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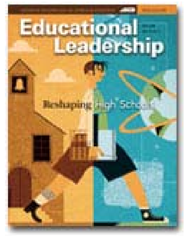

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Put Understanding First

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The high school curriculum should start with the long-term goals of schooling: meaning making and transfer of learning.

A local newspaper reporter asks students attending the town's high school to give their school a letter grade from *A* to *F*. One young man, a senior, rates his high school a *B*. When asked to explain, he replies with a single word: "Boring."

A first-year algebra teacher tries to remain enthusiastic in the face of student apathy. Although she attempts to engender a love of math in her students, many typically respond with the same questions, "Why do we need to learn this stuff? When are we ever going to use this?" She's aware that her answers are not convincing.

While lecturing to the vacant-eyed stares of many of his students, the veteran AP U.S. History teacher sometimes feels like the teacher in the film *Ferris Bueller's Day Off*, who answers his own dull questions. Yet there's so much material to cover to prepare for the upcoming AP exam. What else can he do?

In one district, the results of end-of-year science exams reveal a troubling pattern: Students typically perform adequately on items requiring recall and basic skills but do poorly on items requiring application or careful analysis and explanation.

These vignettes reflect recognizable high school challenges—student displays of boredom, passivity, and apathy; external test pressures that demand superficial content coverage; and students who seem to know the material but don't know how to apply it. These different problems are, in fact, interrelated. They can be traced to one underlying factor—the lack of clarity about the goals of a high school education and how those goals should inform instruction, assessment, and curriculum design.

The Long-Term Purpose of Schooling

The mission of high school is not to cover content, but rather to help learners become thoughtful about, and productive with, content. It's not to help students get good at school, but rather to prepare them for the world beyond school—to enable them to apply what they have learned to issues and problems they will face in the future. The entire high school curriculum—course syllabi, instruction, and especially assessment—must reflect this central mission, which we call *learning for understanding*. Learning for understanding requires that curriculum and instruction address three different but interrelated academic goals: helping students (1) *acquire* important information and skills, (2) *make meaning* of that content, and (3) effectively *transfer* their learning to new situations both within school and beyond it.

All learners need to acquire facts and skills. But an education consists of more than a pile of facts or a laundry list of skills. Even if students can recite key passages from *The Federalist Papers* by heart, if they have only acquired the facts they won't be able to adequately answer questions like, Why do we need checks on power? What are the chief problems that a three-branch system of government is meant to address? When is the balance of power threatened? Where should I stand on the current debates about presidential power? But if their lessons and assessments have asked them to explore various ways in which governmental powers have been checked and balanced (or not) during different periods of history, they will be able to make meaning of facts and address such questions when they naturally arise in their lives.

Unfortunately, the common methods of teaching and testing in high schools focus on acquisition at the expense of meaning and transfer. As a result, when confronted with unfamiliar questions or problems (even selected-response problems on standardized tests), many students flounder. Consider a high school algebra question that was included on state tests in New York and Massachusetts:

> To get from his high school to his home, Jamal travels 5.0 miles east and then 4.0 miles north. When Sheila goes to her home from the same high school, she travels 8.0 miles east and 2.0 miles south. What is the measure of the shortest distance, to the nearest tenth of a mile, between Jamal's home and Sheila's home? (Students were provided with a grid they could use to plot the answer.)

Fewer than 40 percent of New York 10th graders correctly answered this item, despite the fact that the requisite knowledge is "covered" in every Algebra I class in North America. Test results such as these reveal not a failure of coverage but a failure of transfer.

Out-of-context learning of skills is arguably one of the greatest weaknesses of the secondary curriculum—the natural outgrowth of marching through the textbook instead of teaching with meaning and transfer in mind. Schools too often teach and test mathematics, writing, and world language skills in isolation rather than in the context of authentic demands requiring thoughtful application. If we don't give students sufficient ongoing opportunities to puzzle over genuine problems, make meaning of their learning, and apply content in various contexts, then long-term retention and effective performance are unlikely, and high schools will have failed to achieve their purpose.

Teaching for Meaning and Transfer

If transfer, meaning, and acquisition are all fundamental goals of high school instruction, what is the role of the teacher? To support these goals, teachers can weave together these three instructional approaches Mortimer Adler describes in *The Paideia Program* (1984):

- *Direct instruction*. In this role, the teacher's primary goal is to help learners acquire basic information and skills through explicit instruction and modeling. Direct instructional strategies include lecture, multimedia presentations, convergent questioning, demonstration, modeling, guided practice, and feedback.
- *Facilitation*. Teachers in this role seek to help learners make meaning and understand important ideas and processes. Teachers guide learners in actively processing information and exploring complex problems through such instructional strategies as analogies, graphic organizers, divergent questioning and probing, simulations, problem-based learning, Socratic seminars, reciprocal teaching, and student self-assessment.
- *Coaching*. In a coaching role, teachers provide opportunities for students to transfer learning in increasingly complex situations. Teachers establish clear performance goals, provide models, and give feedback (as personalized as possible). They also provide just-in-time teaching (direct instruction) when needed. Instructional strategies include conferencing; encouraging student self-assessment and reflection; and providing specific commentary, feedback, and corrections in the context of authentic application.

As these categories make clear, there is rarely one best teaching approach. In a high school committed to teaching for understanding, we would see all three pedagogies in regular use.

Rethinking Instructional Sequence

When meaning making and transfer assume greater prominence in the curriculum, the sequence of learning events takes on a new significance. Most high schools, aided and abetted by textbooks that stress acquisition almost to the exclusion of the other two aims, have a propensity to cover lots of content *before* allowing students to use that content in authentic situations. This approach, based on a climb-the-ladder, step-by-step model of cognition, may be well intentioned, but it reveals a fundamentally flawed conception of learning. Research in cognitive psychology (Bransford, Brown, & Cocking, 2001) challenges the notion that students must learn all the important facts and basic skills *before* they can address the key concepts of a subject or apply the skills in more complex and authentic ways. And all we need to do is look at how people learn sports, art, or their first language to recognize that this view is flawed.

Sadly, the climb-the-ladder approach may have the greatest negative impact on lower-achieving students. Struggling high school students are often confined to a regimen of excessive teacher talk, rote memorization of discrete facts, and mind-numbing skill-drill worksheets. The unfortunate reality is that some students will never get beyond the first rung of the coverage ladder, with its isolated and uninteresting approach to content; they will therefore have minimal opportunities to engage in and actually use what they are learning in a meaningful way. (And we wonder why these students aren't motivated!)

Return to one of the opening vignettes and recall the scene in the movie *Ferris Bueller's Day Off* in which the history teacher drones on about the Hawley-Smoot Tariff and the Laffer Curve, poses dull recall questions, and then answers them himself. This episode comes painfully close to familiar high school experience. Imagine that the teacher had framed the same content around an essential question (When should the government promote free trade and when should it protect its industries?) and a culminating performance task (As an advisor to the Secretary of Commerce, give advice on the U.S. positions on Chinese imports and NAFTA). Such a change would have enhanced engagement, understanding, rigor, and relevance.

A More Meaningful Sequence

Here's another illustration of an alternative instructional sequence built with meaning and transfer in mind—this one in high school mathematics. The unit involves statistics, specifically the concept of measures of central tendency (mean, media, mode, range, and so on).

Typical high school math textbooks and classes begin by defining the terms *mean, median*, and *mode*; give examples illustrating each measure; provide independent practice with about 15 problems (for example, requiring students to complete a table by calculating all three measures for a data set); and then pose several hypothetical word problems asking students to apply their skills. Notice how the following unit unfolds quite differently, with meaning making and transfer preceding instruction in the basics.

1. *Begin with a hook problem*. Give students a set of data—the finish times for 122 students in four 7th grade classes in a one-mile race held on field day. Ask students to work in small groups to determine which class won the race and prepare to convince other groups of their conclusion. Have each group present its solution and explanation to the class. Ask prompting questions to stimulate alternative answers and to elicit mathematical reasoning.

2. *Introduce essential questions.* What is fair? How might mathematics help determine what is fair and unfair? Present various situations to provoke a discussion about fairness, such as, What do we mean when we say that the rules of a game of chance are not fair? When is straight majority voting fair, and when is it not fair? Is it fair to factor in degree of difficulty in diving competitions? How about weighted grades in school? Ask students to draw some tentative conclusions to explore and test later in the unit.
3. *Preview the culminating performance task*. Tell students, "You will be asked to decide which measure of central tendency—mean, median, or mode—should be used to calculate your final quarterly grade in mathematics. You must explain which method you prefer and show your mathematical reasoning." The task will spark questions from students, such as, What is a median? ... a mode?
4. *Provide direct instruction* on measures of central tendency linked back to the initial problem and essential questions. Give real-world examples. Students will be more likely to see the value of this information given the earlier activities and forthcoming performance task.
5. *Provide practice on the basics*. Have students do problems from the textbook to practice calculating mean, median, and mode. Give quizzes to check for conceptual understanding and computational accuracy.
6. *Provide opportunities for further discussion*. Have students engage in whole-class and small-group discussions of additional examples—for example, When is it most useful to know the "average" in various circumstances (salaries, home prices, batting average, price of a new car)? When is it misleading? What other information does an individual need to act wisely (for instance, to decide whether he or she can afford to buy a new car)?
7. *Provide an application task*. Help students think about the questions, When should we use mean, median, or mode? Where should we be careful in using each measure? Have each student construct a problem like the initial hook problem—a set of data that yields an uncertain solution to the question asked. Have students calculate the answer using all three modes of central tendency, choose the answer they think is best, and write a defense of that answer. In pairs, have students share questions and answers, try to solve each other's problem, and offer feedback to each other on the quality of their solutions and explanations.
8. *Lead a whole-class discussion*. Have students discuss related questions—for example, How important are range (variation) and trend when reaching a solution? Should you be rewarded or penalized for consistency or inconsistency or for downward or upward trend? Have students investigate several situations and draw conclusions (national sports team ranking systems, scores in diving competitions, stock market performance, and so on).
9. *Provide a small-group application*. Ask students to propose the fairest method for assigning quarterly grades. Should all grades be averaged? Should zeroes be factored in? Have each group present its proposal and explain its thinking to the class.
10. *Revisit the original unit hook problem*. Ask students, "Now which class do you think won the one-mile race?" Ask them to use what they have learned to reevaluate the problem and their solutions to it.
11. *Assign the final performance task*. Have students individually review their scores and grades for the quarter on quizzes, tests, homework, class work, their math journal, and so on to determine which measure of central tendency will yield the fairest grade for them. Have them write a note to you explaining their preferred method for grade calculation.
12. *Give students opportunities to reflect on the unit's essential questions* in their math journal and in paired and wholeclass discussions.

In this example, learning for understanding develops in an iterative fashion across the three categories of transfer, meaning, and acquisition. The acquisition of new vocabulary and techniques for calculating central tendency are introduced in response to real problems around the issue of fairness and average and as preparation for the final performance task. Although traditional quizzes are included, they are not the capstone assessment: The unit culminates in a thought-provoking (and personally relevant) transfer task and a reflection on the unit's essential questions.

Using Transfer, Meaning, and Acquisition in Planning

The transfer, meaning, and acquisition categories are useful for analyzing course syllabi, unit plans, and lessons to ensure alignment with the goal of teaching for meaning. For an example of how a teacher could apply the categories to a science unit, see Figure 1. Note that in the chart, instructional activities designed for meaning and transfer are matched with assessments designed for the same goals.

Figure 1. Tracking Transfer, Meaning, and Acquisition

An Instructional Unit on the Nature of Science (Observation, Using Tools of Science, Scientific Reasoning)			
Teaching/Learning Activity	**Questions**	**Assessment**	**Type**

Hook: The teacher poses questions to set the stage and shows optical illusions and pictures of nonvisible light (such as infrared) made visible.	How can we better see? What might we not be seeing, and why? How can we make the invisible visible?		Meaning
Teacher sets up a simulated "crime" in the classroom. Students then individually list what they observed (saw, heard, and so on). Students compare their individual lists to illustrate the variability of both observations and recording of "facts."	How do scientists carefully make and record their observations —without jumping to unsupported conclusions?	Explain how scientific observation differs from casual observation. Explain the value of systematic record-keeping in science.	Meaning
Students research various scientific tools and technologies (telescope, X-ray machine, computer spreadsheet) and discuss their findings to answer the questions.	How do scientific tools and technologies enhance scientific observation and record keeping? Which tool is helpful when?	Provide examples of ways in which scientific tools and technologies enhance scientific observation.	Meaning
Teacher displays and labels the parts of a microscope and explains their functions.	What are the parts of a microscope, and what does each part do?	Quiz on the names of microscope parts. Match the part with its function.	Acquisition
Teacher models how to focus a microscope. Students practice with a partner.	How do you focus a microscope?	*Skill check:* Demonstrate focusing a microscope	Acquisition
Students select items (such as pond water) to observe under the microscope and record their observations.	What can we learn from microscopic observations?	Use a microscope to examine a tiny object and carefully record your observations so that someone else could learn what you observed.	Transfer
Students make microscopic observations as part of a scientific investigation (for example, observing the structure of onion cells and potato cells).	How are the cells of these different plants alike and different?	Students observe three different plant sections under a microscope, record observations, and answer the investigation question.	Transfer
Note: The distinctions among the three types are not always sharp. For example, meaning-making activities may also help students acquire information and skills.			

A close examination of classroom assessments in high school courses reveals that many do not assess for understanding, and fewer still require transfer. So schools need to test their tests—to review their assessments for a marking period and ask, What percentage of items and tasks assess acquisition of discrete information and skills? What percentage require students to infer, generalize, analyze, and make connections, show their reasoning, or support their answer? What percentage require students to apply past learning to new situations?

We recommend that schools develop a public syllabus for every course, which articulates the course's transfer-meaning-acquisition priorities and concomitant assessments. Such an approach offers a practical means of freeing high school instruction from the dominance of the textbook and its emphasis on acquisition. The textbook should serve as a resource, but not as the syllabus.

The Ever-Present Goal

In high schools today, acquisition of content for its own sake dominates teachers' and students' experience—and therefore, schooling fails to achieve its purpose for a sizable proportion of learners. The approach proposed here suggests that to reform the high school curriculum in a meaningful way, we must challenge the common practice of teaching knowledge and skill for acquisition first and then teaching for meaning and transfer later. Rather, we must recognize that the purposeful and effective use of content is the ever-present goal, and we must design all instruction with that goal in mind.

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