the rubrics to analyze current practices; that is, to score and discuss scores for assignments that teachers have given; to observe, score and discuss specific lessons; and to score samples of student work. For each activity, two or more teachers should be involved in scoring, discussing the scores, trying to reach agreement on the scoring, and offering suggestions about how the assignment, lesson, or piece of student work might be changed to warrant higher scores. The point of scoring and discussion should not be to judge or evaluate individual teachers, but to help everyone understand what the standards for AIW mean when intentionally put into practice. Scoring, discussion, and trying to improve assignments, lessons, and student work will build increased understanding of what it would mean to seriously apply the standards in practice; that is, the degree to which teachers would need to change, the amount of time and resources required, and the likely benefits to students and teachers.

Here is an example to illustrate what might go into a strategic plan for a high school for the first year.

Year 1 Sample Plan

1. In at least two departments, or grade levels, teams of teachers would meet at least twice a month to score, discuss, and offer suggestions for improvement of an assignment or piece of student work. During the year each teacher would have shared at least one assignment and piece of student work for group analysis using the criteria.
2. During the year, each teacher would also have an opportunity to observe, score, and discuss a colleague's lesson. If lessons can be videotaped or digitally recorded, they can be shown and discussed within the full group. If videotaping within the school is not feasible, videos of lessons beyond the school might be used. When videotape or DVD is not available, individually observed lessons and discussions thereof would be reported in the team meeting.
3. If students raise objections to or resist authentic assignments, scoring of student work, or authentic instruction, teachers would consider how to convince students

of the value of authentic instruction and intellectual work. After Year 1, teachers would develop agreed-upon plans for including students' scores on authentic assignments as part of student grades (see Ideal Plan below). Teachers would also develop lessons that introduce students to changes in the grading system and attempt to convince students and parents of the value of authentic instruction and intellectual work.

4. At the end of Year 1, based on these experiences, each team of implementing teachers would agree on measurable and attainable goals for AIW over the next 3-5 years. These plans would represent "ideal" visions that would count on the highest levels of administrative support (teacher planning time, access to curriculum resources and coaching, assistance in collecting and analyzing data, gaining parental/community support, etc.). If possible, the group plans would be merged into a single plan for the school, or, on a smaller scale, a department or grade level. The ideal plan(s) could be modified, of course, depending upon the actual level of administrative support.[31]

"Ideal" 5-Year Sample Plan

It will be difficult to build a longer-range strategic plan until a staff completes a reasonably comprehensive initial attempt to implement AIW, as in the year we proposed above. Subsequent plans must be tailored to each school's unique context. Without presuming to dictate succeeding steps, we can, however, give some idea of what might go into longer-range plans through the following example.

At the end of Year 5, the following goals will have been achieved:

1. In each of the grade levels or subject areas implementing AIW, during every six-week period students would complete at least one major assignment scoring high on the three standards; their work on these assignments would be scored according to the standards for student work, and scores on this work would comprise a significant part of student grades or course evaluations.

[31] Teachers who wish to move ahead, whether individually or in teams, and have summer curriculum writing resources can consider developing unit plans that specify where and how they would use AIW standards for lessons, assignments, and scoring of student work.

Scores for the major assignments will be determined through a collegial process involving more than one teacher. The teacher assigning the work would score the work, but at least four work pieces taken at random for each assignment would be scored and agreed upon by the teacher and at least one other colleague.

2. In each of the grade levels or subject areas implementing AIW, during every six-week period students would experience at least six lessons scoring high on three of the four instruction standards. The individual teacher would determine scores, but at least one lesson during each six weeks would be jointly scored with at least another colleague.
3. A resource bank of high scoring assignments, high scoring samples of student work, and high scoring lessons (videos/DVDs or lesson plans) in the relevant grade levels and subjects would be developed and accessible to teachers.
4. Starting in Year 3, data would be collected (i.e., scores on the standards) on the quality of assignments, student work, and lessons submitted for each grade level and subject area. The data would be analyzed for areas of strength, areas needing improvement, and degree of improvement from year to year. "Areas" could refer to specific standards, particular subject areas or grade levels, or particular units within a course of study. The data would be summarized for and discussed by teachers. Data can be used to identify areas where individual teachers may need help, but not for official evaluation of individual teachers.
5. All new teachers would participate in a program that explains the school's approach to AIW and provides them mentoring from experienced colleagues.
6. All teachers would include in their yearly professional development plans a process for continued learning and growth in implementing AIW.
7. At some point before the end of Year 5, the school's staff development committee, supported by district office personnel, would begin to collect teacher and student survey data to document changes in climate and rigor, as well as to inform course corrections and changes along the way. Data might also serve to support off-site professional development in content areas or specific strategies that will increase AIW in their classes.

For some schools this "ideal" plan may seem too ambitious, for others too modest. The plan is not presented as standard for implementation, but to indicate the types of benchmarks that should be considered in setting a strategic plan. After benchmarks have been identified, then each part of the plan should be elaborated to indicate more specific steps to achieve the benchmarks. The description of the plan for Year 1 indicates the kind of incremental steps that could be part of that elaboration.

Chapter 7
School Support

Activities just described can be successfully pursued only with strong support from the school administration which also must work to build support from beyond the school—parents, district, and state. Mindful of many obstacles to AIW in the U.S. system of education, we recognize that gaining and maintaining the kind of support described next will require special commitment, resourcefulness, and patience of school administrators and teachers.[32]

School Vision Grounded in Intellectual Work

The central priority of AIW is rigorous and relevant intellectual work, not simply meeting test score targets or achieving an endless list of proficiencies. Staff success in promoting authentic intellectual work depends largely on school leadership that, through language, action, and allocation of resources, reinforces and celebrates this mission. Examples of schools whose missions focus on intellectual work include one that specified several "habits of mind," or another that aimed toward "applied learning," both of which were defined in ways consistent with the criteria for AIW.[33] The question, "How will this assist or possibly undermine authentic intellectual work in the school?" should guide administrative decision-making on proposed innovative practices, school policies affecting teachers' and students' work, the content of school improvement plans and professional development, hiring teachers, or responding to external demands for curriculum, assessment, or student services. Of course, administrators must tend to other legitimate aspects of schooling (student discipline, transportation, guidance, extra curricular activities), but these should not be allowed to overshadow the intellectual vision.

[32] Case studies of school support for authentic intellectual work are available in Newmann and Associates (1996).
[33] See Newmann and Associates (1996), Chapter 6.

School administrators are often bombarded with mandates and initiatives from the district, state, and federal government as well as other external agents such as foundations or non-profit service agencies. However well intentioned these demands and opportunities may be, as a whole they usually present an uncoordinated, incoherent menu of activities that tends to undermine program coherence in schools. A critical aspect of school support is to "keep the eye on the target," which entails not only finding external support for the mission of high-quality intellectual work, but also to buffer the staff from work that distracts from the main priority.

Norms of Professional Community Focused on AIW

To pursue the vision of authentic intellectual work and support for teachers, school leadership must emphasize norms of trust, honest inquiry, curiosity, experimentation, collective responsibility for school success, and constructive feedback among staff and students alike. Administrative behavior in staff meetings, individual conferences with teachers, and the content of messages to or about the staff in various media (memos, email, websites, press releases) should stress these norms of professional community. In some situations, developing these norms may require special efforts such as staff retreats assisted by facilitators.

Norms for professional community must extend beyond the grade levels or subject departments participating in the AIW framework. Staff members not involved in this effort must also feel supported and willing to support the efforts of their colleagues. If special support is targeted only to the AIW group, this can create divisive morale issues within the faculty that will undermine the effort. To minimize this risk, leadership must work to build schoolwide consensus on the intellectual vision, and to allocate resources equitably among teachers, regardless of their level of involvement in AIW. Similarly, teachers within the AIW group will need to show professional respect and maintain collegial relations beyond their group and avoid appearing as a privileged group.

Tangible Support for Professional Community

Several kinds of tangible support are needed to nurture professional community for AIW.

1. Time for teachers to meet in groups and to plan individually as indicated in Chapter 6. The amount of time set aside for teacher development of the AIW framework will vary, depending upon the school's goals and the capacity of the

staff. After two days of introductory training in the framework, school staff aiming toward an Ideal Plan as described in Chapter 6 might need at least two hours per week of common planning time per week, two hours per week of individual planning time, and four half days per school year to work with coaches or colleagues analyzing results and developing new resources. Orienting new teachers could require at least one day at the beginning of the year and an hour per week of mentoring during the first year.

2. Access to curriculum and assessment materials beyond conventional texts. Teachers will need help from content specialists in the different subject areas to locate hard copy and online materials, along with funds to purchase and duplicate materials and to acquire resources in online data banks.
3. Funding and allocation of the time of coaches or learning coordinators, content specialists, staff developers, and mentors to work with teachers in planning and analyzing instruction and student work. Facilitators must also advise and assist in collecting samples of assignments, student work, and teacher lessons to be entered into a school database, as well as summarizing data and relationships to other measures of achievement (external tests, student grades). As previously noted, prior to schoolwide implementation, these instructional leaders should have sufficient training in the AIW framework to generate their commitment to the effort.

Public Relations

As authentic intellectual work becomes more visible within the school, it can provoke questions or outright resistance from parents and students who fail to understand its educational value. Common objections include:

- The approach will not prepare students sufficiently for standardized tests and continued education;
- It is too "student-centered;"
- It is so difficult that lower grades will reduce students' competitiveness for admission to higher education;

- It further disadvantages certain groups of students such as those of limited English proficiency, those from lower socioeconomic groups, or those with special educational needs.

Teachers and school leadership should anticipate these reactions and support activities to minimize opposition. In the Chapter 6 discussion of the Year 1 sample plan, we suggested that teachers address student resistance in their classes. In addition, through meetings with concerned students and parents, school administrators, teachers, and students who support the approach can explain its benefits within the school along with results of research. To make the benefits more visible, the school can provide public displays of student authentic work in the school and at parent visitations. Citizens can be invited to participate with teachers in scoring and discussion of major student projects. After an extended period of implementation, the school should be able to report data showing improvement in student achievement, engagement, and teacher morale. Alumnae reporting on the value of this work after graduation would presumably build further support.

Summary

We have presented three criteria—*construction of knowledge, through disciplined inquiry,* to produce discourse, products, and performance that have *value beyond demonstrating success in school*—along with standards and rubrics for each criterion, to enhance academic rigor and relevance across subjects and grade levels in elementary, middle, and high schools. Beginning with an analysis of the cognitive work done by adults who continuously use knowledge in the workplace, in their roles as democratic citizens, and in solving complex problems in their personal lives, we characterize this work as "authentic intellectual work" (AIW). We use the adjective "authentic" to contrast this kind of mental work with conventional schoolwork which has less meaning for students than "real world" intellectual work involved, for example, in building a house, diagnosing an illness, trying to influence public policy, or caring for one's children. We argue that if schools put more effort into teaching academic subjects in ways that help students perform authentic intellectual work, students would be better prepared to handle intellectual challenges of the modern world and would be more engaged in schoolwork, and that teachers would benefit from a stronger sense of professional community and find teaching itself more interesting.

Standards for curriculum and assessment commonly issued by districts, states, or professional organizations tend to emphasize the specific subject matter content and skills to be mastered in each subject and grade level. Though the standards often also call for "critical thinking," "inquiry," and "learning to learn," in reality, the pressure on teachers to cover voluminous amounts of subject matter usually prevents them from taking time to help students think carefully about, build in-depth understanding of, and communicate elaborately about the content and skills that the standards prescribe.

The AIW framework, rather than adding a new set of techniques for teaching or assessment, or a new way to organize curriculum content, presents specific standards and rubrics to focus whatever is taught more emphatically according to the three criteria. In short, rigor and relevance can best be achieved by helping students to work with

knowledge, rather than only to reproduce it *(construction of knowledge)*, to build in-depth understanding of and elaborated communication about the subject *(disciplined inquiry),* and to enhance the meaning of academic work by applying these understandings to questions, problems, and issues that occur in students' lives beyond school *(value beyond school).*

Research studies in schools across the United States have shown that when teachers' lessons and assignments for students meet these criteria, students of different racial, ethnic, gender, disability status, and socioeconomic groups score significantly higher on tests of complex intellectual performance as well as on tests of basic knowledge and skills, compared to students in classes where teaching falls short on the criteria. The research also showed that teaching consistent with the criteria enhances equal educational outcomes among the students of different social backgrounds.

Most of the research did not evaluate the impact of programs deliberately trying to implement the AIW framework. Instead, studies used the framework to describe the quality of instruction, teachers' assignments, and student work as teachers taught according to whatever programs and techniques they considered most effective. But as research uncovered substantial positive achievement benefits for students exposed to teaching consistent with the framework, we concluded that the framework should be made available to practitioners, and teachers should have an opportunity to participate in professional development to help them use the standards and rubrics to guide their teaching and assessment of student work. In working with several schools along these lines, we are encouraged by the results, and some reports have shown that in-service efforts improved teaching according to the framework.

Chapters 3-5 on instruction, teachers' assignments, and scoring student work presented the standards and rubrics in detail and illustrated their application to specific examples of lessons, assignments, and student work in English, Mathematics, Science, and Social studies in different secondary schools.

To help school staffs consider the extent to which they might implement the framework, we suggested in Chapters 6 and 7 specific activities for teachers and administrators and the kinds of support they will need. Comprehensive implementation is complex, labor intensive, and requires significant amounts of staff time, supported by strong, continuous administrative leadership.

To maximize success, school, district, and state resources should be allocated to support significant time for a critical mass of teachers within a school, if not the entire staff, to study, discuss, and implement the framework, with data collection and debriefing on their efforts. The discussions must support honest critical inquiry and a culture of collegial help. We responded to the kinds of questions and reservations teachers may have and proposed both short-range and long-range strategic plans that would help to guide implementation. The main activities involve teachers using the standards and rubrics for designing and teaching lessons, for constructing assignments, and for scoring the quality of student work. Success in all this requires frequent critical, constructive, and collegial discussions among groups of teachers about the quality of and how to improve the lessons, assignments, and student work. Discussion should include the extent to which teachers should stress each of the standards in different parts of the curriculum and the degree to which demands for AIW should be balanced by more conventional approaches to instruction and assessment.

Teachers' success in using the framework requires strong support from the school administration, which also must work to build support from beyond the school—parents, district, and state. Administrators must emphasize a school vision grounded in rigorous and relevant intellectual work according to the AIW framework, not simply meeting test score targets or achieving an endless list of proficiencies. The question, "How will this assist or possibly undermine authentic intellectual work in the school?" should guide administrative decision-making on proposed innovative practices, school policies affecting teachers' and students' work, the content of school improvement plans and professional development, hiring teachers, and responding to external demands for curriculum, assessment, or student services.

Leadership must also offer tangible support by allocating enough time for teachers to meet to work on the issues above; by providing access to curriculum and assessment materials beyond conventional texts and tests; by supporting coaches, learning coordinators, mentors, and others to assist teachers in implementing the framework; and in collecting and summarizing data on the project's success and development. Administrators will also need to conduct special public relations efforts to inform or convince parents and their community of the merits of AIW as a central focus.

The report was written for teachers and administrators considering whether to invest in sustained professional development on instruction and assessment that emphasizes student production of authentic intellectual work, and we hope that reading and discussing this report will become a first step in an extended professional development adventure for schools to increase rigor and relevance in teaching academic subjects to diverse students.

References

Aristotle (1946). *The politics of Aristotle.* (Sir Ernest Barker, Trans.). Oxford: Clarendon Press.

Avery, P.G. (1999). Authentic instruction and assessment. *Social Education, 65*(6), 368-373.

Avery, P.G., Freeman, C., & Carmichael-Tanaka, D.L. (2002). Developing Authentic Instruction in the Social Studies. *Journal of Research in Education, 12*(1), 50-56.

Barber, B.R. (1984). *Strong democracy: Participatory politics for a new age.* Berkeley, CA: University of California Press.

Bridgeland, J.M., DiIulio, J.J., Jr., & Morison, K.B. (2006). *The silent epidemic: Perspectives of high school dropouts.* A report by Civic Enterprises in association with Peter D. Hart Research Associates for the Bill & Melinda Gates Foundation.

Cappelli, P., Bassi, L., Katz, D., Knoke, D., Osterman, P., & Useem, M. (1997). *Change at work.* New York: Oxford University Press.

Decker, P.T., King Rice, J., Moore, M.T., & Rollefson, M.R. (1997). *Education and the economy: An indicators report.* Washington, D.C.: National Center for Education Statistics, U.S. Department of Education, Office of Educational Research and Improvement.

Dewey, J. (1966). *Democracy and education.* New York: Free Press. (Original work published in 1916).

Jefferson, T. (1939). *Democracy* (S.K. Padover, Ed.). New York: D. Appleton-Century Company.

Kane, M.B., Khattri, N., Reeve, A.L., Adamson, R.J., & Pelavin Research Institute (1995). *Assessment of student performance: Studies of education reform.* (3 vols.). Washington, DC: Office of Educational Research and Improvement, U.S. Department of Education.

King, M.B., Schroeder, J., & Chawszczweski, D. (2001, September). *Authentic assessment and student performance in inclusive schools. Brief No. 5*. Madison, WI: Research Institute on Secondary Education Reform for Youth with Disabilities. Available at http://www.wcer.wisc.edu/riser/briefs.htm

Ladwig, J., Smith, M., Gore, J., Amosa, W., & Griffiths, T. (2007, April). *An examination of the relationship between the quality of pedagogy and student achievement.* Paper presented at the annual meeting of the American Educational Research Association, Chicago.

Lee, V. E. & Smith, J. (1996, February). Collective responsibility for learning and its effects on gains in achievement and engagement for early secondary school students. *American Journal of Education, 104,* 103-147.

Lee, V. E., Smith, J., & Croninger, R. (1995). *Another look at high school restructuring. Issues in Restructuring Schools, No. 9.* Madison, WI: Center on Organization and Restructuring of Schools, Wisconsin Center for Education Research, University of Wisconsin. Available at http://www.wcer.wisc.edu/archive/cors/default.htm

Lee, V.E., Smith, J., & Croninger, R. (1997, April). How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education, 70,* 128-150.

Louis, K.S., Kruse, S.D., & Marks, H.M. (1996). School-wide professional community (Chap. 10). In F.M. Newmann & Associates, *Authentic achievement: Restructuring schools for intellectual quality.* San Francisco: Jossey-Bass.

Marks, H.M. (2000, Spring). Student engagement in instructional activity: patterns in elementary, middle and high schools. *American Educational Research Journal, 37*(1), 153-184.

Murnane, R. J. & Levy, M. (1996). *Teaching the new basic skills: Principles for children to thrive in a changing economy.* New York: Free Press.

National Center on Education and the Economy (1990). *America's choice: High skills or low wages? The report of the commission on the skills of the American workforce.* Rochester, NY.

Newmann, F.M. & Associates (1996). *Authentic achievement: Restructuring schools for intellectual quality.* San Francisco: Jossey-Bass.

Newmann, F.M., Bryk, A.S., & Nagaoka, J. (2001). *Authentic intellectual work and standardized tests: Conflict or coexistence.* Chicago: Consortium on Chicago School Research. Available at www.consortium-chicago.org

Newmann, F.M., Lopez, G., & Bryk, A.S. (1998). *The quality of intellectual work in Chicago schools: A baseline report.* Chicago: Consortium on Chicago School Research. Available at www.consortium-chicago.org

Newmann, F.M., Marks, H.M., & Gamoran, A. (1996). Authentic pedagogy and student performance. *American Journal of Education, 104*(4), 280-312.

Newmann, F.M., Secada, W.G., & Wehlage, G.G. (1995). *A guide to authentic instruction and assessment: Vision, standards, and scoring.* Madison, WI: Wisconsin Center for Education Research, University of Wisconsin.

Newmann, F.M., Smith, B.A, Allensworth, E. & Bryk, A.S. (2001). Instructional program coherence: What it is and why it should guide school improvement policy? *Educational Evaluation and Policy Analysis, 23*(4), 297-321.

Newmann, F.M., & Wehlage, G.G. (1995). *Successful school restructuring: A report to the public and educators.* Madison, WI: Wisconsin Center for Education Research, University of Wisconsin.

Appendix A: General Rules to Guide Scoring According to Rubrics of Chapters 3, 4, and 5

Observed Instruction

General Rules

The four standards for classroom instruction reflect the three more general standards for authentic achievement as follows:

Construction of Knowledge	Higher Order Thinking Substantive Conversation
Disciplined Inquiry	Deep Knowledge Substantive Conversation
Value Beyond School	Connection to the World Beyond The Classroom

- The descriptions for scores 1-5 on each standard constitute the minimum criteria for that score. When in doubt between two scores, make the decision by asking whether the minimum conditions of the higher score have been met. If not, use the lower score. In determining scores for each standard, the observer should consider only the evidence observed during the lesson observation. "Many" students refers to at least one-third of the students in a class; "most" refers to more than half; "almost all" should be interpreted as all but a "few."
- Scores should take into account what students can reasonably be expected to do at the grade level.

Teachers' Assignments in a Discipline

The main point here is to estimate the extent to which successful completion of the assignment requires the kind of cognitive work appropriate in the subject or discipline indicated by each of the three standards: Construction of Knowledge, Elaborated Written

Communication in the discipline, and Connections to Students' Lives. Each standard will be scored according to different rules, but the following apply to all three standards:

- If the assignment has different parts that imply different expectations (e.g., worksheet/short-answer questions and a question asking for explanations of some conclusions), the score should reflect the teacher's apparent dominant or overall expectations. Overall expectations are indicated by the proportion of time or effort spent on different parts of the assignment and criteria for evaluation, if stated by the teacher.
- Take into account what students can reasonably be expected to do at the grade level.
- When it is difficult to decide between two scores, give the higher score only when a persuasive case can be made that the assignment meets minimal criteria for the higher score.
- If the specific wording of the criteria is not helpful in making judgments, base the score on the general intent or spirit of the standard described in the introductory paragraphs of the standard.

Student Work in a Discipline

The purpose of scoring is to estimate the extent to which the student's performance illustrates the kind of cognitive work appropriate to the subject or discipline, indicated by each of the three standards: Analysis in the discipline, Disciplinary Concepts, and Elaborated Written Communication in the discipline. Each standard will be scored according to different rules, but the following apply to all three standards:

- Scores should be based only on evidence in the student's performance relevant to the criteria. Do not consider things such as following directions, correct spelling, neatness, etc. unless they are relevant to the criteria.
- Scores may be limited by assignments that fail to call for analysis, disciplinary conceptual understanding, or elaborated written communication, but the scores must be based only upon the work shown.
- Take into account what students can reasonably be expected to do at the grade level. However, scores should still be assigned according to criteria in the standards, not relative to other papers that have been scored.

- When it is difficult to decide between two scores, give the higher score only when a persuasive case can be made that the paper meets minimal criteria for the higher score.
- If the specific wording of the criteria is not helpful in making judgments, base the score on the general intent or spirit of the standard described in the introductory paragraphs of the standard.
- Completion of the assignment is not necessary to score high.

Appendix B:
Standard and Rubric for Scoring Student Writing

Standard: Forms and Conventions: Grammar, Usage, Mechanics, and Vocabulary

Student performance demonstrates proficiencies with grammar, usage, mechanics, and vocabulary appropriate to grade level.

This standard is intended to measure the degree to which students attempt to, and succeed at, using language structures at the sentence and word level to make their meaning understandable to readers.

Scorers should not count individual errors, but instead should assess the degree to which errors interfere with understanding the student's meaning.

Scorers should take into consideration the efforts students might make at trying out new language structures that represent a "stretch" for someone at their grade level and not fault students severely if these "stretch" efforts are not carried off with complete success.

Scorers should assess the quality of the actual written work and not take into consideration possible effects of a student's possible linguistic background or learning disability.

Rubric

4 = The writing is an excellent demonstration of grammar, usage, mechanics, and/or vocabulary appropriate for the grade level. There are no errors, or if there are a few errors, the errors present no problem for understanding the student's meaning, nor does the performance compromise the student's credibility.

3 = The writing is a satisfactory use of grammar, usage, mechanics, and/or vocabulary for the grade level. There are some errors, but they present no problem for understanding the student's meaning.

2 = There are many errors in grammar, usage, mechanics, and/or vocabulary, or the errors in grammar, usage, mechanics, and/or vocabulary that make it difficult, but not impossible, to understand the student's meaning.

1 = Grammar, usage, mechanics, and/or vocabulary are so flawed that it is not possible to understand the student's meaning.

Authentic Instruction AND Assessment

Common Standards for Rigor and Relevance in Teaching Academic Subjects

Fred M. Newmann, M. Bruce King, Dana L. Carmichael

What should be the main goal for student learning across academic subjects in a school? The authors' answer is straightforward—authentic intellectual work. Based on analysis of adults working with knowledge, authentic intellectual work is defined by three criteria—*construction of knowledge,* through *disciplined inquiry,* to produce discourse, products, and performance that have *value beyond school.*

The authors argue that if schools put more effort into teaching in ways that help students perform authentic intellectual work, students will be more engaged in schoolwork and be better prepared to handle intellectual challenges of the modern world, and teachers will benefit from a stronger sense of professional community and find teaching itself more interesting. Based on research and work in schools over more than 15 years, the authors summarize key studies, present standards and rubrics for the three criteria, and suggest specific activities for teachers and administrators to support implementation.

The Iowa Department of Education sponsored this report for a pilot project for Iowa high schools to increase rigor and relevance in teaching and learning.

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