EPILOGUE
ANOTHER LOOK AT *DESIGNS*

Readers may very well question some of the central premises of this book—or what they perceive them to be. For example, readers may have concluded that, in effect, *Designs* claims that:

- There is no curriculum crisis.
- A curriculum is like a Boeing 777 or a garden wall.
- Curriculum design consists of reducing much of current content.
- Teachers are not curriculum designers.
- Curriculum design is futile without the aid of computers.

Would Project 2061 support those claims? Yes—to some degree and with certain qualifications, as the following commentary tries to make clear. But remember, it is the intent of *Designs* to stimulate readers' discussion, not to insist that they agree.

One way to pursue the conversation about curriculum is to access the Project 2061 Web site at www.project2061.org.

A sustained curriculum revolution is needed.

Much of *Designs* is cast in time frames of a decade or more. Given the long-term perspective of Project 2061, this should not be surprising. International studies of student performance in science and mathematics show that curriculum improvements are badly needed right away, but changes that can be made quickly rarely have a significant or lasting impact. Ambitious curriculum reform simply cannot be had in a hurry, no matter how much we might wish it or how alluring the latest panacea appears to be. It is possible, however, to undertake long-term curriculum-reform measures that contribute to worthwhile improvements along the way. In 1993, when work on *Designs* began, this point was discussed in an article published in *2061 Today* and reproduced on the following page. Part III of *Designs* provides another example of how to deal with both short-term needs and long-term goals.

It may also be said that, in an important sense, D*esigns* is less about what curricula should be like, or even about how badly reform is or is not needed, than it is about how to create the curriculum you want. Its fundamental notion is that design should focus intensely on outcomes and on local choices of means to achieve them. Once learning goals have been agreed upon and constraints made clear, then any curriculum

LONG TERM IN THE SHORT RUN

Here's our predicament: We want to improve education now, right now, for the sake of today's students and the future of the nation; yet we know that quick fixes invariably fail. Problems are immediate and concrete, good solutions are generational and speculative.

This dilemma is one that Project 2061 had to confront from the start, having declared itself to be "long-term." Under-the-gun teachers and administrators, school-board members, governors, and legislators are understandably less than thrilled with a reform proposition that *deliberately* plans to take 25 years or so to have full impact.

Not seeming to serve the immediate, urgent needs of practitioners is but one of the possible shortcomings of long-termness. Another is that it is difficult for long-term reform efforts to survive long enough to actually become long term. Given that resources for underwriting reform are in fact limited, it is difficult for foundations, government agencies, and industry to commit substantial funds year after year to projects whose payoff is over the horizon and, in the bargain, relatively uncertain. Moreover, it is vastly easier for a project to expound lofty goals and long-term strategies than to demonstrate that it is making acceptable progress in the here and now toward those goals. Faith has its limits, and adherents as well as doubters want evidence of progress sooner rather than later.

No matter, AAAS was not willing to back away from its determination to launch and sustain Project 2061, a truly long-term reform initiative in science, mathematics, and technology education. It made sense, however to take into account the traditional drawbacks of long-term reform projects, ameliorating them at least, and turning them to advantage when possible.

The project's mid-range plans call for it, among other things, to have produced, field tested, revised, and disseminated a set of interrelated reform tools by the year 2000, fifteen years after its beginning, and to have provided training in their use for all educators who desire it. But in view of the desirability of contributing to immediate reform needs and of demonstrating near-term progress toward distant goals, Project 2061 decided to plan its work so that its products would emerge serially and, further, so that each would stand on its own as a useful resource for reformers.

Benchmarks for Science Literacy is a case in point. While *Benchmarks* was being developed, educators made extensive use of *Science for All Americans*, in the process reaching judgments on the quality and significance of the project's work. And now, as other Project 2061 products are being developed, educators can use *Benchmarks* along with *Science for All Americans* to further their current reform efforts and to make fresh judgments concerning the directions and value of the project and the feasibility of its long-term approach. In this way, each new product will provide immediate, practical help and also an opportunity to ascertain whether Project 2061 is still on course toward its ultimate goals.

The point is this: Long-term reform efforts can be designed to contribute significantly to near-at-hand improvements, but short-term efforts rarely contribute much to reform in the long run. Time counts—and so does timing.

that delivers the goods is acceptable—and whether it is deemed traditional or radical, discipline-based or integrated, takes a conceptual or an inquiry approach, is not the point. The teachers, consultants, and project staff who have had a hand in creating *Designs* have their own individual views, strongly held, on how urgently reform is needed and why, and on what curricula ought to be like ideally, but they have also understood that *Designs* is not the venue for expressing them.

A curriculum is like other design problems. In an important sense, curriculum is like the Interstate Highway System, a library, an assembly line, a chain of retail stores, a movie, a vegetable farm, a bank, the census, a research project, or a garden wall. All of these things are alike in that they are designed by people with specific goals in mind—they don't just happen. So it is with curriculum.

To declare that a curriculum is part of the designed world (in contrast to the natural world) scarcely seems radical. Still, some educators find that view to be too narrow and mechanistic. A jetliner, they might say, is a piece of machinery, a school is not; a movie is make-believe, education is real; an automobile assembly line turns out predetermined products, a curriculum helps individuals determine for themselves what they will become. Is there not something disturbing about applying architectural and engineering thinking to what is at heart an humanistic enterprise? Doesn't the quality of elementary and secondary education, like education at every level, depend more on the relationship between teachers and students than on which particular subjects are studied when?

There is little to be gained in trying to decide whether viewing curriculum design as one would airplane design is humanistic or mechanistic. Nor is there any reason why productive student-teacher relationships and a modern curriculum cannot coexist and reinforce each other. Indeed, the thrust of *Designs* is that it is possible to design curricula that are humanistic by any measure—the character of the experiences students have and the personal and social value of what they learn—but that such results are unlikely to happen accidentally. Quality instruction and quality curriculum are both essential and require planning.

In designing a brick wall, it can be assumed that all of the building blocks are essentially alike in substance and shape, whereas such an assumption cannot be made with regard to the building blocks of a curriculum. Perhaps designing a wall from irregular field stones would serve better, but in either case, all that is intended is to draw upon a familiar image to help think about curriculum design. A mason or

farmer creating a New England stone fence may reshape some of the stones, but mostly it is a matter of selecting and organizing stones; in the future as now, teachers will modify some of the blocks comprising their curriculum, but mostly it will be a matter of then selecting and organizing the blocks.

The other drawback is that, alas, the requisite pool of blocks does not now exist, and will take a decade or longer to create. That is, there are not blocks that meet the standards put forth in the Project 2061 curriculum-block template, and not a pool of blocks having the great variety called for in this book. But the idea here is to consider new possibilities for designing coherent K-12 curricula in the future—something very different from proposing a particular curriculum or curriculum approach. If the idea appears, after much debate, to have merit, perhaps steps will be initiated to make it possible; if not, others may be motivated to come forward with other possibilities.

Curriculum reform requires more than reducing the current content. One chapter of *Designs* is devoted to the proposition that *to gain time to study key ideas thoroughly*, teachers simply should reduce the sheer number of different topics studied, trim unnecessary details from some topics, and cut back on the memorization of large numbers of technical terms. But if "simply" means easily, it is the wrong word, since few things in education are easily accomplished, and certainly not the measures suggested in CHAPTER 7: UNBURDENING THE CURRICULUM. If instead "simply" is taken to mean "only," it is equally misleading, for improvements in the curriculum cannot be achieved in isolation. Some of the issues that must be taken into account are discussed in *Blueprints for Reform* and summarized in the box on the facing page.

As is asserted at the beginning of this book, "unburdening" the curriculum ought not to be interpreted as "watering down." Perhaps the contrary is closer to what is intended: By removing that which is less important—certain topics, details, and terminology—time becomes available to learn better the ideas that are more important. The content specified in *Science for All Americans*, for example, was very carefully chosen to form a mutually supporting set of ideas that are also important and learnable.

Teachers should not be expected to design curriculum. Some readers may feel that *Designs* underplays the importance of teachers in curriculum design, others that it places unrealistic demands on teachers, and still others that the book is inconsistent with regard to the role of teachers in curriculum design. The project pleads innocent

BLUEPRINTS FOR REFORM: SCIENCE, MATHEMATICS, AND TECHNOLOGY EDUCATION

If lasting, meaningful reform of the science, mathematics, and technology curriculum is to occur, changes are needed throughout the entire K-12 education system. *Blueprints for Reform* examines 12 aspects of the system under three major themes:

THE FOUNDATION

Equity: How is the attainment of science literacy by all students impeded by policies and practices?

Policy: Do current local, state, and federal education policies help or hinder the realization of science literacy?

Finance: What are the costs, in terms of money and other resources, of "science literacy for all?"

Research: What kinds of research are needed to improve instruction for science literacy?

THE SCHOOL CONTEXT

School Organization: What will the realization of science literacy goals require of grade structure, teacher collaboration, and control of curriculum materials and assessments?

Curriculum Connections: How can connections among the natural and social sciences, mathematics, and technology be fostered?

Materials and Technology: What new resources are needed for teachers to help students become science literate?

Assessment: Do current assessment practices work for or against the kind of learning recommended in *Science for All Americans*?

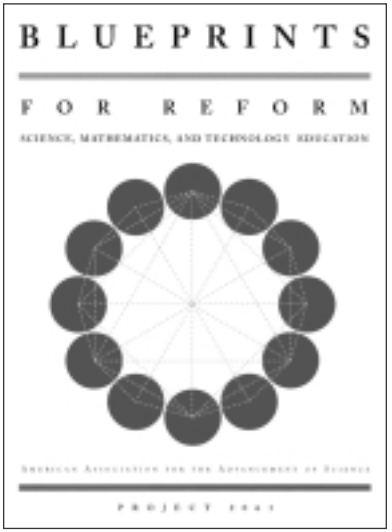
THE SUPPORT STRUCTURE

Teacher Education: What changes are needed to produce teachers with the knowledge and skills to implement curricula based on science literacy goals?

Higher Education: What changes in admissions standards might be necessary to support K-12 reforms to promote science literacy?

Family and Community: How can families and communities help in supporting or implementing local, state, or national standards?

Business and Industry: In what ways can partnerships between business and education contribute to the attainment of science literacy?



"Too many states are assuming that, given a succinct vision statement or a curriculum framework, districts, schools, or teachers will be able to create the instructional materials they need…. This seems a poor assumption for any number of reasons, including the questionable premise that the vision is so well understood at the local level that it can readily be converted to specific curricula or materials. Also, quality control of new materials is required that is typically beyond the capability of individual schools."
—Zucker, et al., *Evaluation of the National Science Foundation's Statewide Systemic Initiatives Program*, 1995

on the first and third charges, but is ready to plea bargain on the second. Briefly summarized, *Designs* has this to say about the role of teachers in curriculum design:

> Teachers are not, individually or collectively, in a position to develop the building blocks of the curriculum. They lack the time, technical support, training, and, for the most part, the desire to create whole courses and grade-level subject treatments, or the instructional materials to go with them. That is as it is now.
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> Teachers do have the responsibility—and would still have it in the plan put forth in this book—to modify curriculum blocks to fit local circumstances. To do that better, they will need better subject-matter and technical training than is currently the norm.
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> Teachers—but not all teachers—are absolutely essential in the development of curriculum blocks. They are needed to submit ideas for blocks, to work on block-development teams (whether on funded projects or with commercial publishers), to review draft material, and to carry out field studies. Teachers who participate in such work will become specialists but, except for periodic professional leaves to serve on development teams, will be mostly classroom based. It is classroom teachers, and not university scholars, writers, audiovisual and computer specialists, etc., who are most likely to keep curriculum-design efforts grounded in the reality of school life.
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> Once a proper pool of curriculum blocks exists, teachers will have a *central* role in curriculum design by assembly. Working in collaboration with parents, administrators, and others having a stake in the curriculum, groups of teachers will be responsible for formulating a design that meets the specifications set by the school board and is able to garner enough professional and public support to warrant implementation. These teachers will, of course, need to have had advanced training and be backed up with appropriate technical and clerical support.
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> Until such a pool of curriculum blocks exists, teachers can take the lead in improving the existing curriculum. They can begin to reduce curriculum overload and increase curriculum coherence (both developmentally and conceptually), and in the process incrementally improve the current curriculum and develop the

skills and insights that will put them in the position to carry out enlightened curriculum design when the time comes. But for that to happen, teachers will need to receive authorization, encouragement, and professional support of a kind and level that is not common today.

Teachers can also attempt to affect the curriculum-materials market. They can demand, or at least favor, materials with substantive connections (not just the window-dressing of "topic" correspondence tables) to national and state standards.

Curriculum design requires the aid of computers. The concept of curriculum design by assembly and the role of computers in design are so closely related in *Designs* that the message of Part II could be taken by some readers to be that you can't do significant curriculum design without computers. As a practical matter, that is probably true, though in principle the operations could be carried out with paper and pencil. However, without electronic databases, rapid information exchange, analytic utilities, convenient record keeping, and the rest of the capabilities that computer-based information and communications systems bring to the task, sophisticated curriculum design would be enormously clumsy and time consuming—just as it would be in designing buildings, vehicles, gardens, molecules, and much else, were it not for computer-aided design.

Computers provide educators with an opportunity to do what heretofore has been pretty much out of the question—namely, to design highly sophisticated curricula that focus on specified learning goals and take local circumstances and preferences into account. The necessary computer and communications hardware exists right now, and Project 2061 will have developed the necessary software for search, selection, and record keeping within a few years (and is already testing some aspects of it).

Computers bring new possibilities to the task of curriculum design, but they do not bring solutions. If we are one day to have K-12 curricula that prepare all young people for interesting, responsible, and productive lives, it will only be because we are determined to have it so and are sufficiently creative and forward looking in our reform efforts. It will be up to teachers and those who prepare teachers, to parents, to citizens without children in the schools, to political and business leaders, to developers of instructional and assessment materials, to university researchers, and above all to education leaders. Can they come together on curriculum design? Will they? *Designs* is a modest attempt to move us all in that direction.