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HORACE

Thoroughness, not coverage, must guide the curriculum if students are to learn to use their minds well. The starting point is to organize course offerings as well as course work around questions, not answers. But why are so few schools daring to take this step?

Asking the Essential Questions: Curriculum Development

WHAT ARE THE AIMS of a high school curriculum? Getting to a clear answer is the necessary first step in rethinking a school's curriculum. But to commit oneself, as Essential Schools do, to the idea that the goal of education is to get students to use their minds well is to take the deceptively simple first step in rethinking our entire system of education.

Evidence of how difficult this proves is apparent even among the Coalition of Essential Schools. The governing metaphor of student as worker is accepted among all Essential Schools. But few are taking the necessary and frightening next step—to redesign the entire curriculum around thorough coverage of fewer areas, rather than offering an array of courses aimed to attract students for whom vastly different expectations are held. Why this should be so is a fascinating and deeply political question, best explored by looking, in theory and in practice, at what that student-worker is doing in the Essential School classroom.

Authentic Work

What, for instance, does it mean for a student to "work" in such a class? Clearly it does not mean to take assiduous notes as a teacher delivers instruction from the front of the room. The fifth of the common principles Coalition schools embrace suggests that teachers, instead, act as coaches—"to provoke students to learn how to learn, and thus to teach themselves." This kind of "authentic" student work is active and collaborative; it has evident value and clear goals, and it generates more ideas, connections, and challenges the more it is pursued.

Authentic work, says Coalition research scholar Grant Wiggins, who has studied the pedagogy of Essential Schools, meets these and other very specific standards. When students are really workers, Wiggins says, they can always answer certain questions—about the task's purpose, about the resources needed to carry it out, about what it means to do the task well. They can grasp what is essential about the task, set priorities, make intelligent judgments. Ideally, this is true not only at the level of a particular assignment, but also when applied to all the courses in a curriculum, taken together. Students should emerge from their high school career with an integrated vision of *how to think* within the culture, which implies a broad understanding, not just narrow or rote expertise.

This way of looking at work contrasts directly with the traditional pedagogy of American secondary education. For a century high schools have asked students to memorize facts and answers in carefully distinct fields of study; and teachers have been under pres-

Figure 1.
Essential Questions to Shape a School's Curriculum

In every class and every subject, students will learn to ask and to answer these questions:

- From whose viewpoint are we seeing or reading or hearing? From what angle or perspective?
- How do we know when we know? What's the evidence, and how reliable is it?
- How are things, events, or people connected to each other? What is the cause and what is the effect? How do they fit together?
- What's new and what's old? Have we run across this idea before?
- So what? Why does it matter? What does it all mean?

sure to design courses that cover a specific chronological sequence of material. This emphasis on coverage in the curriculum inevitably focuses attention not on how to learn or think, but on what facts one "needs" to know, presented once only in a linear "run" through four years of school. But what one "needs" to know depends, as David Cohen forcefully argues in *The Shopping Mall High School*, on what one's future role in the social structure is seen to be. The fragmentation of the curriculum into subjects, levels, and purposes that will appeal to every student reflects the historical role of American high schools less as centers of learning than as holding places for people whose place in the social and economic structure is not yet ready for them. Except for a few at the top, whether or not our students learn to think has not been the point at all.

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Questions, Not Answers

The alternative, to adopt thoroughness in place of coverage as the guiding principle of a curriculum, rests on the Coalition's conviction that every student can come to think critically. But where might an individual teacher begin? The starting point, as Grant Wiggins argues, is to "organize courses not around 'answers' but around questions and problems to which 'content' represents answers." Such "essential questions," as they are known, are an important ingredient of curriculum reform as the Coalition of Essential Schools sees it. On every level—from the most encompassing, schoolwide questions to the specific question posed in a particular unit of a particular course—the "essential question" should shape the way students learn to think critically for themselves.

At Central Park East Secondary School in New York City, for example, the entire curriculum is focused on getting students to ask and answer questions like these: "From whose viewpoint are we seeing or reading or hearing? How do we know what we know? How are things, events, and people connected to each other? What in this idea is new and what old? Why does this matter?" (See Figure 1.) When they are applied at the course level, such questions consistently engage students in what Benjamin Bloom calls "higher order thinking"—analyzing, synthesizing, and evaluating evidence they gather themselves.

For example, a Central Park East U.S. history class focusing on immigration centers around a more specific "higher-level" essential question: "Whose country is this, anyway?" That question shapes the materials and activities that will guide student research into smaller, unit-level questions, like "What factors motivated people to uproot themselves and come to this country?" or "Are there ethnic differences in these factors?" By exploring

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Editor: Kathleen Cushman
Assistant Editor: Alan Bern
Managing Editor: Susan Fisher

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the political, economic, and social forces that shaped American immigration from its beginning—and by asking at every point the guiding "schoolwide" questions—students gain a critical understanding of the content of U.S. history, rather than memorizing a set of facts or someone else's interpretation of what those facts mean.

Unit-level questions serve as what Grant Wiggins calls "entry points" to larger questions that can go to the heart of a discipline. Because they take shape as projects, case studies, or simulations, they get students under way quickly, making inquiries that lead to the essential facts and theories the course will cover. And they *evoke* these abstract and complex issues in a concrete setting with which students are already familiar.

Teachers throughout the Coalition are coming up with questions like this, to serve as entry points in every discipline. CES's Assistant Director for Schools, Amy Gerstein, has a file full of examples teachers have developed, often in the summer workshops the Coalition sponsors. Teacher Priscilla Winn Barlow, for instance, asks students in a botany unit the essential question, "What is life, growth, 'natural' development? What factors most influence healthy development?" (See Figure 2.) Her entry-point questions are more specific, such as: "Do stems of germinating seedlings always grow upwards and roots downwards?" To answer this last, students must devise an experiment, and eventually come on their own to a definition of what tropism is. The unit continues with questions designed to evaluate what environmental factors plants respond to, and how.

In the example above, the "essential question" about growth is undeniably a higher-level question. To answer it, students must combine information they find in books with information they acquire through their own experimentation. Because they must come up with their own hypotheses to test, they also gain important skills in creating experimental situations that allow them to reason from observation.

Such entry points can lead directly towards key unifying theories at the very center of math or science. For instance, first-year algebra students could learn to factor polynomials by discovering the relationship between multiplication and factorization through a series of entry-point questions. (See Figure 3.) "Given a quadratic polynomial," workshop participant Robert Cornell asks, "can you find whether it can be rewritten in factored form by actually finding the factored form?" After students come up with techniques to do this, Cornell asks an even more pointed question: "When a polynomial is rewritten into factored form, what facts do you know about the polynomial that you didn't know before?" At its essence, this question leads to what mathematicians and scientists must struggle with at the highest level: whether or not two apparently different phenomena reflect the same deep fact about the world.

Asking questions as a way of organizing content also serves to strengthen students' sense of their own authority over the content. Through their work they become experts on one aspect of a problem, and learn to collaborate with other students in the exchange of important facts. This "jigsaw approach" is described in the unit on AIDS developed by Grace Taylor at Brown University (see Figure 4). Noteworthy in this assignment is the extent to which discipline lines must be crossed to master the material, and the fact that different kinds

Figure 2.
A Botany Unit Designed Around Essential Questions

What is life, growth, "natural" development? What factors most influence healthy development?

Entry Point Questions

- Do stems of germinating seedlings always grow upwards and roots downwards? Devise an experiment to determine the answer. (What is tropism?)
- What environmental factor are the seedlings responding to? How does the plant sense this factor? (Preselected reference material would be available on reserve).
- Is this the only factor that the seedling stems respond to? Devise experiments to determine a valid answer to this question.
- What part of the stem is receiving the stimulus? What part of the stem is responding to the stimulus? Do roots respond to this stimulus?

of intellectual skills are developed. In the process of doing their research the students will learn about social studies issues, and also about important biology matters like contagion and the nature of viruses. But they will also be mastering the more general skill of critically analyzing the various texts they use.

To do well in a unit called "Homo-Insectivorous and the Dilemma of World Hunger" developed at one summer workshop by teachers Sandy Ohlerich, Dana Minoya, and Kent Vierot (Figure 5), students must also master such collaborative skills. As well, while they research whether eating insects could be a solution to world hunger students must become familiar with content in a range of disciplines from political economics to biology, entomology, and human nutrition. Finally, they must learn something about speech and rhetoric to prepare a persuasive presentation to the class.

Each entry point question will have its own specific ways it encourages students to use their minds well. Some questions will tilt in the direction of content mastery, others towards the development of higher-order thinking skills like deductive reasoning. By actively carrying out such assignments students are learning different kinds and levels of intellectual skills all at once.

Figure 3.
A Project in Factoring for First-Year Algebra Students

1. The factoring process is the inverse of the multiplying process, yet many students see the two processes as separate from one another. Many algebra texts have one chapter called Multiplying and another called Factoring; many teachers present polynomial multiplication, test that, and then present polynomial factorization. Through this separation, many students often miss concepts such as what it means for a polynomial to be in factored form and what the relationship is between multiplication and factorization.

Finally, much of a student's time is taken up with the mechanics of factorization. This time focuses on the fringe of the topic rather than the essence of factorization.

This section will concentrate on quadratic expressions.

2. The essential question is "Given a quadratic polynomial can you find whether it can be rewritten into factored form by actually finding the factored form?"

3. When students can multiply binomials with ease, have them write the results of multiplications such as the following:

$$(x-3)(x-7) \quad (x+3)(x+1) \quad (x-4)(x+2)$$

Erase the original multiplication problem leaving just the correct answers. Now ask the students to see if they can recreate the original problem. They should be able to find a multiplication problem that yields the answer.

4. How many techniques can a class come up with to find the original factored form of the polynomial?

- If a polynomial can be factored is the factored form unique?
- Is there a way to determine whether or not a polynomial can be factored without actually finding the factors?
- If you happen to know one factor of a polynomial, then it is an easy matter to find the other factor. How can you find this first factor?
- When a polynomial is rewritten into factored form, what facts do you know about the polynomial that you didn't know before?

The Teacher's Role

It's easy to see how a question-centered approach could radically change the way a teacher designs a particular course. Rather than moving from point A to point Z, the teacher encourages students to learn key skills through which content can be revealed. "Instead of merely 'covering' material, students *uncover* and *recover* important ideas in context," says Grant Wiggins. "No essential idea, fact, theory, or application can be learned by doing something *once*." Wiggins compares such learning to the ways in which ball players or musicians master their skills—they learn new rules and strategies as they need them, not in "logical" order; and they make such essential skills habitual by practicing them again and again.

If the analogy is carried further, the teacher's role as coach becomes even clearer—to make herself gradually obsolete as students learn to solve problems for themselves. This attitude extends also to the textbook, which the student learns to use as an intellectual resource for research, not a program to be rigidly followed in sequence.

Most Essential Schools, CES's Director for Schools Bob McCarthy says, are already well on their way to shaping course work around such essential questions. In the classroom with the door shut, an individual teacher can often make these fundamental changes in approach without anyone even noticing. But it isn't long before new pedagogy begins to rub up against the structure of the traditionally designed curriculum. Special-topic courses–trigonometry, for instance,

or economics, or American literature–may be too confining for the question-centered logic of Essential School pedagogy; if essential questions are posed within them, what students need to learn will necessarily reach far beyond the conventional limits of the course. At this point, if teachers are not actively sharing this approach among themselves and if the overall school curriculum does not reflect it, trouble can start to brew.

What About Assessment?

The matter of assessment is the first to present itself. The conventional curriculum is closely tied to standard measures of what it means to do well in our society—competency tests, SAT scores, college acceptance, and more. If a school is in desperate academic straits—low scores, high drop-out rates, few going on to college—it might well consider a wholesale shift in its curriculum to reflect more thorough coverage of fewer areas. A school like this has little to lose and everything to gain by teaching students to use their minds well.

But what of a more conventionally successful school, where "all the tests" show that students are doing just fine, and whose students often gain admission to the most prestigious colleges? What incentive does such a school have to reexamine its curriculum and methods? The problem here, Coalition chairman Ted Sizer points out, is that few of those tests are designed to measure critical thinking. "The fact is that most 'successful' students can't stand up to two Socratic questions in a row," he says. And it is common knowledge among professors at even the "best colleges" that students coming into them have serious weaknesses in their ability to think critically or creatively.

The inadequacy and even harm of test-based criteria of educational success is further borne out, Sizer notes, by the epidemic of cheating most high schools nationwide are experiencing. If to succeed in school means to do well on such tests, a student can succeed on everyone's agreed terms not by thinking well but by outsmarting the tests—by either memorization or cheating, or both. The entire curriculum is designed to meet the standards measured by those tests—so a student can progress through four years of high school and go on to college without ever being required to demonstrate that he can use his mind well.

Figure 4.
Asking Essential Questions About AIDS

Two weeks before students are asked to start collecting articles on AIDS (minimum of three each). *"What are the questions we need to ask about AIDS?"* A list is generated and five important aspects are chosen. Groups with five students are formed.

Jigsaw Learning. All the "ones" go to a table where they research their aspect using articles and auxiliary materials (pamphlets, section of video, etc.); all the "twos" to another table where they research their aspect, etc. Each student will later return to her/his original group as the "expert" on that aspect and thus all the "ones" will discuss their aspect among themselves so they all understand it and will be able to explain it fully and clearly. The teacher circulates listening to the various groups, suggesting where necessary. At the end of the two group meetings all students should understand all five aspects.

Case Studies. Assuming that bioethical decision-making has been done previously, one case study on AIDS is given to each group for discussion. Students will identify the problem, generate alternatives, discuss possible solutions in accordance with their values, and hopefully come to consensus while realizing the possible consequences of their decision. The recorder for each group will report on the case study, the direction of their discussion and their solution. The other students can then challenge, ask questions, make comments, etc.

"Most 'successful' students can't stand up to two Socratic questions in a row," Sizer says. And it is common knowledge among professors at even the "best colleges" that students coming into them have serious weaknesses in their ability to think.

In fact, most schools remain wedded to the assumption that the mere passage of four years' time is the governing principle behind the curriculum. That assumption, Sizer says, is "bureaucratically useful," but ill-defined and indefensible. The ideal curriculum, he says, is like a trip the student takes, going at different speeds during different periods. Students leave school only when they arrive at the end of the trip—by demonstrating mastery in the form of a final exhibition.

It is worth looking at what goals the standard high school curriculum does serve. Historically, as *The Shopping Mall High School* points out, thinking well has almost never been one of high school's aims. Our current curriculum, instead, results

Figure 5.
Homo-Insectivorous and the Dilemma of World Hunger

You and your team of population and nutrition experts are faced with the growing problem of world hunger. Various methods are used to lessen the problem at the present time, but you believe that all food resources are not being fully explored. Insects, as a food source, could be a possible solution. Using your knowledge and any pertinent information, devise a presentation by your team to convince skeptics (scientists and common folk) that insects are a viable food source of the future.

directly from explicit social and economic policies over the past hundred years, aimed to keep young people out of the job market and off the streets. Based on a deep cynicism about *who can learn to think*, our educational system defines success in different ways depending on who you are. For some, success in high school will simply equal not getting into trouble before they finish.

Based on a deep cynicism about who can learn to think, our educational system defines success in different ways depending on who you are.

The standard curriculum is perfectly matched to those often unarticulated goals. Courses form a kind of checklist—two years of math, three years of English, one year of history—that students tick off as time goes by. A wide range of course options is available to "shop" from, and students are tracked into the ones that will fit their future station in life. Teachers and students agree implicitly that subject mastery is less important than getting through one course and on to another, so course expectations are set accordingly low. Not by coincidence, teacher training reflects the same values—potential teachers rarely have true mastery of their subjects, and the methods they learn rely heavily on textbook-driven pedagogy.

For a school to decide it wants to abandon these goals, and move instead to another vision of teaching *all* its students to use their minds well, has deep political consequences. It is threatening to teachers, who must give up thinking of themselves as deliverers of information; and it threatens the assumptions that underpin the socio-economic stratification of our society. Little wonder that to move towards a schoolwide curriculum reflecting the belief that "Less is more" is a step so hard to take. In the Coalition, the schools that have attempted it are almost without exception the ones directly seeking to empower students who might not otherwise succeed.

Needed: New Assessments

It may be too early to tell whether teaching all students to think critically can also result in higher scores on the standardized tests by which we currently measure success. The sense at the Coalition is that it will, even if only because students will be able to analyze the test questions. But more important than living up to current, inadequate assessment instruments is designing new kinds of assessments that can show students actually working to solve problems on their own.

In this light, the final exhibitions of mastery the Coalition advocates —examples of which Grant Wiggins has spent the year collecting—are integral to the redesign of a curriculum around essential questions. A school must make its alternate vision of success quite explicit—by saying clearly what students should be able to know and do by the time they graduate, and by holding to its exhibition as a test of a student's success. "The shadow cast backwards from that finding should be the curriculum," Ted Sizer says.

A school must make its vision of success quite explicit--by saying clearly what its students should be able to know and do by the time they graduate.

Any consideration of curriculum change, therefore, must begin with an essential question for educators: "What do we really want?" What would it be to imagine a curriculum based on mastery of knowledge rather than chronological coverage of facts? What if questions were encouraged to be asked that linked several subjects together in a larger context, rather than making arbitrary divisions between areas of study? What if teachers were to communicate with each other, sharing their goals and methods freely and integrating them into each other's courses? What if we held to the vision that *all* students can learn to think well? When we have before us a true exhibition of mastery, its benefits will be possible at last to chart.

COACHING HABITS OF MIND
Pursuing Essential Questions in the Classroom

by Grant Wiggins

What is essential must be *experienced* as essential. Essential facts and theories are only understood as the results of one's own work; they are not self-evident notions learned through words as "knowledge," but the residue of effective performances—*habits of mind.*

When they are coaching students to engage in collaborative inquiry, teachers need to insure that essential habits and norms are taught and learned. The following structures, roles, and strategies can be used to improve the quality of group discussion, so that students may become increasingly self-regulating and self-disciplined about their work.

I have done this by dividing a class into segments: exploring, proposing, testing, linking, and closure.

EXPLORING

We do this for the first five to ten minutes, in groups of three to four students. (This assumes that prior work has been assigned and done, leading to written student questions, or organized around questions posed by the teacher.)

Scouting. This is to explore the "panorama" from afar, in groups—the whole terrain of the tentative issues and answers. This assumes that both the prior assignment *and its purpose* are clear to students.

"Where are we going? What's the point?" To avoid these questions, pose or have students pose "essential questions" that guide inquiry and discussion. (A "seminar" assumes that the learning is to come from the members' prior work and ideas.) Help students collaborate by giving a clear set of directions and goals for *using* assignments; warn them in advance how the homework will be used in class. In class, have students share and clarify their two or three written questions from the night before, in small groups. Ask each group to try to answer their questions, and bring one key question to the whole class. All these key questions are put on the board.

Entry Points. Propose and consider some first "paths." Use the students' questions about the reading or exercises, putting each small group's question on the board. Add a "scouting" summary.

Preliminary "mapping." What are the landmarks? What is our tentative consensus on the key points, passages, trouble spots?

HYPOTHESIS PROPOSING AND TESTING

What does the author or experiment mean? This part of the process takes ten to fifteen minutes, as a whole class or in two large groups.

Propose. Begin with the key issues derived from the first "mapping," and propose some explanations or interpretations. This work is easily divided up into "focus" groups of four to six students who wish to work on a particular topic. They work for fifteen minutes and then report their findings, with a list of relevant passages, to the class as a whole.

Go to the text. Use the text, experiment results, or students products frequently and carefully to test out the arguments presented by each group. Ask frequently, "What are your reasons? What is your evidence?"

Suspend belief or disbelief when appropriate. When one point of view is dominant, consider an alternative. What other interpretations or points of view might be possible? What is being unquestioningly assumed or doubted?

Refine. Reconsider initial views and hypotheses as warranted.

"But what if . . . ?" Start the process again.

LINKING AND PERSPECTIVE.

"So what?" Spend ten minutes answering this question as a class.

Links. Consider the implications of each theory or interpretation for other passages in the text, other parts of the experiment or product, and so forth.

If . . . then . . . Consider the implications of a view of the part for the "text" as a whole.

Essential question links. Consider possible links between the current interpretations and the essential questions that guide the course as a whole.

Compare and contrast. Consider the implications of this author's point of view with regard to other authors' views.

Reality Test. Consider the author's or theorist's view in terms of its plausibility, its supporting evidence, its practicality, today's base of knowledge, and so forth.

CLOSURE

For the last ten minutes of the class, summarize the main points of agreement and disagreement in the discussion.

This important skill is the most overlooked strategy in teaching, and should be first modeled by the teacher, then assigned on a rotating basis to pairs or trios of students. Stress that the summary should not be a chronological ramble ("We talked about this, then that, then this . . . ") but a highlighting of essential points. For this reason, give each summarizer a chance to reflect, review notes, and the like before beginning.

Finally, consider what steps ought to be taken next. (with older students, allow two or three minutes for note taking.)

Information and Resources

"Student as Worker: Towards Engaging and Effective Curricula," by Grant Wiggins. Copies of this article may be obtained from the Coalition office for a $3.50 charge.

The Shopping Mall High School: Winners and Losers in the Educational Marketplace, by Arthur G. Powell, Eleanor Farrar, and David K. Cohen. Boston: Houghton Mifflin Company, 1985. $8.95.

Information on scheduled workshops in curriculum development is available through the Coalition of Essential Schools, Box 1938, Brown University, Providence, Rhode Island 02912.

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Providence, Rhode Island 02912