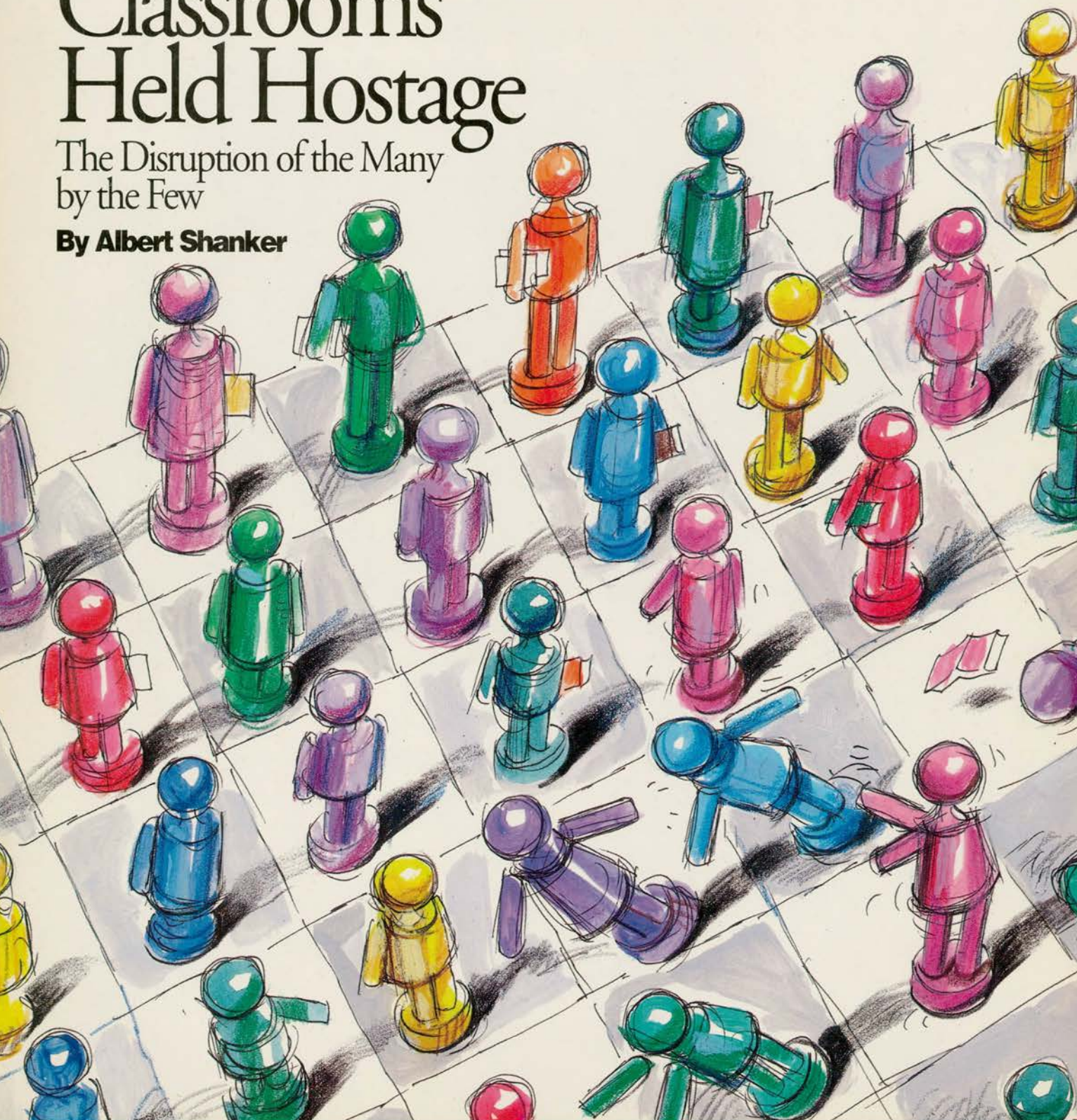
AMERICAN FEDERATION OF TEACHERS
SPRING 1995

AMERICAN Educator

Classrooms Held Hostage

The Disruption of the Many by the Few

By Albert Shanker



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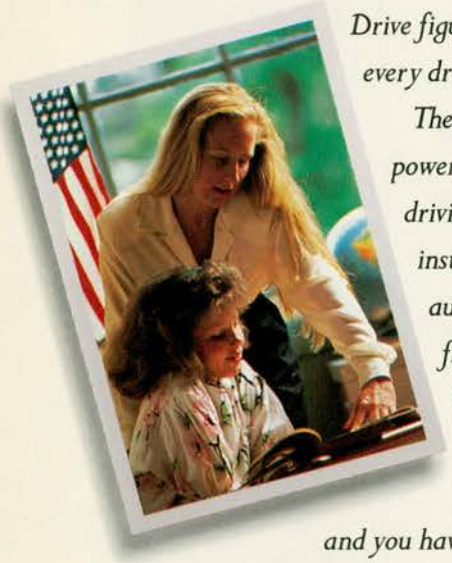

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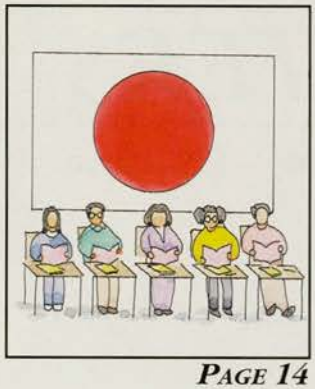
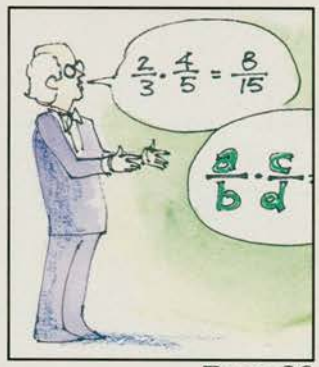


PAGE 14

PAGE 25



PAGE 30

AMERICAN Educator

LETTERS

On Target

Thank you very much for your Winter 1994-95 issue of *American Educator*. My wife is a teacher and a member of the AFT. I have been a public school board member for the last 12 years.

School publications are usually so worried about being politically correct that they do not ever acknowledge the disaster that is befalling American education and society in general.

The articles by Gertrude Himmelfarb, Barbara Dafoe Whitehead, and William Kilpatrick were right on target and much needed. Keep up the good work.

—David Emile Marcantel
Jennings, LA

The Power of Music

For an article addressed to educators, "Music and Morality" (Winter 1994-'95) says remarkably little about music education. We all would grant, without much thought, the mysteriously uplifting and integrating powers of music, even or especially those of the simplest folk tune. How this powerful influence can be brought into the *school* lives of students—that is, or should be, the question.

Transformation through music occurs best and most profoundly if music is a large, challenging and exciting presence in the school day from the earliest grades on. Methods such as Kodaly ensure that the elements of music can be taught in the most accessible and inviting ways. Where are these methods, their teachers, and the time they require in our elementary students' education? Where are the manifold opportunities to make music that should exist throughout the school career of each child? Mr. Kilpatrick's article should have been a diatribe on the wasted opportunities for spirited cooperation in a beautiful enterprise: the absence of music from our schools. There should also have been another article, on the wholesome and elevating effects of a dance and movement program. My own school system has little music and no dance in its curriculum. I read about some other school system's programs, and I think about all the students whose notions of sound and movement are shaped entirely by the media that Mr. Kilpatrick thinks, rightly, may be a threat to the well-being of our children. A diatribe on what happens outside of the school, however, is scarcely valuable to us. We teachers love music, but like the general public, we need to have described what a true musical education and *its* moral effects are. Mr. Kilpatrick failed us. Try again.

—Ruth S. Montgomery
Middletown, CT

As I read your Winter issue, cover-to-cover, I was moved to express my feelings and gratitude for your contribution to education in America. The issue discussed the societal impact of morals deterioration, sex education, and even music! We as educators need to be aware of what we are up against! I passed the article on to our music teacher recently. It put into words what we have felt all along about the influence of the "MTV culture." For some, classical music is never heard outside the school walls. Our principal has it played over the P.A. system every Friday at the end of the day, while we all read together. As a media specialist, I use every opportunity I can to make children aware of the impact of media on their lives.

I am impressed with the credentials and expertise of all your writers. "How-to" periodicals for teachers are abundantly available. The *American Educator* is one of a kind, thought provoking, and superior in content and quality. I save every issue for future reference! In addition, I intend to read the books written by the authors of the excerpted articles.

—Pru Warren
Franklin Square, NY

Sex Education

Barbara Dafoe Whitehead's picture of family life education in New Jersey is essentially incorrect. Either she bases her analysis on faulty information, or she distorts it to make her point that sex education has failed in the United States, and particularly in New Jersey.

Dafoe Whitehead gives the impression that there is one single family life education program that is uniformly used by all of New Jersey's 600 school districts. Quite to the contrary, there are as many family life education programs as there are school districts. When the State Board of Education required family life education in 1980, it permitted local school districts to develop both elementary and secondary programs on their own with the advice and assistance of community advisory committees. In other words, the policy permitted at least 600 family life educational flowers to bloom. This individualized policy has worked well and kept controversy to a minimum.

Again, Dafoe Whitehead is incor-

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rect in implying that a recently published Rutgers University Press curriculum, *Learning About Family Life,* for kindergarten through third grade, is in use in all school districts. Approximately, it is in use in some 30 classrooms, after local school boards have reviewed and approved the material. Although there has been some controversy about the curriculum, and some parents have exercised their right to remove their children from instruction, implementation of the curriculum, teacher training, and parent workshops are progressing smoothly in most districts.

Dafoe Whitehead implies a one-to-one correlation between teen pregnancy rates and family life education. There are simply too many variables to draw any neat conclusions between the two as she strains to do. Prevention/reduction of teenage pregnancy, as pointed out in report after report over the past decade, is a complex socio-economic issue requiring multiple solutions, mostly having to do with reducing poverty and giving young people options for the future. Even with such disavowals, Dafoe Whitehead neglects to cite material that shows that births to teens in New Jersey have declined over the past years: the number of births per 1,000 teens, which stood at 43 in 1989, dropped to 41 in 1990, 40 in 1991 and 39.7 in 1992 (Association for the Children of New Jersey, *kids count New Jersey,* 1994).

Like some critics of sex education, Dafoe Whitehead does not include student opinions about the quality and value of their school programs. I wish she had visited some classrooms before drawing her conclusions about the ineffectiveness of New Jersey's efforts. Network staff survey students about their programs. They frequently tell us that needed information and skills often come too late in their lives to help them reject unwanted sexual advances, or protect themselves from unintended pregnancies and sexually transmitted diseases. Most feel that their programs are minimally adequate and they wish for more help, honesty and openness about sexual health issues from adults.

Barbara Dafoe Whitehead's conclusions about the failure of sex education in New Jersey are more rooted in the politics of the day than in accurate information, recent research data and the educational and health needs of young people.

—Susan N. Wilson
Executive Coordinator
Network for Family Life Education
New Brunswick, NJ

It is surprising that the *American Educator* would choose to re-print Barbara Dafoe Whitehead's story, "The Failure of Sex Education," which originally appeared in *The Atlantic Monthly.* The article misleads readers about what is actually taking place in health education classrooms, demeans teachers by suggesting that sexuality educators do not have cohesive professional training, and contains significant inaccuracies. For these reasons, twenty-seven mainstream, national organizations have signed on to a statement that states: "We believe that the article entitled 'The Failure of Sex Education' presented opinions and inaccuracies that may have misled the reader as to the actual content, value, and status of comprehensive sexuality education in the United States." Whitehead's article has been used at the local level to try to derail programs that have been evaluated and found to help young people postpone intercourse.

Whitehead's focus is the effectiveness of sexuality education in reducing teen pregnancy. First of all, Whitehead declares that the teen pregnancy rate has gone up. In fact, among sexually active teens, the rate has gone down 19 percent during the past twenty years. Teen pregnancy is influenced by a great number of factors, including socio-economic status, educational and economic opportunity, access and ability to use contraceptives, and age. Thus, school-based programs *alone* will not stop teen pregnancy. Whitehead overlooks data showing that a number of sexuality education curricula have been found to help young people to either postpone having intercourse or to use contraceptives when they do have intercourse.

Another of Whitehead's assertions is that schools have completely replaced parents as the sexuality educators of the nation's children. Parents remain the most important sexuality educators of their children. However, in order to give young people the best possible chance to develop into sexually healthy adults, parents, schools, religious institutions and communities must work together to educate and help develop interpersonal skills in young people. More than 8 in 10 parents want this help. By suggesting that professional sexuality educators have given up on young people, Whitehead offends the many dedicated people who are working diligently to give young people the best possible chance at a happy, healthy future.

—Debra W. Haffner
Executive Director, SIECUS
New York, NY

The article by Barbara Dafoe Whitehead was as provocative as it was thoughtful. The question, as I see it, is how can we teach comprehensive sex education without conveying to the children that teachers expect them to have sex? Teacher expectation is a great determinant of how kids will behave and how much they will learn. The cliché that justifies explicit sex education is the one that says, "Well, they're going to do it anyway, we may as well try to protect them." This is an embarrassing abrogation of our professional responsibility. A hell of a lot more of the kids will be having sex if they feel we expect them to.

There is nothing naive or wrong about teaching abstinence as a moral value. We won't convince every student, but we'll do better than we have for the last 30 years teaching them how to put condoms on bananas.

—Paul E. Francis
Pittsburgh, PA

Barbara Dafoe Whitehead replies:

Both Debra Haffner and Susan Wilson run organizations that promote comprehensive sex education in the public schools, the approach to sex education I criticize in my article, so I am not surprised that they go after me. But I am surprised by their tactics. Instead of reasoned argument, they offer half-truths, political threats (27 organizations oppose the article!), and deliberate distortions of my views. To cite two examples among many: Haffner says that I ignore sex education curricula that "help people postpone having intercourse or to use contraceptives when they do have intercourse." In fact, I favorably discuss two: Postponing Sexual Involvement, a program for seventh-

(Continued on page 46)

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Classrooms Held Hostage

The Disruption of the Many by the Few

By Albert Shanker

Over the last decade or more, we've had a national debate on the issue of school quality, and there is a broad consensus that we need to do a lot better. In order to improve our schools, we'll have to adopt some of the practices already in use in countries that have successful school systems. For example, we'll need to develop high standards, assessments related to those standards, and a system of consequences so teachers and youngsters and parents know that school counts, that performance matters, whether a new graduate is looking for a job, trying to get into college, or seeking entrance to a training program.

All this will take time, but we're well on the way to bringing about the improvements that we need. However, none of these changes will do any good unless we meet certain basic conditions. Schools have to be safe and classrooms have to be orderly. Without that, reforms are nonsense. You can deliver a terrific curriculum, but if youngsters are throwing things, cursing and yelling and punching each other, the curriculum doesn't mean a thing in that classroom. The agenda is altogether different.

Albert Shanker is president of the American Federation of Teachers. This article is based on his address to the AFT's conference on safety and discipline, held this past February in Washington, D.C.

Right now, there is a lot of criticism of public education, and members of Congress, governors, and state legislators are talking about radical changes in the system—vouchers, choice, and charter schools. But parents are not really pushing for these things, except in schools where they fear their children are in danger or where the disorder is such that kids can't learn. Then they say, "If you can't provide my children with a safe and orderly place to learn, give me a chance to take them somewhere else." And so we're about to create a ridiculous situation. We're going to set up a system of choice and vouchers, so that 98 percent of the kids who behave can go where they'll be safe, and we'll leave the 2 percent who are violent and disruptive to take over the schools.

This problem of school safety has a number of aspects. First, of course, is the problem of extreme danger, where we are dealing with violence or drugs in the schools. Often the schools living with these threats are at a loss about how to handle them. In Washington, D.C., last week, there were headlines indicating that the mayor and school officials don't have any idea of what to do about the guns, knives, and drugs coming into their schools. They say they've tried everything they can think of and nothing helps. This is not a D.C. problem, only. Many school administrators and school boards across the country treat violence as a fact of life—that's what society is

ILLUSTRATED BY BRU ASSOCIATES

like. They go through some ritual efforts to show that they're doing something, but basically they give up.

The guns, drugs, and violence have to be distinguished from another type of activity. It isn't deadly in the sense that you will read tomorrow morning that some youngster was stabbed or shot, but it is deadly to learning. I'm talking about out-and-out disruption. When there is a youngster who is constantly yelling, running around the room, or picking on students who try to participate in the class, the time of the other students and the teacher are not devoted to math or science but to figuring out how to contain this individual. In this area, we have an even greater tolerance than we do for school violence. Occasionally, kids who are violent are suspended or removed for periods of time, but little ever happens to kids who are "only" disorderly.

Teaching bad lessons

The schools suffer from high levels of violence and disruption partly because of lessons we teach youngsters at a very early age. They see another child in their class behaving atrociously, and they are all sure that something is going to happen to that youngster. They look and wait for fire to come from heaven—or someone to come from the principal's office—because they have a sense of justice. They believe that when you step way out of line, somebody will come to get you and do something about it. But what happens? Often nothing.

And when nothing happens, the little kid who is five or six years old turns to his or her peers and says, "Now look at that. You didn't have the guts to do what I did. You were scared something would happen to you. And what happened? Nothing!" But something has happened, and soon the teacher is no longer the leader in the classroom—that youngster is. And if you didn't do anything when one kid got out of line, what will you do if all the kids get out of line? Now you've got a real problem. Do you kick them all out? I don't think so.

And so we teach these youngsters a bad lesson that continues all the way through school. If you let one kid into a school with a weapon and you tolerate that, pretty soon half of the kids have weapons. Why? They'll tell you they don't want to carry weapons; they are doing it to protect themselves from the first guy. But of course once they have the weapons, the guns and knives don't turn out to be only for protection. And once you have a situation where all of the youngsters in a class or in a school have bought into a certain kind of behavior, whether it's carrying a gun or disrupting class, how do you change that? You've got an entire culture that says this is the way things are going to be.

Last year when Congress was debating the Goals 2000 legislation, some people said that we need a third kind of standard. In addition to having content standards — what students should learn — and performance standards — how good is good enough — we need opportunity-to-learn standards. It was their view that it is unfair to hold kids to content and performance standards unless they have had certain advantages. It's not fair, if one kid has had early childhood education and one hasn't, to hold them to the same standard. It's not fair, if at this school they don't have any textbooks or the textbooks are 15 years old, and in that school they have the most modern books. It's not fair, if in this school they've got computers, and in that school kids have never seen a computer.

I think the advocates of opportunity-to-learn standards are missing an important point. Of course it's better if students have the most up-to-date textbooks, but a lot of kids have made it without them. It's much better for young children to have high-quality early childhood education, but a lot of kids have been successful without any. It's better for kids to have access to computers, but throughout history people have learned without them. But nobody has ever learned in a classroom where one or two kids take up 90 percent of the time through disruption, violence, or threats of violence. You deprive children of an opportunity to learn if you do not first provide an orderly environment in the classroom and in the school. That comes ahead of all of these other things.

Punishing the victims?

This seems self-evident, but it sometimes looks as though the weight of opinion, particularly among educators, is in the other direction. John Cole, president of the Texas Federation of Teachers, recently sent me a report on the 1995 Scholastic Summit on Youth Violence, which captures a currently popular point of view—that our principal concern should not be with the kids whose learning is destroyed because of violence and disruption but with the kids who create the violent atmosphere:

> "...start with the concept that the real victims of violence are those unfortunate individuals who have been led into lives of crime by the failure of society to provide them with hope for a meaningful life. Following that logic, one must conclude that society has not done enough for these children and that we must find ways to salvage their lives. Schools must work patiently with these individuals, offering them different avenues out of this situation. As an institution charged with responsibility for education, schools must have programs to identify those who are embarking on a life of crime and violence and lift them out of the snares into which they have fallen. Society, meanwhile, should be more forgiving of the sins of these poor creatures, who through no real fault of their own are the victims of racism and economic injustice."
>
> "Again and again and again, panelists pointed out that the young people we are talking about, to paraphrase Rodney Dangerfield, 'don't get no respect.' The experts assured us that young people take up weapons, commit acts of violence, and abuse drugs because this enables them to obtain respect from their peers. I found myself thinking that we aid and abet this behavior when we bend over backwards to accommodate those young people who have bought into this philosophy. By lavishing attention on them, we may even encourage a spread of that behavior. Many of these programs are well meaning but counterproductive.
>
> "I don't want to condemn this conference as a waste of time. Obviously we do need programs to work with these young people, and we should try to salvage as many as we can. However, we must somehow come to grips with the idea that individuals have responsibility for their own actions. If we assume that society is to blame for all of the prob-

Nobody has ever learned in a classroom where one or two kids take up 90 percent of the time through disruption, violence, or threats of violence.

lems these young people have, may we then assume that society must develop solutions that take care of these young people's problems? We take away from each individual the responsibility for his or her own life. Once the individual assumes that he or she has lost control of his own destiny, that individual has no difficulty in justifying any act because he or she feels no responsibility for the consequences."

When we oppose the view that puts the welfare of a few violent and disruptive kids far above that of the majority of kids in their schools, it is not that we want to be punitive or nasty. The point is that schools must teach not only English and mathematics and reading and writing and history; they must also teach that there are ways of behaving in society that are unacceptable. And when we sit back and tolerate certain types of behavior, we are teaching youngsters that this behavior is acceptable, even though we know it is likely to lead to their being in jail or in poverty for the rest of their lives. We are not doing our jobs as teachers. And the system is not doing its job, if we send youngsters the message that this is tolerable behavior within society.

We are also putting at risk the education of millions of other youngsters. And we are doing something we wouldn't do as parents. Suppose a family had four or five kids, one of whom was emotionally disturbed and very dangerous. Most parents would separate that one youngster from the other three or four because they wouldn't want the others to be harmed. They would try very hard to help the disturbed child—indeed they'd probably do more for him than for the other kids—but they would consider it their first responsibility to make sure he didn't hurt the others. They wouldn't say to themselves, "I have to trust this youngster with my other children to show him that I'm not separating him out or treating him differently. Otherwise I might damage his self-esteem." That kind of ridiculous talk is left to the schools, and the proper response to it is outrage—outrage that we have a system willing to sacrifice the overwhelming majority of children for a handful, without even doing that handful any good.

That outrage is there among parents and other members of the general public, and we saw it reflected in the results of the November 1994 elections. People are angry at the way government is run—they are asking why it can't do things in a common-sense way. And the schools are included in this anger. People are paying for public education so youngsters will be able to be employed and get decent jobs. In fact, they hope that the kids coming up will be as well off as we are—or better off—just the way we are in respect to our parents. But the schools are turning into institutions whose primary function seems to be to socialize kids or, worse yet, into custodial institutions—places where kids are warehoused. And the academic function is being neglected or even destroyed.

So we have to be tough on these issues because we are defending the right of children to an education, and those who insist on allowing violence and disruptive behavior in our schools are destroying this right for the overwhelming majority of youngsters.

Zero tolerance

Two or three years ago, when I was in Texas at a con-

vention of the Texas Federation of Teachers, there was a press conference about a position the convention had adopted on school violence, and the phrase "zero tolerance" was used. The teachers said that certain dangerous activities would not be tolerated in school, and when they occurred, there would be consequences for the students who engaged in them. This might mean suspension or expulsion or something else, but the consequences would be clearly specified in advance. The phrase "zero tolerance"—and the idea behind it—got picked up by radio and television, and it has been sweeping the country. The other night, I heard a governor at a meeting of the National Governors' Association stand up and come out for zero tolerance. And it's a position that teachers should take very seriously. We should resolve not to teach youngsters bad lessons, and we should resolve to start very early. When a youngster does something that is terribly wrong, and the other youngsters are sure that something is going to happen to him because of what he did, we had better make sure that we fulfill those expectations. So instead of beginning to learn that anything goes in school, youngsters say to themselves, "Thank God, I didn't do a terrible thing like that." That is the beginning of a sense of doing something right, as against doing wrong.

And we have to deal with this notion that society and social conditions are responsible for whatever kids do that is wrong. The AFT does not take second place to anybody in fighting for decent conditions for minorities and groups that have been oppressed. We're not in a state of denial, either. We're not saying that things are wonderful for everybody in American society. But the answer to social inequities is not to tell people that anything goes. When a parent sees a kid getting in trouble and the kid tries to say that he can't help it—he's doing all these terrible things because he's running with a bad crowd or because he's not appreciated at school—a good parent says, "That's no excuse." Because the parent doesn't want the youngster to end up as a criminal or someone who will never be able to get a job.

Otherwise, we are encouraging a Menendez brothers mentality: "We had a right to murder our parents because they gave us too much money and we resented it." We are encouraging the mentality that says, " I'm not responsible for my actions. The devil made me do it. So don't make me suffer the consequences." And when we allow kids in first grade to get away with things they know they should not, we are setting up their excuses for horrible crimes later on. So it's AFT's position that every child has a right to an education and, if anything gets in the way, we're going to do something about it. And if that anything happens to be a handful of youngsters, they have to be removed from the others.

What should schools do? They should have codes of conduct. These codes can be developed through collective bargaining or they can be mandated in legislation. I don't think it would be a bad idea to have state laws requiring that every school system have a code of discipline—one that is clear and lays out what kind of behavior is unacceptable and the consequences of such behavior. The law might even call for some kind of financial penalty if complaints from parents, teachers, or students show that a school district doesn't have such a code or isn't enforcing it. Taxpayers are providing money for a district to give kids an education, and if that district allows

Enforcement is a critical part of a code of conduct, and I believe that the punishments should be spelled out in advance.

a small number of kids to destroy the education of all the rest, what is the point of spending the money? I think there will be a lot of support for this kind of legislation. One of the things fueling the political anger in this country is the feeling that we have a lot of laws that help people to become irresponsible or encourage them not to take responsibility for their own actions.

Enforcement is a critical part of a code of conduct, and I believe that the punishments should be spelled out in advance. Once you allow flexibility, punishments will be more severe for some kids than for others and you will get unfairness; you will get prejudice. The way to make sure that punishments are handed our fairly is to say, "We don't care if you're white or Hispanic or African-American or whether you're a recent immigrant, when you commit this infraction, this is what happens. We don't have a different sanction depending upon whether we like you a little more or a little less." That's how fairness would be ensured, and I think it's very important that we insist on that.

I've been talking about students' taking responsibility for their behavior, but I think we, as educators, have to take responsibility, too. Not all youngsters can sit still and keep quiet for five or six hours—not all adults would be capable of doing it. Education systems in other countries often recognize this fact. In Japan or China, for example, when kids are finished with math, they go out and play ball for fifteen or twenty minutes, and when they're finished with Chinese or Japanese, they go out and run around for fifteen or twenty minutes. So it's wrong to declare a kid a major menace because he moves around and disturbs the rest of us. Instead, we ought to provide some types of programs that allow a youngster to be more active. We haven't figured out a way of creating a human child who sits still for six hours, so we need to say, "All right, if you can't sit still, here's another way for you to learn English and history and mathematics. But you still have to learn. You still don't use foul language, you don't hit anybody, you don't spit, you don't run all over the place." We don't want to create a situation in which the youngster is blamed because of a rigidity we have built into the system.

All this is common sense. I'm talking about the way parents would behave with respect to their own children. If my youngster does something wrong, I want my youngster to know it and pay some price for it so he or she doesn't do it again. And I'm not doing this because I hate my youngster or because I get pleasure in handing out punishments. I'm doing it because I am afraid that if I let this go, there's going to be something else and something else and something else, and at some point it's going to be too late. A good school system ought to think the same way because the schools have a parental responsibility for kids while they are in school.

Roadblocks

School administrators can be a big problem when it comes to dealing with school violence. They are worried that their reputations will suffer if their schools report many such incidents. So administrators often let teachers know that if they say they are having problems with violence or disruption, they must be ineffective teachers. I faced this as a teacher. If I reported this kind of problem to the principal, I was informed that if I knew how to motivate the students properly, the problem would never have come up. And if an administrator tells that to one or two teachers, the school may still have plenty of violence and disruption but there will certainly be few reported incidents. This unwritten gag rule exists in many places, and it is one reason why we need to seek laws that require a full and honest reporting of incidents of violence and extreme disruption, with penalties for individuals or schools that try to discourage reports.

If violence and disruption are the number one problem, the number two problem we face is what will happen if we throw the kids who are causing the trouble out of school. It reminds me of a big campaign in New York City to get crime off the streets. Lots of extra policemen were assigned to patrol the streets, and this was very successful: The criminals left the streets and went down into the subways. Then there was a campaign to deal with crime in the subways, which drove the criminals back onto the streets. So the business community, parents, and others will say, "You can't just throw kids out of school." One possibility would be to place some conditions on a kid's returning to school. For example, the student might have to bring a parent or relative or some other grown-up who is responsible for his conduct to stay in class with him until he is able to behave properly on his own. And there are other possibilities. But we can't say that we have to wait until we build new schools or new classrooms or have new facilities before we start removing these youngsters. The first thing we have to do is separate out the youngster who is a danger to the other youngsters.

This seems harsh; it seems punitive. But I think there's a close parallel with how we treat adults who have committed serious crimes. We know that when we arrest adults and put them in jail, being in jail is not likely to help them. However, most of us are glad when someone who has committed a serious crime is put away—not because it will do that person any good, but because that person won't be around to harm anyone else for the next ten or fifteen years and because his incarceration will deter others. The justification is the same for separating youngsters who are destroying the education of others. I'm not sure that we can devise programs that will help most of those youngsters. We should try. But our first obligation is never to allow the education of the twenty or twenty-five or thirty to be destroyed because we have an obligation to one—especially when there is no evidence that we are doing anything for that one by keeping him in the classroom with the other kids.

Legal problems

Legal problems are another big obstacle to dealing with violence and disruption in the schools. Suppose a youngster is expelled from school and he gets a lawyer and goes to court to fight the expulsion. If the principal and the board lawyer go to represent the school, they might wait around the courthouse a whole day before the court found that it would not be able to hear the case that day. They'd come a second day and maybe the case would be held over again. It might take three or four days before the case was heard. So if you've got a decent-sized school, even if you're dealing with only 2 percent or 3 percent of the youngsters, a principal could spend his full time in court. And what does the court do when it's heard

(Continued on page 47)

What We Can Learn from Japanese Teachers' Manuals

READERS OF the *American Educator* are familiar with the work of Harold Stevenson and James Stigler, whose pioneering cross-cultural studies of the educational systems of Japan, China, and Taiwan have shed light on why students in those countries perform at such dramatically higher levels in math than do their American counterparts. The differences in achievement are indeed staggering. For example, one study comparing first and fifth graders in the U.S., Taiwan, and Japan found that the highest-scoring American classroom obtained an average score lower than that of the lowest-scoring Japanese classroom and of all but one of the twenty classrooms in Taiwan. Numerous other studies conducted by Stevenson and Stigler have shown similarly bleak results.

Disproving popular claims that there are any meaningful differences in the intellectual capacity of Asian and American children, Stevenson, Stigler, and their international team of researchers have looked elsewhere for answers. They have spent hundreds of hours in comparative classroom observations at the elementary school level, held extensive discussions with teachers and administrators, and conducted a thorough examination of such factors as the content and sequence of the curriculum, the allotment of time, the preparation of teachers, the impact of a clearly defined national curriculum, the structure of lessons and the differences in pedagogical approach, attitudes toward education and the role of the family, and beliefs about effort vs. innate ability and what that means for school organization and expectations for student performance.

While not suggesting that we could or should try to import Chinese or Japanese culture, Stevenson and Stigler have shown that there is much to learn from studying their educational systems. "Meaning often emerges through contrast," they have written. "We do not know what it means to work hard until we see how hard others work. We do not understand what children can accomplish until we have seen what other children the same age do....Cross-cultural comparisons can help us discover characteristics of our own culture that we fail to notice because we are so familiar with them."

An overview of some of Stevenson and Stigler's findings was presented in the cover story of the Spring 1991 issue of this magazine. Entitled "Polishing the Stone: How Asian Teachers Perfect Their Lessons," the article evoked widespread interest and holds the record for our most frequently requested reprint.

The authors' more detailed findings—and their recommendations for American education—were brought together in their 1992 book, *The Learning Gap* (now available in paperback from Simon and Schuster).

To our great benefit, their work continues. In order to give American educators a more first-hand look at how the curriculum and pedagogical approach of Japanese education differs from ours, Stevenson and Shin-ying Lee, a longtime collaborator with Stevenson and Stigler, have embarked on an ambitious project to translate a typical set of Japanese math textbooks and the accompanying teachers' manuals for grades one through six. In the pages that follow, we have reproduced a translation of the unit on "weight" from a typical third-grade teacher's manual, *Shinban Sansu 3: Kyoushiyou Shidousho* (1993).

The Japanese teacher's manual is divided into three sections. The front part of the book, similar at least superficially to American teachers' manuals, displays the relevant pages from the student textbook, surrounded by notes intended for the teacher's guidance. We reproduce here the entire seven pages of that section on "weight."

The second part of the Japanese teacher's manual—which has no counterpart in teachers' manuals used in the U.S.—provides the Japanese teacher with a more in-depth discussion of the mathematical topic. We begin our translated text with this section, because it lays the foundation for the unit and because it is what the Japanese teacher would be reading first, as she prepares to introduce the concept of weight to her students. Because of space limitations, we can reproduce only part of this section; the remainder includes a more detailed hour-by-hour instructional plan and a suggested review test for the unit.

The final section of the Japanese manual—which we do not include here—shows how the various topics covered in that semester's work fit into the overall math curriculum for grades one through six—what students in earlier grades would have learned about the topics and what students in future grades can be expected to learn.

Fascinated by the content of these translations—their depth, logic, focus, and clarity—we thought it would be interesting to round up the comparable sections on weight from the math manuals written for American teachers. We looked at two widely used math series, and what follows are four brief observations comparing the two countries' approaches. Of course, these observations reflect the content of both the teacher's guide and the student textbook, since the two are tied together.

We invite you to make your own review: to compare whatever series is used in your school or district to the excerpt that follows.

We owe a special note of recognition to Shin-ying Lee, of the Center for Human Growth and Development at the University of Michigan, who oversaw the translation and who made the arrangements for permission from the Japanese publisher, and without whose energy, efficien-

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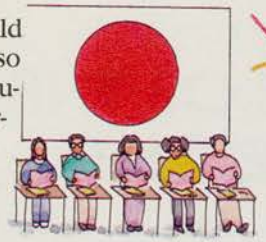
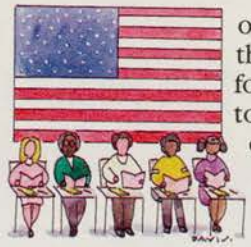
Alice Gill, who taught third grade for many years in Cleveland, Ohio, now heads the AFT's "Thinking Math" project. Liz McPike is editor of the American Educator.

cy, and exactness this project would not have been possible. We are also grateful to the publisher, Kyouiku-Shuppan, Inc., for their kind permission to reproduce this unit.

We should note that Japan has a national curriculum, and while the textbooks and teachers' manuals are produced by private companies, they must all meet certain guidelines. They differ primarily in their superficial features, and the one we have reproduced can be considered typical.





Observations

■ **Laying the Foundation**. As noted above, the Japanese manual provides the teacher with a discussion of the unit she is preparing to take up with her students. It presents the unit's goals and mathematical foundations, while pointing out areas that might cause the students special difficulty. This discussion serves both as a brief refresher course for the teacher and as a walk-through of the key concepts of the lesson. For example, the overview of the weight unit reminds the teacher of what the basic nature of a scale is: "A scale is constructed to capture the force of gravity on an object's mass with visual movement. One example is associating an object's weight with the lengthening of a spring. Another example is converting the weight into rotational movement, observing the weight in relation to the number of degrees a scale's dial hand moves." Likewise, this section gives teachers ideas for helping students grasp difficult concepts: "Since weight cannot be sensed visibly, and because many students may think an object's weight changes when its physical position or shape changes, it is difficult to illustrate the concepts [of conservation and additivity] through simple verbal explanation. It is therefore imperative to engage students in activities such as weighing a toy after changing its position and weighing clay after tearing it, then connecting it, etc."

■ **Organization of the Curriculum.** The most obvious difference in the organization of the curriculum is that the American texts take up the topic of weight—often very briefly—each year, while the Japanese wait until third grade and then take it up in a thorough, comprehensive manner, devoting a full eight hours to its study. The U.S. texts—we examined grades one through four—mix weight in with other types of measurement—length, volume, and even temperature and time—while the Japanese texts take up length and volume (considered easier topics than weight) in depth in the first and second grades. This reflects the well-known "spiral" approach of the U.S. curriculum, where many different topics are presented each year and then repeated with more elaboration at later grades. In addition to the argument that children may be better served by having a critical mass of focused time on a topic, rather than moving through so much so fast, there is another problem with the spiral approach. As Stevenson and Stigler pointed out in *The Learning Gap*: "...daunted by the length of most textbooks and knowing that the children's future teachers will be likely to return to the material, American teachers often omit some topics. Different topics are omitted by different teachers, thereby making it impossible for the children's later teachers to know what has been covered at earlier grades....Asian textbooks, by contrast, are developed on the assumption that... if the concept or skill is taught well the first time, it is unnecessary at a later grade to repeat the discussion." The assumed need for "reteaching," so pervasive in the American texts, does not exist in Japanese texts.

■ **Depth and Polish.** The Japanese textbooks and teachers' manuals demonstrate a meticulously thought-out understanding of how best to help children grasp the mathematical concepts and acquire the skills being taught. Their coherent, logical, sequential organization stands in sharp contrast to the often haphazard, disjointed, and more superficial character of the American texts. One gets the feeling that each activity in the Japanese lesson has stood the test of time and that indeed the entire lesson has been carefully "polished" (recall "Polishing the Stone") by scores of teachers, perhaps over generations. And yet this is not a scripted lesson. It provides a balance between, on the one hand, capturing the accumulated wisdom of the profession and, on the other, relying on the individual teacher to adroitly and creatively guide the children through the material—interpreting, pacing, elaborating, adding examples and activities, doing her own "polishing." Most importantly, she is expected to know her students and to carefully observe and monitor their progress until she is certain that everyone has mastered the material.

In addition to the cohesion and logic of the Japanese lesson, it also takes the children deeper into the topic. For example, this unit covers the concept of "conservation" of weight, teaches the difference between arbitrary and universal units of measurement, and introduces students to different types of scales and "how to select appropriate units and measuring devices."

■ **Clutter.** The American teachers' manuals are cluttered with a jumble of add-on's, extra activities, and alternative modes of presenting the lesson. The cumulative effect is often a distracting format and a confusing treatment of the material. It is difficult to delineate what is important from what isn't. It would appear that American publishers are afraid to leave anything out, lest it just happens to be the current favorite fad of some textbook adoption committee. Not knowing what to do with all this stuff, they splatter it around the margins of the teacher's manual. One series we examined included a seemingly endless mishmash of boxes and sidebars and highlighted areas, with such titles as Cooperative Learning Hint, Manipulative Activity, Science Connection, A Different Modality, Manipulative Connection Card, Calculator Activity, Career Connection, Consumer Connection, Physical Education Connection, Mental Math Activity, and Communicating Math Activity. The Japanese use some of these approaches—for example, they make extensive use of manipulatives and of small group work—but they do so by incorporating them naturally into the lesson. The essentials are kept very clear, and the focus is never lost.

—*Alice Gill and Liz McPike*

(EXCERPTS FROM)

EXPLANATION OF THE UNIT ON WEIGHT

I. OVERVIEW

Students have experienced the measurement of weight such as at the time of physical health check-ups to measure their body weight. We should remind them of such experiences to introduce the concept of weight for the first time in this unit. Although weight is a quantity unable to be measured in a direct, visible way like length and size, have the students realize that they can use an arbitrary unit and find how many units there are to find weight just like in length and size. It should be done through actual measuring of concrete objects, then have them understand the usage of the units of weight such as "g" and "kg."

Like a clock, a scale has graduations along the curve on its surface. Students sometimes have difficulty reading the measures. Also, the fact that weight cannot be determined by the object's size nor texture makes it hard for the students to understand weight. Thus, it is important to allow them to experience many occasions of actually measuring the weights and getting familiar with the concept.

II. GOALS

(1) To understand the concept of weight.
(2) To understand the units of weight, "g" and "kg."
(3) To be able to read a scale and measure various objects with a scale.
(4) To understand the relationship between "g" and "kg."
(5) To be able to add and subtract weight.

III. KEY POINTS OF INSTRUCTION

A. Concept and measurement of weight

Although this is the first unit of formal instruction on weight, children have had previous experience with weight in daily life and in various routine activities such as physical examinations.

Judging from outward appearance only, it is easier to estimate an object's length or volume than its weight. However, when determining weight, both indirect and direct approaches are possible: feeling the weight of the object in one's hands or placing it on a scale. It is also possible to numerically express an object's weight beginning with an arbitrary unit of measurement. A similar instructional method was outlined in the unit on Length and Measurement.

These basic ideas are important not only in order for students to understand the concept of weight, but also for them to understand its measurement. As in the instruction of length and volume, there are four steps for the instruction of weight:

1) Direct comparison;
2) Indirect comparison;
3) Measurement by an arbitrary unit;
4) Measurement by a universal unit.

Because weight is difficult to judge visually, it is important to focus on the necessity of a measuring tool. Students' subjective interpretations of weight (e.g., "heavy," "light") are replaced by the graduation indicated on measuring tools and visualized there. This leads to the introduction of a scale.

A scale is constructed to capture the force of gravity on an object's mass with visual movement. One example is associating an object's weight with the lengthening of a spring. Another example is converting the weight into rotational movement, observing the weight in relation to the number of degrees a scale's dial hand moves. This idea of measurement is much more difficult for students to learn compared to the measurement of length or volume. For example, it is easy to visually grasp the sense of an object's length by using a measuring tape, because the increments shown on the flexible tape are the same as those on a graduated ruler. But using a scale, an object's weight is indicated more abstractly—by the degree a dial hand has moved—so it is harder to get the sense of how much it weighs visually.

Because a balance scale makes it easier for children to understand the concept of weight and visualize the meaning of measurement, it is better to use a balance scale when first introducing the topic. However, because upper-dish automatic scales are used more frequently in real life, it is also important that children learn how to use and read them accurately.

As part of their study of the automatic scale, students in this unit will assemble several bags of sand with amounts such as 1kg, 2 kg, and 3 kg. This is so that students are exposed to both the physical experience and actual measurement of standard weight.

B. Introducing the unit of weight

There are three key points regarding the instruction of the weight unit.

1) Weight can be expressed using the number of standard units; it can be numerically stated and labeled.
2) It is more convenient to have two related units such as g and kg so that depending on the purpose one can determine the unit to use and can write the weight in simplest terms (e.g., 2 g rather than 0.002 kg).
3) 1 kg is equivalent to 1000 times 1g.

Because children are not particularly good at converting between these units, and converting is not encountered so often in daily life, it is extremely important to emphasize the relation 1 kg=1000 g.

The minimum graduation of an upper-dish automatic scale with the capacity of 1 kg represents 5 g, and there are 200 of these increments shown on such a scale. It follows then, that if the minimum graduation were 1g there

would be 1000 increments on the scale. This may be one way for students to imagine the relation of 1 kg and 1000 g.

Also, it is advisable to tell the students that the "k" in 1 kg means "one thousand times." Teachers can remind students that a similar relationship was encountered previously with length (1 km=1000 m).

C. Sense of weight: Estimating standard quantity

Concerning the sense of weight, 1 kg and 1 g are the best standard quantities for students to become familiar with so they may begin to grasp the actual numeric amount certain objects weigh. Since there are various capacity levels for upper-dish automatic scales (e.g., 1 kg, 4 kg, 10 kg, etc.), depending on what the objects will actually weigh, it is also important to be capable of determining which scale to use.

For example, knowing roughly how much 1 kg weighs helps when estimating the weight of a 3-4 kg object since it is possible to guess that it would be 3 or 4 times heavier than 1 kg.

Another advantage of acquiring a sense of standard quantity is that, given a desired numeric amount and objects with an insufficient weight sum, students can estimate the additional amount needed to make up the difference. For this reason, teachers should provide an environment that includes many different objects weighing various standard amounts so that students have the opportunity to re-experience the weight of them at any time. For example, when assembling a bag of sand with the weight of 1 kg, teachers can keep an eye out for daily objects weighing 100 g or 500 g.

D. How to read graduations

It is harder for students to read graduations on a scale than to read graduations on a ruler, because a scale includes numbers such as 5, 50, 500; or 2, 20, 200; as well as 1, 10, 100 as the smallest graduations. However, it does not show numbers such as 3 or 70. Commenting on the contrast between the graduations on a scale and the ones on a ruler will lead to students' awareness about the structure of the base-10 system.

Be aware of the following points in order to use a scale correctly.

1) Put the scale on a level surface.
2) Before measuring, make sure that the hand points precisely at 0.
3) Check the maximum weight capacity of the scale, and do not put objects on it that seem heavier. (Before measuring, hold the objects and estimate their weight by hand.)
4) Place objects on the plate gently and take them away gently.
5) Face the dial straight on to read the graduation accurately.

It is also important to develop the students' ability to distinguish the characteristics of different scales and to choose a correct one according to their purpose. This can be done by having students actually use different scales to measure the weight of various objects existing around them.

Next, the following steps should be taken in order to read graduations.

1) Check the maximum capacity of the scale (e.g., the graduation of 1 kg).
2) Check the graduations of large increment numbers.
   - How many graduations can these large increments be divided into?
   - What is the sense of physical weight represented by one of these large increments?
3) Check the smallest graduations.
   - How many graduations are there between two larger increments?
   - What is the sense of physical weight represented by one of these smallest increments?

Students should read from the large graduation to smaller graduations as outlined above. Also, if the dial hand points between two graduations, they should choose the number that is closest to the hand.

E. The importance of manipulative activities

Unlike the study of length or volume in first and second grade, it is hard to understand the conservation and additivity of weight. Since weight cannot be sensed visibly, and because many students may think an object's weight changes when its physical position or shape changes, it is difficult to illustrate the concepts through simple verbal explanation. It is therefore imperative to engage students in activities such as weighing a toy after changing its position and weighing clay after tearing it, then connecting it, etc.

Hence, we deal with several manipulative activities in this unit. For each activity, teachers should show a model experiment and should make sure every child is involved and gets frequent opportunities to use the scales.

The following are examples of manipulative activities.

1) Have students go to a sandbox and put 1 kg sand (which they have to guess) in a plastic bag and measure it on a scale. Most children at this age have not yet developed a sense of 1 kg of weight, so have them try to make the 1 kg bag by adding or removing sand many times. As an expansion of this activity, teachers can have the students make bags with 2 kg, 3 kg, or 1.5 kg sand, which will enhance their interest and motivation in their study of weight.
2) Let students try to make 2 kg by putting everyday objects on a scale. (It could be 1.5 kg or 3 kg, etc.) Given this assignment, students will likely begin to put objects on a scale randomly and soon become aware that they can make 2 kg more quickly with heavier objects. This activity will also help them develop a method of estimating an object's weight before measuring. Some students may even record the weight of each object and add to make the total weight of 2 kg.

Furthermore, teachers can show students how they can determine the weight of fruits in a basket if they subtract the weight of the basket from the total weight. This will help them understand the meaning of conservation and additivity of weight.

A. Section One
(2 hours):

Objectives for the first section:
To learn the concept of weight, the meaning of measurement, and the unit of weight [gram (g)].

Hour One and Two:
Goal: To understand the concept of weight and the unit of weight, the gram (g).

Materials:
Dictionary or books
A bucket with water
Large springs
Scale
Scissors
Compass (the type used to draw circles)
Glue
Pencil
Wooden blocks
1-yen coins

(Example of a proposal for teaching this section)

Topic 1:
"Which book is heavier? Which bucket is heavier?"
Activity: Present two kinds of books and two buckets of water.
Guidance: Let students compare the weights of both of the objects by holding one in one hand and another in another hand. Allow students to realize the importance of measurements of weights by letting them know that it is not necessarily possible to distinguish the weights of the objects just by holding them.

Topic 2:
"Which one is heavier? How can we compare the weight of the objects?"
Activity: Present scissors, compass, and glue.

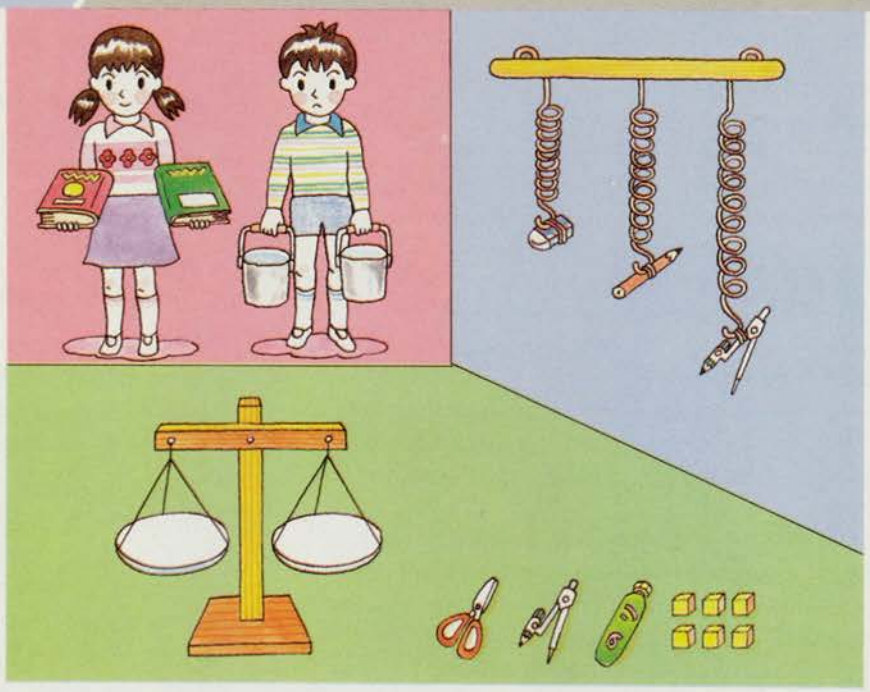
Guidance: Have students discuss the different ways to compare the weights of the objects. Even though students may suggest using a regular scale, suggest that they use a justice scale indicated in the textbook.

12 重さ

Unit 12: Weight

(Translation from Japanese textbook)

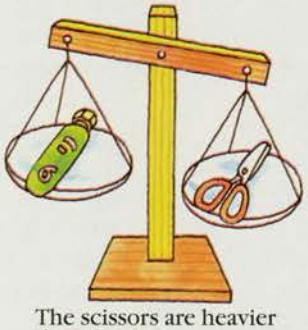
Eight Hours
Early-mid November



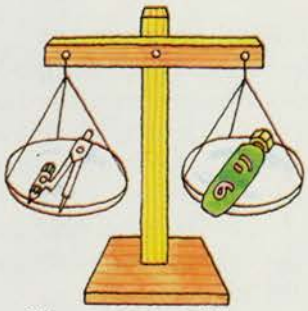
Comparing Different Weights

☆ Let's compare the weights of various objects.

◇ Let's use a device like the one in the picture and compare.



The scissors are heavier than the glue.



The compass and the glue weigh the same.

18

Important Notes:
1. How to introduce the concept of weights:
Weight is a difficult concept for students to understand, compared with the concepts of length and volume, because (a) weight is hard to determine visually and (b) weight is not necessarily determined by the size and shape of the objects.

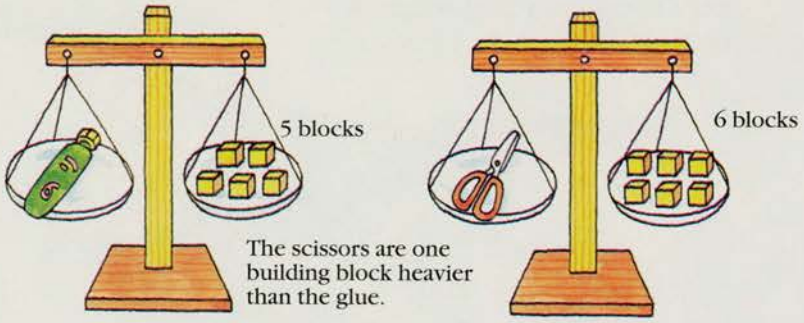
Therefore, it is important that more manipulative activities are introduced and that students measure the weights of objects by picking up the objects to feel their weights (direct comparison).

In other words, it is important for teachers to introduce them step-by-step to direct comparisons and indirect comparisons, leading to the use of universal units.

For the comparison of two objects, it is important to use objects that are tactually discernible in weight and objects that are not tactually discernible in weight, so that students can learn that they cannot measure the weight of the objects just by using their senses.

Editor's note: The Japanese teachers' manual includes—in a contrasting color of type, so as to be easily seen—the answers to each of the questions that appear in the children's text.

② What is the difference in weight of a pair of scissors and a tube of glue? Let's use building blocks and compare them.

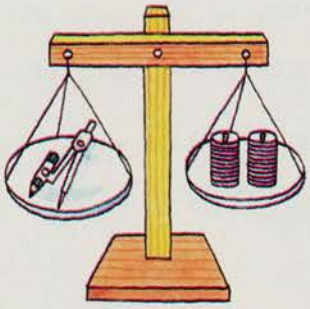


It is possible to express weight using the number of units of weight. For the unit of weight, "gram" is used. One gram is written as "1g."

The weight of a 1-yen coin (*it's like a penny) is 1 g.

③ What is the weight of the compass?

Let's weigh it using 1-yen coins.



④ What is the weight of a tube of glue, a pair of scissors? Let's compare them using 1-yen coins.

19

2. The order of guidance for teaching weight:
It is important to include the following steps:
(a). Direct comparison (by using hands and justice scale);
(b). Indirect comparison (by using a regular scale);
(c). Arbitrary units (by using wooden blocks);
(d). Universal units (e.g., one gram).

3. Purpose of the unit:
The purpose of this unit is to remind students of the steps of measurement and weight, which are similar to those with the measurement of volume and length. Let the students realize the necessity of using arbitrary units and universal units.

Topic 3:
"Let's compare the objects using the justice scale."
Activity: Present a justice scale.
Guidance: Be sure to check if students know that when comparing two objects on a justice scale, the heavier side will drop down, and the lighter side will rise, and that if the two weights are the same, the two sides will remain even.

In the example on p. 18, the scissors is heaviest, and the compass and the glue have the same weight.

Topic 4:
"How much heavier are the scissors than the glue? Let's examine and find out by using wooden blocks."
Activity: Continue to weigh using the justice scale. This deals with step two on p. 19.
Guidance: First, allow students to realize the difference in the weights of the glue and the scissors. Second, get them to remember how they can measure the length by the number of units (i.e., make a certain unit and count how many units equal a certain length). Third, suggest that they use wooden blocks as units of measurement. Each block should be the same weight.

The glue in the textbook illustration equals five wooden blocks, whereas the scissors equals six blocks. Therefore, the scissors is one block heavier than the glue.

It may also be a good idea to suggest other items such as nails or paper clips as a unit of measurement. Then explain to the students that there is a unit of weight, a gram (g), and one gram is equal to one coin of one yen. One gram is written as 1g.

Topic 5:
"What is the weight of the compass? Let's measure it by using one-yen coins."
Activity: This deals with step three on p. 19.
Guidance: Let the students measure the weight of the compass by one-yen coins and finally represent the weight in terms of grams. Twenty one-yen coins equals twenty grams.

Topic 6:
"What are the weights of the glue and scissors, in terms of grams? Let's measure them using one-yen coins."
Activity: This deals with step four on p. 19.
Guidance: Let the students measure the objects and then share their findings with the class.

B. Section Two
(6 hours)

Objectives for the second section:

1. To learn how to read and use the units on a scale;
2. To learn the unit of weight, the kilogram, and that 1kg=1000g;
3. To learn how to select appropriate units and measuring devices depending on the objects;
4. To learn that weight has conservation and additivity.

Hour Three:
Goal: To learn how to read units of a scale.

Materials:
Scale with a horizontal platform (two types: 1kg and 400g)
Book (weight has to be less than 1kg)
Enlarged drawing of the face of the scale

(Example of a proposal for teaching this section)

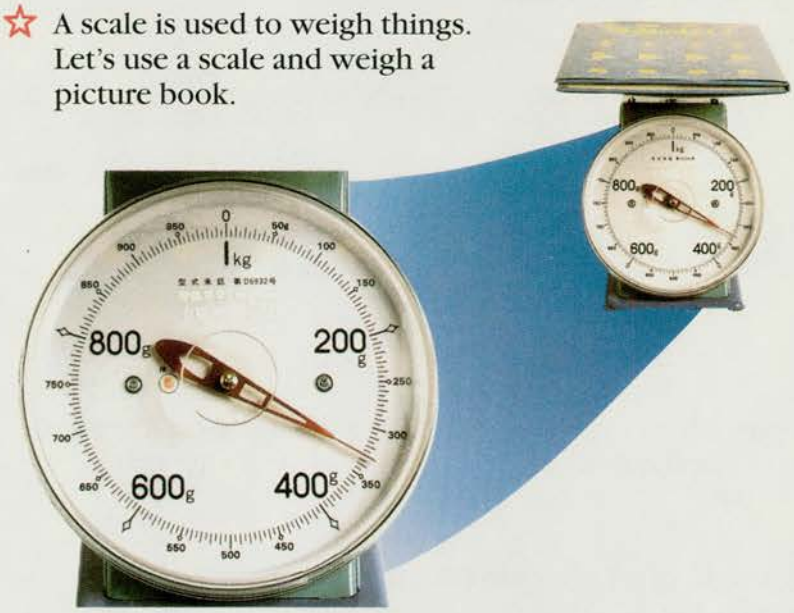
Topic 1:
This deals with the asterisk and step one in the text on p. 20: "In order to measure weight we use a scale. How many lines are there between 0g and 100g, and how much does each line indicate in grams?"
Activity: Present the 1kg scale.
Guidance: Let the students understand the unit system of a scale before measuring the weights. There are three points:

- the largest units on the scale are 200g, 400g, 600g, 800g, and 1 kg;
- the smallest unit on the scale is 5g, with increments of 5g;
- the smallest unit on the scale is the least discriminable unit on the scale.

Topic 2:
"What's the weight of the picture book in grams?"
Activity: This deals with step two on p. 20.
Guidance: Show the enlarged drawing of the face of the scale, and let the students see that the picture book weighs 330g. Also, let them realize that 330g is lighter than 400g, and is heavier than 300g.
Exercise: Reading units on a scale
Read the weight of the scales a, b, and c in the textbook, which is on p. 20 of the textbook.

❮ Scale ❯

☆ A scale is used to weigh things. Let's use a scale and weigh a picture book.

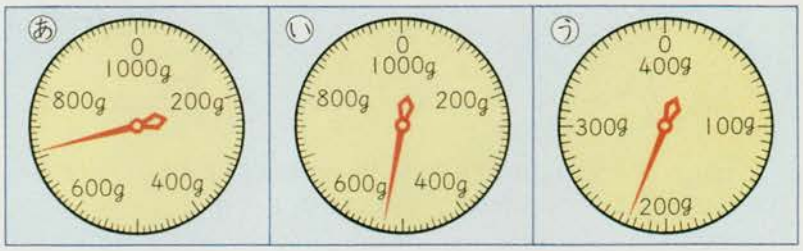


① How many graduations are there between 0 and 100? How many grams is one graduation on this scale?

② What is the weight of the picture book?

③ What is the maximum weight this scale can measure?

📖 Let's find out what weight each scale indicates.



20

Important Notes:

- *Guidance for teaching students how to read units on the scale:*

In the beginning, students are usually unfamiliar with reading units on the scale. So introduce the following basic steps in teaching:

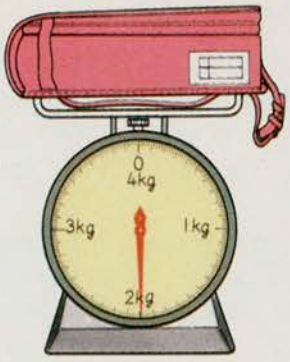
a. Let students read the large units on the scale, such as 200g or 1kg.
b. Let students read the intermediate level of units. Let students see how many intermediate units there are in one large unit. Let them say what one intermediate level is.
c. Let students read the smallest level of units.

By following these steps, students can learn how to read the units correctly.

In terms of reading units, students should learn first to read the larger units (100s). Then the intermediate units (10s). And then the smallest units (1s). Finally, to learn to put units together to equal the weight.

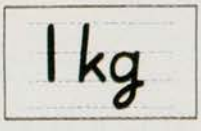
In addition, students can also read the unit as being some number of units away from the maximum unit (e.g., 30g away from 400g equal 370g).

☆ When Deborah put the school bag on the scale, the hand of the scale pointed as shown in this picture. Let's find out the weight of the school bag.



To weigh the heavy objects, a unit called a **kilogram** is used.

1 kilogram is written as 1 kg.
1 kg = 1,000 g.



① What is the weight of the bookbag? How many grams is that?

② What is the maximum weight that this scale can measure?

When you use a scale:

① Put the scale on a flat surface.

② Make sure the hand is pointing at "0."

③ Find out the maximum weight it can measure.

④ After guessing roughly how much the object will weigh, place it gently on the scale.

⑤ Read the graduations from the starting point.

21

Hour Four and Five:
Goal: To learn the unit of weight, the kilogram, and that 1kg=1000g.

Materials:
Scale with a horizontal platform (two types: 1kg and 400g)
Bookbag

Topic 1:
"Let's measure the weight of the bookbags."
Guidance: Let students talk about their bookbags and let them estimate the weight of their bookbag.

Teach them the units of weight (e.g., kg for heavy objects) and let them practice using the unit of kilogram.

Let students understand the relation between 1kg and 1000g.

Let students figure out what the bookbag in the textbook illustration weighs.

Topic 2:
"What is the maximum this scale (p. 21) would be able to measure?"
Activity: This deals with step three on p. 21.
Guidance: Let students know that the scale can measure up to 4kg. Let the students determine the minimum unit on the scale.

Topic 3:
"Let's list the points we need to be aware of when we measure weights."
Guidance: Let students know the right way of measuring weights and get them used to doing it.

■ *Sense of the weight of one kilogram:*
Let students measure the weight of a liter of milk or juice, or whatever liquid they can find. Let them acquire the sense of weight for 1 kg by holding one liter of water, which equals 1kg.

Exercise one:
Let the students get the idea of the weight of 1kg.
"By holding a bag of sand that weighs 1kg, let's get an idea of the weight of 1kg." In addition, hold different objects and estimate the weight of each of the objects. Then find the exact weight by using a scale.

Exercise two: Reading the units on a scale:

- Let the students learn how to read units in kilograms and in grams.
- Get them familiar with reading the larger units first, and to figure out the weight by reading the smaller units.

Exercise three: Reading weight in grams (5200g), and in kilograms and grams (5kg 200g).

Hour Six:
Goal: To learn how to select appropriate units and measuring devices depending on the objects.

Materials:
Body scale
Spring scale
Automatic balance scale
Objects to be measured

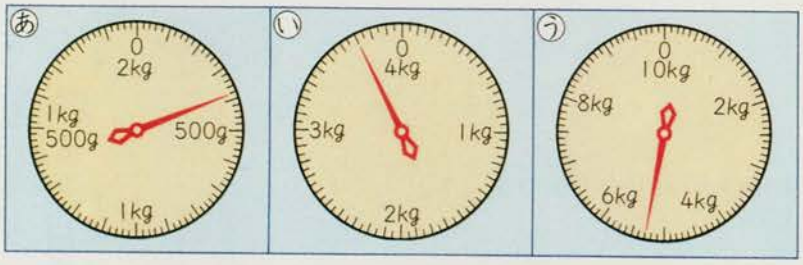
Topic 1:
This deals with steps one and two in the textbook. Step one: "What kind of objects do you measure with these scales?" Step two: "Let's estimate the weight of the different objects and measure them with the scale."
Activity: Show the three different scales on p. 22 in the textbook.
Guidance: Let the students realize that there are different scales for measuring different objects.
Let them think of the kinds of objects they can use with the scales on p. 22 by thinking of the objects around them.

Let them realize that, before measuring weights, it is better to estimate the weight first, and then choose the right scale to measure the weight.

2 Take the bag of sand that weighs 1 kg and try to remember how heavy 1 kg is.

Hold various objects with your hand and guess how much each object will weigh. Then weigh each one with the scale.

3 Let's find out the weight that each scale indicates.



4 How many grams is 5 kg? How many kg and g is 1800g?

5 How many g is "3 kg 40 g"?

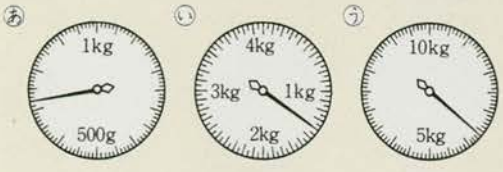
☆ Let's weigh the various objects using the scales.

◇ What kind of weight do the scales A, B, and C measure?

22

Supplementary problems

Let's find out the weight that each scale indicates:



◈② Let's guess how much each object weighs, and then weigh each one with the scale.

☆ There are 2 pumpkins. The weight of each pumpkin was 900g and 800g.
What is the total weight of the two pumpkins?

◈① Let's weigh them and find out.

◈② What calculation do we have to do?

900 + 800 = 1700

1700 g = 1 kg 700 g answer: 1 kg 700 g

◆ What is the difference between the weights of the 2 pumpkins?

900 - 800 = 100 answer: 100g

6 300 g + 500 g 8kg 200g + 5kg 400g

700 g - 200 g 4kg 700g - 3kg

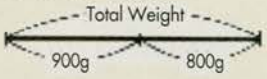
7 James weighs 26kg 900g. His brother is 5kg heavier, and his younger brother weighs 3kg 700g less than he. What are the weights of James's younger and older brothers?

23

Hour Seven:
Goal: To learn conservation and additivity of the weight of an object.

Materials:
Automatic balance scale
Pumpkins

Topic 1:
"There are two pumpkins. One weighs 900g and the other weighs 800g. When you put the two pumpkins on one scale, what is the total weight?"
Activity: (Step one): "Let's measure the weight." "Add the weight of the two pumpkins and obtain the total weight of the pumpkins."
Guidance: Draw a number line similar to this:



Obtain the total weight

Topic 2:
Activity: This deals with step two.
Guidance: Based on the results in step one, make an equation to obtain the total weight:
900g + 800g = 1700g
1700g = 1kg 700g

Topic 3:
"What is the difference between the two pumpkins in grams?"
Activity: This deals with step 2a.
Guidance: Make an equation and calculate it.

Topic 4:
The addition and subtraction of weights (problems 6 and 7 on p. 23).

■ *Conservation of weights:*
Suppose there is a kilogram clay ball. The weight of the clay won't change regardless of the shape of the clay. The number of pieces one divides the clay into also does not change the total weight. This characteristic is called conservation of weights.

■ *Additivity of weights:*
Suppose we add 3g of clay and 2g of clay. It is 3+2=5, which means there is a total of 5g of clay. This characteristic is called the additivity of weights.

Because it is believed that there are children who have not yet acquired the concepts of the conservation and additivity of weights, it is important to let children discover the ideas by shaping, cutting, and weighing the clay.

Hour Eight:
Goal: Summary of this unit and more exercises.

Exercise one:
exercise for reading the units on the scale.

Exercise two:
exercise for reading weight in kilograms and in grams.

Exercise three:
ordering of weights, from heaviest to lightest.

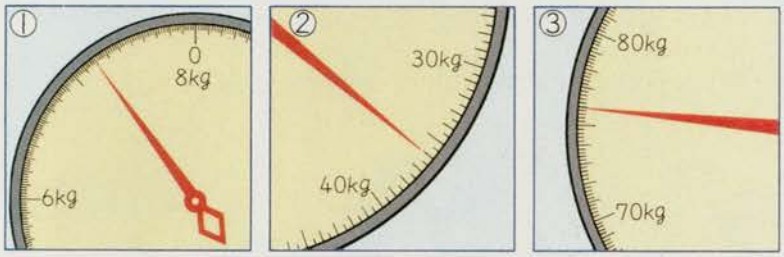
Exercise four:
addition and subtraction of weights.

Exercise five:
exercise for selecting the appropriate units.

End of the Unit Exercise

まとめのれんしゅう

1 Let's read the weight that each hand is pointing at.



2 Let's figure out the numbers that go in the blanks.

3 kg = □ g　　4800 g = □ kg □ g

1 kg 600 g = □ g　　9000 g = □ kg

3 Which one is the heaviest weight and which one is the lightest weight? Let's put them in order from the heaviest to the lightest.

① (2500 g, 3 kg, 2 kg 800 g, 2 kg 90 g)

② (7900 g, 7 kg 500 g, 8 kg, 8400 g)

4 Let's calculate.

200 g + 500 g　　5 kg + 7 kg 300 g

400 g - 200 g　　7 kg 800 g - 3 kg 800 g

5 What unit is used for the weight below?

Weight of a (Japanese) arithmetic text 180 □

Weight of a large package to be mailed? 3 □

24

Supplementary Problems

1.Find out the numbers that fit in the blanks(□) and write the numbers down.

7kg = □g	(7000)
4000 g = □kg	(4)
2 kg800 g = □g	(2800)
8300 g =□kg □g	(8;300)
5 kg40 g = □g	(5040)
3050 g = □kg □ g	(3;50)

2.What units are used for the weights mentioned below:

body weight　　1 tomato

3.Calculate the problems.

500 g +700 g　(1200 g,　1 kg200 g)

4 kg + 8 kg　(12kg)

6 kg800 g + 9 kg600 g　(16kg400 g)

1300 g – 800 g　(500 g)

7 kg400 g – 3 kg　(4 kg400 g)

TIME ON OUR SIDE

BY DONNA FOWLER

"LEARNING IN America is a prisoner of time," begins the report of the National Education Commission on Time and Learning, whose task was to examine the relationship between time and learning in the nation's schools. The Commission found that uniformity rules the day in the way our schools use time. Most schools open and close at fixed hours in morning and afternoon, run for nine months of the year, and provide about 5.6 hours of classroom time a day. No matter how simple or complex the subject—or how well or poorly students understand it—most school schedules allow an average 51-minute class period. "Time," says the commission, "is learning's warden."

The traditional schedule is one of the aspects of schooling that has proven most resistant to change, despite the common-sense observation that learning needs should determine the schedule, not vice versa. But a number of schools across the country have taken bold steps to start treating the schedule as malleable instead of fixed, and to reshape their school day.

Each school day can be chopped up in a variety of ways. The key to successfully altering the traditional schedule is deciding what will be gained by the change—more help for students that need it, more intensive study and better student-teacher relationships, more opportunity for teachers to plan and polish their lessons and to dig deeper into their own disciplines, greater emphasis on academic learning, while still recognizing the importance of extracurricular activities? Time should be shaped to fit the larger purposes of schooling.

Three of the five schools described below—Davis Elementary School in Gresham, Oregon; Thomas Jefferson High School for Science and Technology in Alexandria, Virginia; and Hefferan Elementary School in Chicago, Illiniois—are featured in the Commission's report, *Prisoners of Time.* (For more detailed descriptions of the Commission's reports, and ordering information, see sidebar on page 28.) All have creatively restructured their schedules to suit specific, often multiple, purposes, but none operates on a year-round basis. Most operate roughly within the confines of a normal school day.

Math During Recess? Will Anyone Come?

They do at Davis Elementary School in Gresham, Oregon, where a program called "Recess Math" provides extra math instruction before and after school, during the noon hour and recess, and during the summer. The program was the joint brainchild of teacher Kristine Fosback and the former school principal, Donnise Brown. Brown was concerned about low math scores and insufficient time devoted to math instruction, "about equal time with physical education." Math scores at Davis were well below the district and state averages, other efforts had failed to bring scores up, and extracurricular activities were encroaching on teaching time. Fosback had begun stockpiling creative math materials, and both dreamed of getting a teacher to turn the materials into a math enrichment program.

A three-year, $250,000 grant from the RJR Nabisco Foundation helped launch the program. Most of the money went for staffing and supplies. The school hired another full-time certified teacher and a three-fourths-time aide to run the program. The program was voluntary, although students who wanted to participate were asked to sign a pledge that they would attend a 20-class session at the time of their choice. School staff were amazed at the response; it seemed like everyone wanted to join Recess Math.

Davis Elementary, according to Fosback, who devel-

Donna Fowler is assistant director of the AFT's public affairs department.

oped the Recess Math program, "has all the problems of an inner-city school, even though we're in the suburbs." More than 50 percent of its students qualify for free lunch and about 20 percent are minority. Recess Math has helped raise student scores; tests show that Davis students are learning math substantially faster than their peers in the district. According to the report from the Commission on Time and Learning, "Test results between the fall of 1990 and the fall of 1991 indicated that Davis's third, fourth, and fifth graders' math skills increased at a rate about 50 percent higher than other students in the system." "But we still have a way to go," Fosback says, in improving math achievement.

How do you get kids to give up their recess to go to a math class? Fosback says the program is a "non-pressure situation" for students, with a "very hands-on approach." Students find it an appealing alternative to the unstructured time of recess. They spend a little free time with the materials when they arrive for their session, and then the teacher gathers them together for an instructional activity. They learn to see, she explains, that "math is everywhere, math is fun." They enjoy the math games, manipulatives, and computer activities. Very few have dropped out of the extra sessions.

The program is extremely popular with parents, too. Each year, the school showcases the program at a Recess Math Family Night, where parents and children can come and explore the various activities and materials used in Recess Math. At the last Family Night, Fosback notes proudly, nearly 500 people attended. After the Nabisco grant ended, the district incorporated the program into its overall planning and began offering it in other schools, although in a "somewhat watered-down version," according to Fosback.

Eventually, more than 90 percent of Davis's 350 students were involved—including an average of 100 students per day during the summer—and demand was such that classes were being held in halls. "We ran out of space," says Fosback, "before we ran out of students." Unfortunately, Recess Math is gradually falling victim to the budget woes afflicting most school districts. Other schools no longer offer Recess Math and the program at Davis no longer has a full-time teacher. The aide coordinates the program, and regular teachers take turns teaching a reduced number of the 20-class sessions. Fosback says that the program can run well on about $30,000 a year, most of which goes for staffing costs and materials. She is committed to keeping Recess Math going at Davis Elementary. It's the only program, she says, that "gets 99.9 percent approval from parents."

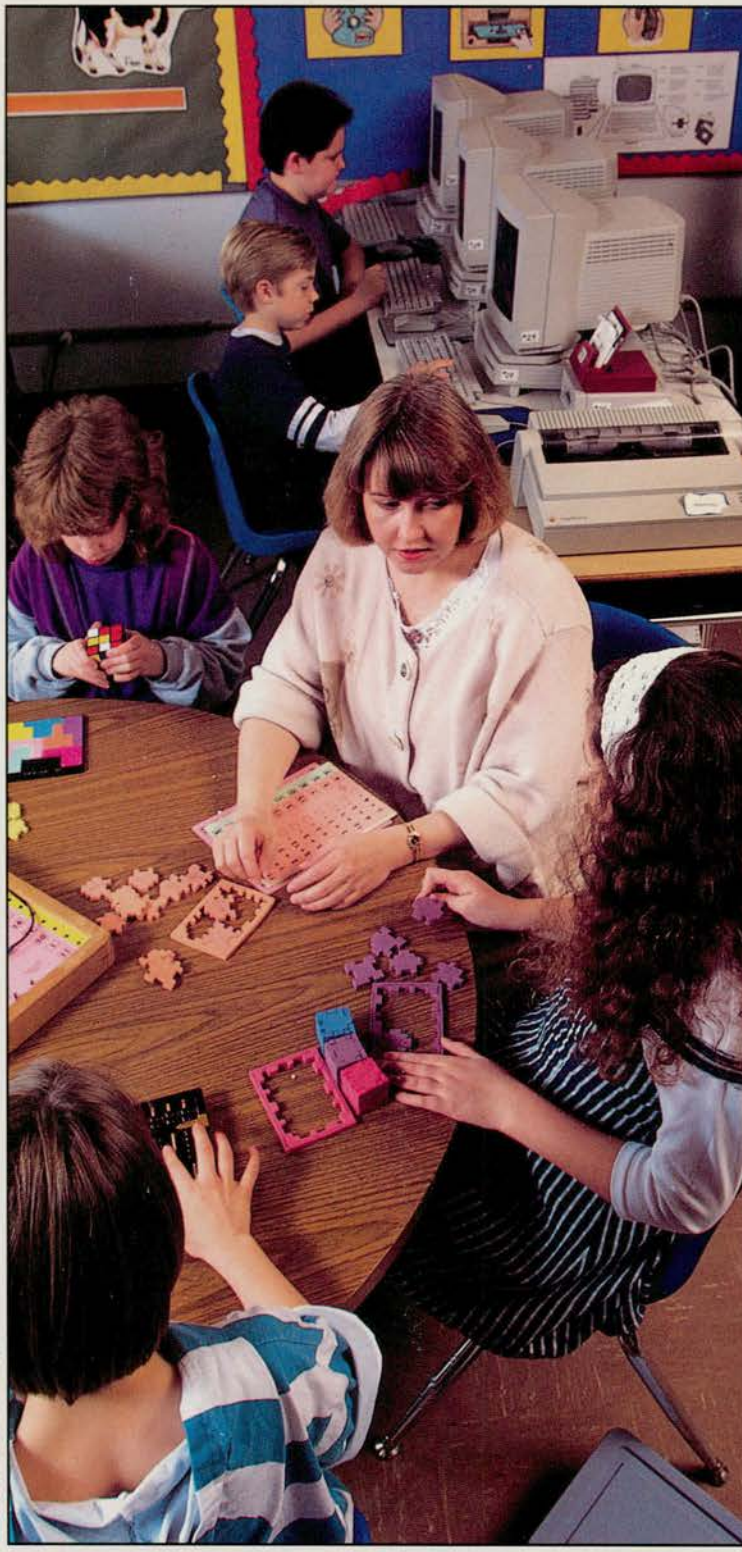


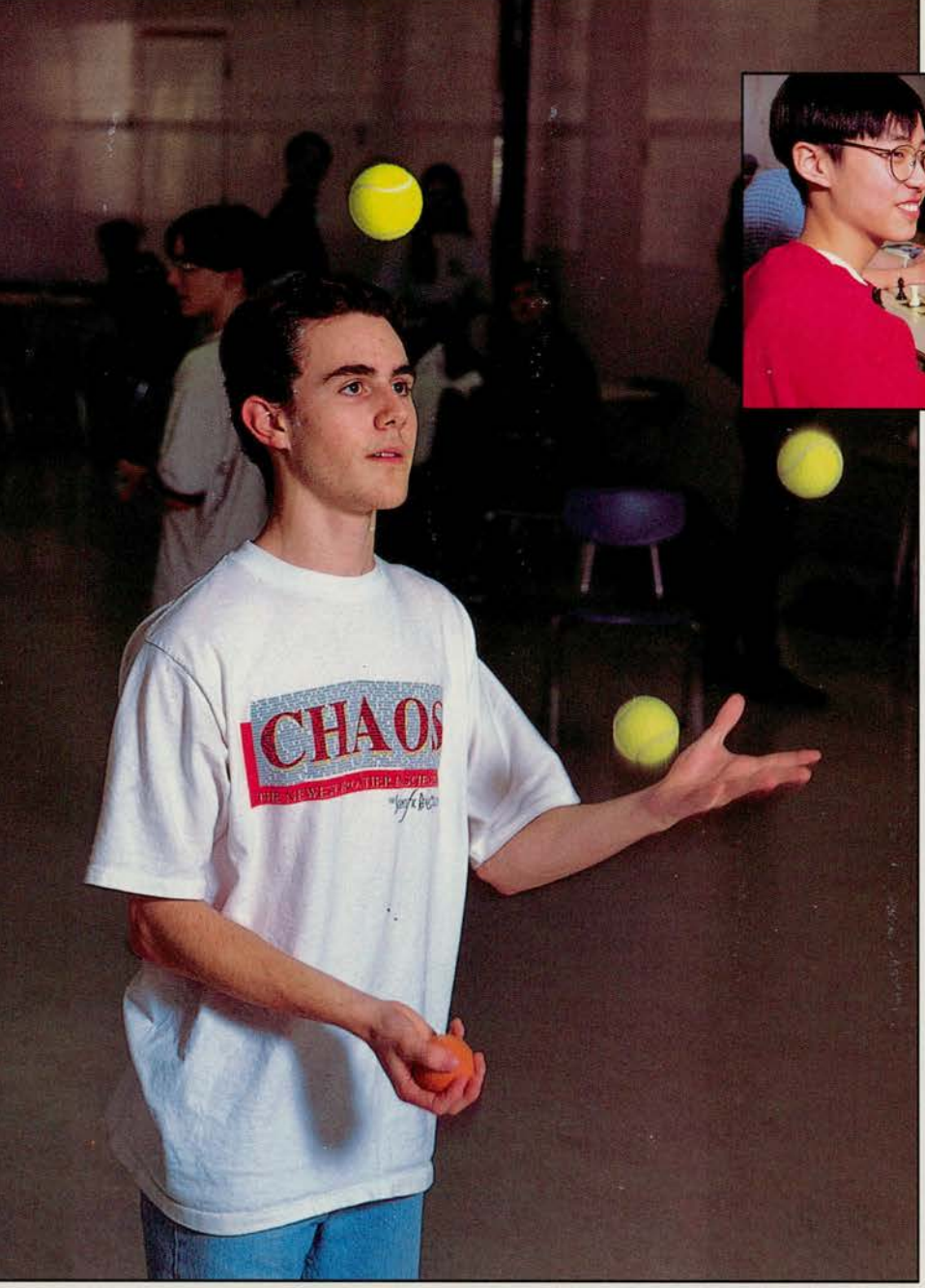
PHOTO: RANDY L. RASMUSSEN

A Feast of Electives in Alexandria, Virginia

Thomas Jefferson High School for Science and Technology in Alexandria, Virginia, combines block scheduling, an extra class period for elective activities, and interdisciplinary teaching into an extraordinarily rich learning environment that sends all of its graduates to college. It has 10 state-of-the-art technology laboratories in areas such as optics, industrial robotics, and telecommunications, and an unusually strong partnership with businesses, who help sponsor the labs and provide intensive mentor opportunities for students.

The school is selective, with students admitted, according to principal Geoffrey Jones, "strictly on merit." The 1,650-member student body comes from all over northern Virginia, with some commuting up to 60 miles. This was one of the reasons, says Jones, for the extra eighth period: "It recognizes that the kids come from a distance and need to spend some time together and get to know each other."

Each month, students can choose among at least 100 eighth-period activities. These range from traditional extracurricular fare like intramural sports and honor societies, to extra lab work and student teams like the Chess Team, to student-initiated clubs. Among the latter, stu-

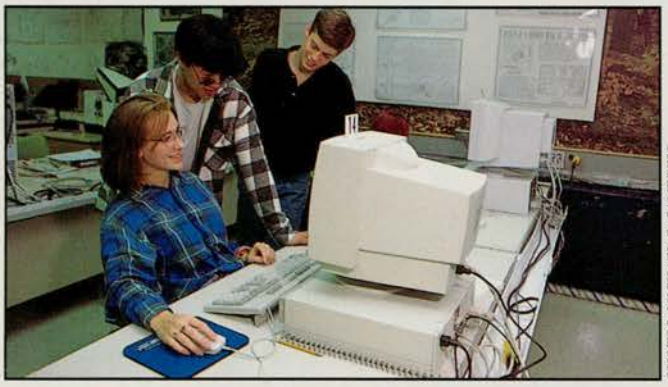


dents can find offerings ranging from a Juggling Club to an Amnesty International Club. Tutoring is offered in every subject every day. The schedule is made up monthly according to choices made by the students, and changes can be made midstream if needed—for example, if a Chess Team member finds she needs some extra help in math, she can shift to math tutoring.

The National Education Commission on Time and Learning let Thomas Jefferson sophomore Paul Helms describe what the extra eighth period can mean: "It is one of the most important things in the school. I use it to go to both the Fellowship of Christian Athletes and to a Latin Honors Class." Senior Seth Mitcho is even more emphatic: "Eighth period has helped make this school the center of our lives and often of our families."

The eighth-period program is run by full-time coordinator Rich Slivoskey and a full-time assistant. On Mondays, the eighth period is reserved for administrative uses—assemblies, a guidance curriculum, student government, for example—to keep these activities from intruding on the school day. Each month, this leaves students with some 15-20 eighth periods they can use as they wish. Slivoskey says the program is constantly changing to meet the needs of the community—"and our community is constantly changing." The only time student choice is curtailed is when faculty find students in academic jeopardy. Then, students will be assigned to tutoring in the problem subject.

Faculty have choices, too. No teacher is required to participate in the program; they may choose to teach an additional regular class instead. This means that teachers participating in the eighth-period program have five classes, two planning periods, and an eighth-period activity, while the other teachers have six classes and two planning periods each day. For those who participate in the eighth-period program, each day is different. They may find themselves doing anything from tutoring in their subject to overseeing the Animal Rights club on any given day. About half of the faculty participates in the program. To create the eighth period, the school lengthened its day by half an hour and shaved a few minutes off of other class periods, all of which meet for 45 minutes. All



PHOTOS: MICHAEL C. CAMPBELL

Above left: Students voluntarily forgo recess to choose among computers, math puzzles, and math games in the "Recess Math" room at Davis Elementary School in Gresham, Oregon. Counter clockwise from top: Nothing rivals the popular "Eighth Period" at Thomas Jefferson High School in Alexandria, Va., where there's time for the chess club, the juggling club, and the computer club.

teachers receive a 7 percent pay increment for the extra time, a provision that is incorporated in their union contract.

Jefferson High uses time inventively in other ways, too; for example, through a variety of block scheduling arrangements. Each class at Jefferson has a double period once a week, so that each class meets four times weekly, once in double session. All ninth-graders take a three-hour interdisciplinary block class every day that combines biology, English, and technology. The course is team-taught and employs cooperative learning, with a counselor assigned to each team. Jones says this is especially valuable for these "students in transition" from middle school to high school, a vulnerable time for some. The longer classes give students more time with each other and with the same team of teachers their first year at the school. Students often work on projects, which they can carry over into eighth period, if they wish.

This ninth-grade initiative is in its sixth year. Jones says students like it, and teachers like it "now—they didn't at the beginning. It took some getting used to." It gives teachers the flexibility to use a variety of teaching methods. For example, Jones says the class can spend the period watching a movie, writing in their journals about it, and then discussing their observations. Sometimes the class is devoted entirely to one of the three subject areas. The block class also permits extended field trips that don't disrupt other classes.

The approach has been extended to other subjects. Sophomores and juniors now take combined English-social studies classes in two-hour blocks, and seniors take three-hour block classes that combine geoscience, government, and language arts. This allows them, Jones explains, to study environmental issues as problems of both science and politics. The interdisciplinary block class approach has fostered the use of a variety of assessments, according to Jones, including portfolios and presentations.

Each of Jefferson's seniors is required to participate in either extra lab work or the school's business mentor program. About 80 of the 400 seniors are involved in the mentor program, which assigns students to area companies such as TRW, Boeing, Martin Marietta, and several government research labs. The focus is on research and development, and students participate in everything from project design to testing. The mentor program requires an extra commitment of time—between 15 - 20 hours a week, according to Jones—and finding transportation, which limits the number of students who join. But Jones notes that the business partners are extremely committed to making the program an authentic learning experience for the students.

Shaping Time To Fit Pedagogy

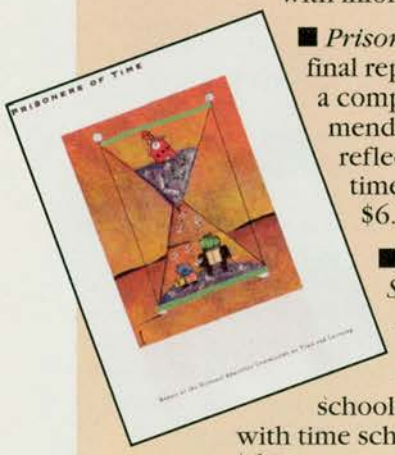
As noted earlier, both academic content and pedagogical approach have traditionally had to give way to rigid notions about time. An increasing number of educators, however, have come to realize that the time dimension must be made subordinate to the needs of teaching and learning. Nowhere is this change more apparent than in schools that follow the Paideia philosophy, which prescribes very specific uses of time to serve instruction.

At the Hughes Center in Cincinnati, Ohio, students can participate in Paideia education from kindergarten through twelfth grade. The Paideia philosophy, developed a decade ago by Mortimer Adler, is based on a rich, classical curriculum for *all* students; high expectations; and the belief that teaching and learning require the proper mix of three distinct instructional modes: didactic instruction; coaching; and Socratic seminars that give students time for analaysis, discussion, and reflection. There is no tracking in the Paideia schools, nor are there any advanced placement classes.

The Paideia approach pervades the Hughes Center, which has six distinct high schools within it—communications, health professions, math and science, humanities, computer sciences, and teaching. Most of these programs benefit from partnerships with corporations or community institutions. Scripps-Howard, for example, helps underwrite the communications high school. The company supplied funds for remodeling the building and installing computers, among other contributions. The American Medical Association helped launch the health professions high school, which has affiliations with several area hospitals. The high school for the teaching professions is allied with the University of Cincinnati edu-

Prisoners of Time

The National Education Commission on Time and Learning, which formally completed its work last September, issued three very valuable reports, each written in clear, compelling language and packed with information and ideas:



■ *Prisoners of Time*, the official final report of the Commission, is a compilation of findings, recommendations, and practices that reflect new thinking about time and learning. 56 pages. $6.75.

■ *Prisoners of Time: Schools and Programs Making Time Work for Students and Teachers* contains profiles of 39 schools that have experimented with time schedules and calendars. 58 pages. $6.75.

■ *Prisoners of Time: What We Know and What We Need To Know* summarizes the key research reviewed by the Commission and suggests questions that need further investigation. 60 pages. $6.75.

■ *Prisoners of Time Video* provides both a report summary and practical examples of schools putting the recommendations to work. 12 minutes. $12.50.

Shipping and handling charges: 1 item-$2.90; 2-5 items-$3.75; 6-10 items-$4.25; 10-15 items-$5.00. All orders must be pre-paid. Send check or money order to TaLIS/CSG, 1700 North Moore St., Suite 1250, Arlington, VA 22209. Telephone: (800)299-5486; fax: (703)243-0496.

PHOTOS: BRUCE CRIPPEN

Above: The two-period reading lab gives student Myeia Edmerson the time she needs to dig deeply into the text. Seated at left is teacher Sue Taylor.
Left, preparing for a Socratic seminar with principal Diana Porter.

cation school. Current plans call for the merger of the math and science and computer sciences programs.

Hughes is a magnet school with no entry requirements. Students come from all over Cincinnati and are admitted on a first-come, first-served basis. The student population of 1,700 is predominantly (about 75 percent) African American, with 2 percent to 3 percent other minorities, and about 22 percent white. Forty-two percent of the students are eligible for free or reduced-price lunch.

At Hughes, the school day is shaped around Paideia's three pillars of instruction: didactic, coaching, and seminar. The schedule varies to suit the nature of the instruction and the subject area. English classes are the only ones to meet in double periods five days a week. Three of these are didactic instruction (Wednesday through Friday), one is a reading lab (Monday), and the other a seminar (Tuesday). In most other subjects, classes meet in three didactic sessions (Monday through Wednesday), with a double-period lab on Thursday, and no class on Friday. Foreign language classes meet for five single periods a week.

The reading lab and seminar are linked. Although the English teachers are in charge of the seminar, the readings can be in any subject. Sometimes the "text" is a film, or readings in science or social studies. The emphasis in the lab and seminar is on developing an analytical approach to a work. In the reading lab, students are seeking to understand its literal meaning, and, using the same text, the seminar pushes students toward greater abstraction and an engagement with universal questions.

Porter described a lab and seminar with ninth-graders on Martin Luther King Jr.'s *Letter from A Birmingham Jail*. In the lab, students focus on King the writer, rather than King the political leader. Their task is a thorough, literal understanding of the text, so they summarize paragraphs, identify literary conventions such as metaphors, and work on vocabulary and character analysis. The seminar, led by two students, begins with an opening question. For this text, the opening question was "According to King, is there ever a time when violence is justified?" Students write for awhile about the opening question and must argue their points with specific reference to the text. They then debate what Porter calls the "core question," which encourages students to make a leap to more universal issues and ideas. In this case, the core question focused on the concept of unjust laws and the citizen's responsibility. Throughout the seminar, the teacher assesses each student according to specific criteria on the quality of the discussion.

All of this takes place within the confines of a normal high school day—about six hours and fifty minutes, according to Porter. The Paideia approach has been used for about six years at Hughes and is gradually spreading through the district. There are four Paideia elementary schools and two Paideia middle schools.

The results? "Our kids are much more skilled in discourse and reading texts," says Porter. "Many of them

(Continued on page 44)

Why Is Algebra Important To Learn?

(Teachers, this one's for your students!)

By Zalman Usiskin

We have all heard or read eloquent expositions on the value of studying history. Likewise, most people can quickly summon up a compelling case for the importance of good writing skills, the benefits of being exposed to quality literature and art, the need to understand basic scientific concepts, and the indispensable requirement to master the tools of everyday arithmetic.

But when it comes to providing the rationale for learning mathematics beyond arithmetic—namely, algebra, geometry, and their extensions—most people are likely to mumble something about needing it for college. Indeed, just this past year, a book questioning the importance of math education in general and arguing that almost no one really needs algebra received considerable attention and quite favorable reception in the popular press. And, more importantly, every day across this country countless numbers of students sit in algebra or geometry classes wondering (as did generations before them) why they are studying linear (not to mention quadratic) equations or a method for finding the volume of a cylinder."What's the point? I'll never use any of this stuff," they say.

They deserve an answer. And while it is true that the newer textbooks do a better job than the older ones did of showing the practical applications of algebra and geometry, most do so in a scattered, piecemeal fashion. For some students, this poses no problem. They love math, they're good at it, they never question its value or appeal. But there are many others who need the whys and wherefores set forth in a convincing manner. And since more and more school districts are replacing dumbed-down "consumer math" courses with a requirement that all students take algebra and geometry, we thought the time was ripe to pull together, for a student audience, the case for studying post-arithmetic math.We convinced Zalman Usiskin, the director of the widely acclaimed University of Chicago School Mathematics Project, to take up the question of algebra in this issue. Perhaps in a future issue, we'll ask him to do the same for geometry. He wrote this essay for your students, and we hope you will share it with them.

—Editor

MOST PEOPLE realize that they need to know arithmetic. Whole numbers, fractions, decimals, and percents are everywhere. You need them to do any work with money, to deal accurately with measurements, to understand probability, to follow the results of election polls or sports or lotteries, and a wide range of other things. Numbers are everywhere. Just pick up a newspaper or magazine, open to any page at random, and count the numbers on it. You may be surprised at how many there are.

Algebra seems different. Scan the same newspaper and you are not likely to see any algebraic formulas. The need to know algebra isn't as obvious.

Furthermore, we all know adults who live productive lives without ever using algebra. Even adults who studied the subject as youngsters may not have studied its practical applications; hence it is difficult for them to see—let alone explain to others—what value they derived from it.

It is true that the value of algebra is not as obvious as the value of arithmetic. In actuality, however, its usefulness is all around us. But for those who don't know where or how to look, it is often hidden. It is well worth the effort to dig a little deeper to uncover the many ways this discipline is at work in the world and why mastering it greatly enriches our lives. In this essay, we hope to do some of that digging.

TO SAY "You need algebra for college," or "You won't do well on the SAT or ACT without it" are true statements, but they don't tell us very much. *Why* is algebra

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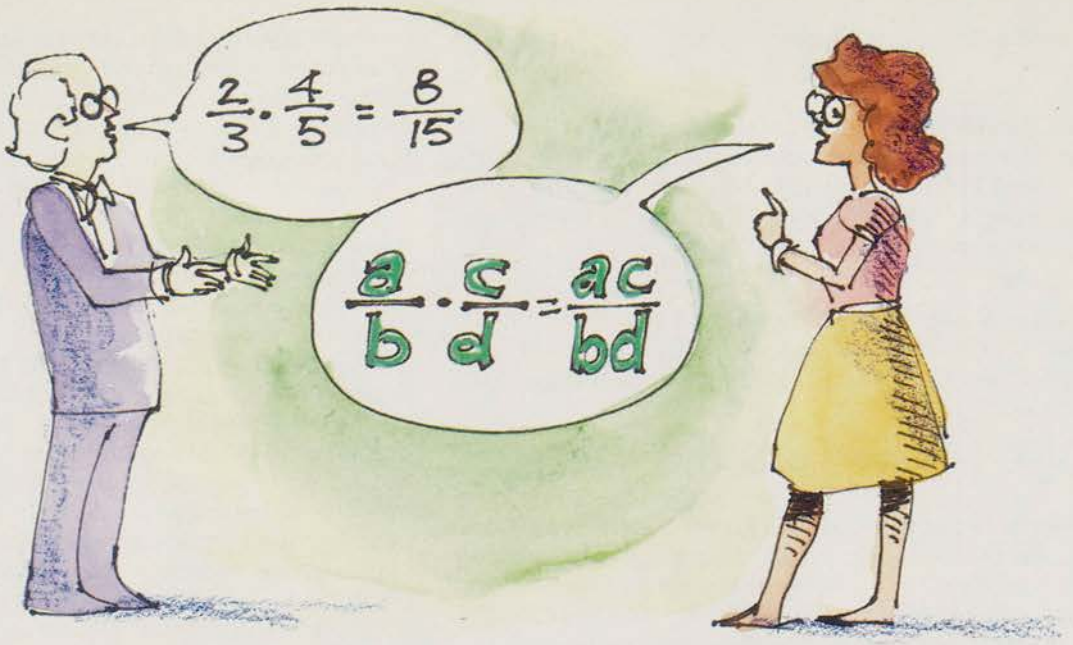
Zalman Usiskin is professor of education and director of the University of Chicago School Mathematics Project at the University of Chicago. He is the author of "What Should Not Be in High School Algebra and Geometry?" (1980, 1995); "We Need Another Revolution in Secondary School Mathematics" (1985), dozens of other articles, and has authored or co-authored math textbooks for grades 7-12. *The assistance of Suzanne Levin, Fan Lianghuo, and Sharon Senk in providing ideas for this article is greatly appreciated.*



ILLUSTRATED BY ROBERT BARKIN

considered so important that it has become a requirement for entry to virtually every college? And why are more and more school districts requiring all students to study algebra, including those who may not be college-bound or who haven't yet made up their minds about their futures? In the pages that follow, we offer some answers to these questions. Here are some general reasons:

Without a knowledge of algebra,

- you are kept from doing many jobs or even entering programs that will get you a job;
- you lose control over parts of your life and must rely on others to do things for you;
- you are more likely to make unwise decisions, financial and otherwise; and
- you will not be able to understand many ideas discussed in chemistry, physics, the earth sciences, economics, business, psychology, and many other areas.

In these matters, algebra has much in common with reading, writing, and arithmetic: Lack of knowledge limits your opportunities. More specifically, what follows are the characteristics of algebra that cause it to be so important and some of the many things you could not do at all—or not do as easily—without it.

Algebra is the language of generalization. If you do something once, you probably don't need algebra. But if you are doing a process again and again, algebra provides a very simple language for describing what you are doing. Algebra is the language through which we describe patterns. For instance, here is the rule for multiplication of fractions, written in English words:

To multiply two fractions, multiply their numerators to get the numerator of the product, and then multiply their denominators to get the denominator of the product.

As an example,

$$\frac{2}{3} \cdot \frac{4}{5} = \frac{8}{15}$$

Here is the same rule, written in the language of algebra:

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$$

Not only is the algebra much shorter, but it looks like the arithmetic!

Some general patterns are formulas. Formulas state one quantity in terms of another. There are formulas in every walk of life. For instance, there is a formula for finding Celsius temperatures from Fahrenheit temperatures

$$F = \frac{9}{5} C + 32,$$

and vice-versa

$$C = \frac{5}{9} (F - 32).$$

There are formulas for area that come in handy if you are looking for a place to live and want to know how much room you will have, or if you are sewing clothes and want to determine the amount of material you'll need. There are formulas for perimeter that tell how much fencing you might need for a field, or how much ribbon to tie a package. There are all sorts of formulas in sports, and they can help you calculate earned-run average in baseball (not hard), or rate a quarterback in football (rather complicated), or determine the probability of a particular player making two free throws in a row in a basketball game (easy but not certain). Income tax, discounts, sales tax, and virtually every money matter involve applying some formula. You can get along without the formulas—many people do—but you are less likely to be fooled by someone if you yourself can deal with the formulas.

Some patterns are not so simple. For instance, the formula

$$W = d + 2m + \left\lfloor \frac{3(m+1)}{5} \right\rfloor + y + \left\lfloor \frac{y}{4} \right\rfloor - \left\lfloor \frac{y}{100} \right\rfloor + \left\lfloor \frac{y}{400} \right\rfloor + 2$$

tells you on which day of the week a particular date will

fall, even years into the future, where

d = the day of the month of the given date
m = the number of the month in the year, with January and February regarded as the 13th and 14th months of the previous year. The other months are numbered 3 to 12 as usual.
y = the year.

(You may not be familiar with the $\lfloor\ \rfloor$ symbol—brackets without the top corners—which means round the number inside it down to the nearest integer. For instance,

$$\lfloor 19.23 \rfloor = 19; \lfloor 497 \rfloor = 497; \text{and } \left\lfloor \frac{42}{5} \right\rfloor = 8.)$$

Once W is computed, divide W by 7 and the remainder is the day of the week, with Saturday = 0, Sunday = 1, and so on, with Friday = 6. You might try the formula on today's date to see that it works. It even accounts for the fact that the year 2000 will *not* be a leap year.

Algebra enables a person to answer *all* the questions of a particular type at one time. Suppose you are thinking of borrowing some money. Typically, money borrowed for a car or a house or other large purchase is paid back monthly, but the interest rate is given as a yearly rate. The key is how much money per month you must pay back, and this is not easy to calculate. Even if you use tables, you may not find tables with the rate you will be charged or the amount you wish to borrow. But there is a formula that can calculate the monthly payment P if an amount A is borrowed for m months at an r% annual rate.

$$P = Ax^m \frac{x-1}{x^m-1}, \text{where } x = 1 + \frac{r}{1200}$$

With a scientific or graphics calculator, you can use this formula even if the amounts are strange. With this formula, you can calculate that a 4-year loan of $8,500 to buy a car, at an 11.25% annual rate, requires a monthly payment of $220.72.

Not all formulas are so complicated. Suppose you want to calculate the miles per gallon that a car is getting. If the car's gas tank is filled at 25,000 miles and then again at 25,400 miles, and 15.3 gallons of gas have been used by the time of the second fillup, you could subtract to find the number of miles, and then divide by 15.3 to find the miles per gallon, in this case about 26 mpg. You can do a single problem like this just using arithmetic. But if you had to answer a lot of questions of this type, you would want to have a general procedure. If the first fillup is at f miles and the second at s miles, and you fill up with g gallons of gas the second time, then the miles per gallon is

$$\frac{s-f}{g}.$$

It's a great deal easier to substitute into a formula than to have to figure out how to do the question each time.

Computer programs use the language of algebra because they require a language that will work for a variety of inputs. Formulas are also the backbone of today's spreadsheets. It used to be that only accountants used spreadsheets, to keep records of financial matters. Now spreadsheets are used for all sorts of recordkeeping.

Algebra is the language of relationships between quantities. What happens to various aspects of your health as you grow older, or as your weight changes, or as you eat different foods or take different medicines? What will it cost to produce an article of clothing if more are made in a factory or if a different material is used? How will your budget be affected if you change your spending habits? How is the energy use of the world affected by its population? How does a tree grow over time? How is Celsius (Centigrade) temperature related to Fahrenheit temperature?

These kinds of questions, in which one quantity depends on others, are the basis of functions. When people do not know algebra, functions are often described by long tables. Many functions can be pictured by graphs. But the algebraic description is the shortest and often the one easiest to use; moreover, it can give information that the other descriptions do not contain. Functions are studied when one wishes to find out what happens to a quantity in the long run. For instance, will the population of a particular animal in a region stabilize, increase, or decrease? Functions are also important for determining when a quantity will reach its highest or lowest value. These are two of the types of questions that form the

basis for calculus, and they require that someone know algebra first.

Algebra is a language for solving certain kinds of numerical problems. It used to be common to see problems involving age, motion, coins, work, and mixtures in algebra books. Now algebra books are just as likely to have problems that involve everyday situations. How much of a particular food can you eat and stay within a particular diet? How much can you spend and still be within budget? When there is a formula relating two quantities, if you know one, you can find the other. And today's technology has made it possible to work with far more complicated formulas than one could deal with even a generation ago.

Some Algebraic Topics and a Few of Their Applications

Linear equations: Anything that changes at a constant rate gives rise to a linear equation of the form $T = Ax + By$ (and sometimes many other variables). This applies to the total cost of items when each item costs the same, total calories or vitamins or minerals consumed in food, total amounts of material in producing objects, total electricity or other energy costs on household bills, costs of renting a car, and the cost of a long-distance call. For instance, algebra can indicate from a phone bill what the initial cost and additional cost per minute was on a long-distance call; it can also tell how long a person could talk for any particular number of dollars.

Slope: Any quantity that changes must change at some rate. The rate of change is often very important. In business, how much the cost of producing changes when one more item is produced is called the marginal cost. How fast a car changes speed is called its acceleration or deceleration. How fast your money increases or decreases can affect your financial status. How fast the unemployment rate goes up or down can affect inflation. The algebraic idea behind all these notions is slope, and is studied usually in a first course.

Small parts of smooth curves can often be approximated well by lines. These lines can be described by a linear equation. For instance, the world record in the mile run for men (the most famous track-and-field record) since 1875 is quite well approximated by the equation

$$t = -.346Y + 914.156,$$

where t is the time in seconds and Y is the year. (For 1995 this gives a value of 3 minutes 43.89 seconds; the record is currently 3 minutes 44.39.) The slope in this equation, which can be obtained automatically using most graphics calculators available for schools today, indicates that the record has been decreasing by about 0.346 seconds a year on average, which should indicate to runners and their coaches that there is still a way to go before the limit of human capability is reached.

Exponents: The area of a square with side s is s^2; the volume of a cube with edge e is e^3. These applications were known to mathematicians more than 2,000 years ago, and connect algebra with geometry. In the Middle Ages, mathematicians began to study games of chance, and out of these games came the notions of probability and odds, which today require a knowledge of exponents. If something grows at a constant percent of itself, the growth is called exponential. Exponential growth is found in all the largest money matters that affect people: the compound interest by which savings institutions calculate interest; car, mortgage, and credit card payments for anything bought on time; retirement funds and life insurance and other types of annuities. The same mathematical concept underlies population growth and helps in predicting not only human population sizes but also animal and plant populations and sizes of tumors and other aspects of disease. So people interested in finance, business, accounting, environmental issues, and medicine use these ideas often.

Quadratics: It was Isaac Newton who discovered that any object that is affected by gravity will travel on a path described by a quadratic expression of the form $Ax^2 + Bxy + Cy^2 Dx + Ey + F$. This applies to stars and planets and comets and meteors and moons; to rockets and paths of bullets; and to paths of baseballs hit and basketballs thrown and any other objects thrown or shot or travelling without additional propellants. So this idea is used in physics, in space science, in the armed services, in sports, and in hobbies or other activities that involve throwing or propelling objects.

Quadratic expressions also describe counting situa-

tions that involve pairs, such as the number of games necessary for teams in a league to play each other, or the number of connections needed between two cities. They are involved in the fundamental formula for the distance between two points, in formulas for momentum and force and pressure and other physical quantities.

Logarithms: Logarithms are seldom used today for computation; calculators and computers have taken that drudgery away. Their uses are found now most commonly in understanding scales that need to cover quantities of vastly different magnitudes, such as the Richter scale for earthquakes, the Ph scale used to determine acidity or alkalinity in chemistry, the star magnitude scale used in astronomy, and in many statistical scales. Logarithms also are needed to solve problems involving exponents; for instance, the solution to an equation like $(1.06)^x = 2$ (How long will it take for money invested at 6% annually to double?) is most easily described using logarithms

$$(x = \frac{\log 2}{\log 1.06} \approx 12 \text{ years}).$$

Permutations and Combinations: These ideas, now usually found in more advanced high school algebra courses, began as a result of studies of gambling. Today they are used to determine the odds of winning lotteries or card games or other games of chance. This is the reason that people who know the mathematics are less likely than other people to gamble unwisely. Permutations and combinations help to determine the number of people or objects needed to be involved in political and other opinion polls, TV ratings, and product testing, and they also help in determining the accuracy of the poll or test. Consequently, they are important tools for jobs that require the manufacture of high-quality products.

A Sampling of Algebra Problems

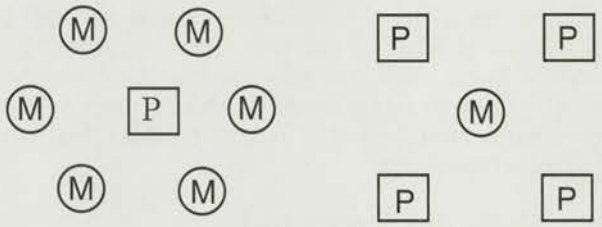
Out of the huge number of situations and questions that can be solved by algebra and are accessible to most high school students, we have picked ten. In parentheses following the examples are the algebraic ideas needed for the solution. (The answers may be found on p.46.)

1. *The World Almanac and Book of Facts* 1995 lists 59 major earthquakes from 1940 to 1994. Here are their frequencies by season of the year: Autumn, 14; Winter, 14; Spring, 11; Summer, 20. Use statistics to determine whether these frequencies support a view that more earthquakes occur at certain times of the year than at others, or if differences like these occur commonly by mere chance. (quadratic expressions)

2. To estimate the number N of bricks needed in a wall, some bricklayers use the formula N = 7LH, where L and H are the length and height of the wall in feet. About how many bricks would a bricklayer need for a wall 8.5 feet high and 24.5 feet long? (formulas)

3. Nellie and Joe plan to save money for an around-the-world trip when they retire 10 years from now. Nellie plans to save $1,000 per year for the first 5 years and then stop making deposits. Joe plans to wait 5 years to begin saving but then to save $1,200 a year for 5 years. If they deposit their savings at the end of the year into accounts yielding 6% a year, how much will each person have after 10 years? (polynomials)

4. A marching band has 52 musicians and 24 members of the pompom squad. One of the drills involves hexagons and squares like those shown below. Can these formations be executed in such a way that no one is "left over"? If so, how many hexagons and how many squares can be made? (systems of linear equations)



Hexagon with pompom person in center

Square with band member in center

5. Architects designing auditoriums use the fact that sound intensity is inversely proportional to the square of the distance from the sound source. A person moves from one seat to another 4 times the distance from the source. How is the intensity of the sound affected? (functions of variation)

6. One rental car company charges $21.95 per day plus 41¢ a mile. Another charges a flat rate of $39.95 per day with unlimited mileage. For what driving distances should you pick the second company over the first? (linear equations)

7. A batter hit a baseball when it was 3 feet off the ground. It passed 4 feet above the 6-foot-tall pitcher 60 feet away. It was caught by an outfielder 300 feet away, 5 feet off the ground. How far from the batter did the baseball reach its maximum height, and what was that height? (quadratics and systems)

8. Rock music played at 120 decibels is how many times as intense as music played at 105 decibels? (logarithms)

9. In 1992, the population of Mexico was 92.4 million and growing at a rate of about 2.4% annually. If this growth rate continues, in about what year will the population of Mexico reach 100 million? (exponentials and logarithms)

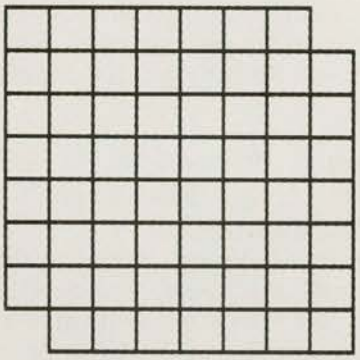
10. POWERBALL™ is a lottery played in 15 states. To play, an individual picks five numbers from 1 to 45 and a sixth "powerball" number from 1 to 45. To win the jackpot, which is always at least $2 million, you must match all 5 numbers (in any order) plus the powerball. What is the probability of winning the POWERBALL™ jackpot? (combinations)

The Importance of Deduction

It is often said that you can be certain of the answer to a mathematics problem. There is a sense in which this is true. If you agree with the assumptions in the problem, and if valid reasoning has been used, then you must agree with the solution or solutions. This property of the solving of mathematical problems is a result of a basic underlying aspect of mathematical thinking—the *deductive process,* or *deduction* for short.

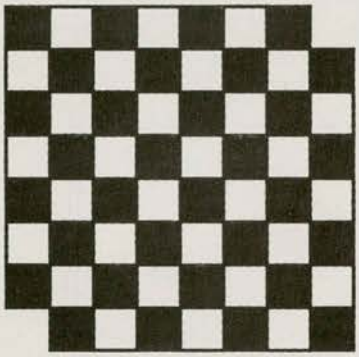
Deduction is the logical process by which the truth of one statement follows from the truth of others. For mathematicians, only results that have been deduced from agreed-upon statements using valid arguments of deduction can be thought of as *true*. Deduction is used throughout mathematics.

Deduction is a difficult criterion for the establishment of truth because it means we cannot say something is true merely because we have lots of examples. For instance, below is pictured an 8-by-8 grid, but with two opposite corners removed.



Can the grid be covered with 31 dominoes that each cover two squares? If you try to actually do this, you will find that no matter how you fit the dominoes together they will not cover the squares. You can cover 60 of the squares but the 2 that remain will not be next to each other. But all the unsuccessful attempts in the world do not prove that someone could not come up with a way to cover the grid with 31 dominoes. Only deduction can do that.

Here is a proof. First, color the squares like a checkerboard. This does not change the problem. If dominoes can cover the original grid, they can cover this checkerboard, and vice versa.



Now each domino always covers two adjacent squares, one black and one white. The 31 dominoes must thus cover 31 black squares and 31 white squares. But the opposite corners of an 8-by-8 checkerboard are the same color, so by removing the opposite corners, we are left with 30 of one color (white above) and 32 of the other (black above). No matter how 30 of the 31 dominoes are placed, there will be two black squares without dominoes on them, and the remaining domino cannot cover both. The deductive argument *proves* that any attempt to cover this cut-off checkerboard with 31 dominoes will be futile.

Deduction can also indicate whether other checkerboards can be covered with these dominoes. For instance, a 5-by-5 grid cannot be covered with dominoes because there are 25 squares, an odd number. But a 9-by-8 grid can be covered whether or not its two opposite corners are removed.

The covering of a grid with dominoes is a type of problem called a *partition* or *covering* problem. It is not so unrealistic a problem. Any metalworker who needs to cut items from a sheet of metal, or a clothesmaker who needs to cut pieces of cloth from a bolt may be faced with this kind of question: Can the items be cut with no pieces left over? Boxes can be formed by cutting off corners and folding the remaining pieces up. It saves money if no pieces are left over. Thus the same process of deduction that is applied to grids and dominoes may be useful in many other situations.

The process of deduction is also found outside of mathematics. It is used by lawyers and union negotiators and by anyone else trying to make a convincing argument or build their case. It is thought by many people to be the purest form of reasoning, and it comprises another of the reasons that many people believe mathematics is important for all students to study.

The Wonder of It All

You would not be able to understand this article if you could not read. Even though most students learn to read in elementary school, we teach the reading of literature in high school and throughout college. The reason for doing this is not just that reading literature is needed for jobs, or because literature may help in solving everyday problems. It is also because many people find good books enjoyable, relaxing, exciting. Reading is fun!

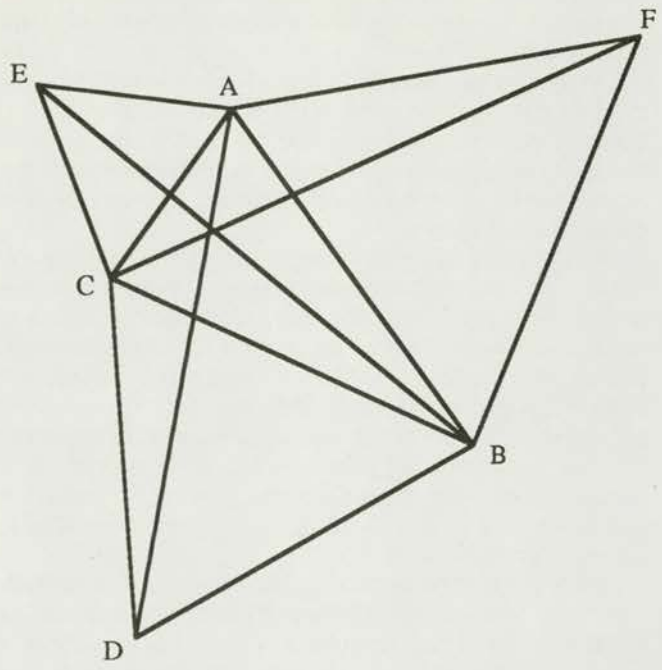
It is no different with mathematics. Not everyone studies mathematics because of its usefulness. Many people study mathematics because they enjoy its puzzles, which are like mysteries in literature. Many people study mathematics because they like the way that it all fits into a structure, somewhat like the way a book or a piece of music of high quality can be analyzed for its structure. Many people study mathematics because of its beauty.

Some of the beauty of mathematics comes from its wonder. Just how was that result discovered? How is it proved? For instance, add up the digits of a whole number. Then the number is divisible by 9 if and only if the sum of digits is divisible by 9. For example:

- 4,374 is divisible by 9 because the sum 4+3+7+4 is 18, and that is divisible by 9;
- 91,604 is not divisible by 9 because the sum of its digits is 20, and that is not divisible by 9.

We know this property of whole numbers written in our base-10 decimal system is true because it has been proved. The proof requires only the algebra studied in high school.

Geometry, too, is famous for its wonderful relationships. Here is one with a surprising use. Start with any triangle. We call ours ABC. On each of the sides of triangle ABC, construct an equilateral triangle. In the figure, tri-



angles BCD, ACE, and ABF are equilateral.

Now connect AD, BE, and CF. It looks as if these three lines intersect at the same point. In fact, for any triangle, it can be proved that these lines do intersect at the same point. That point is called the Fermat point of the triangle, named after Pierre Fermat, a 17th century French lawyer and mathematician. When the original triangle has no angle as great as 120°, the Fermat point has the property that the sum of its distances to A, B, and C is smaller than that sum for any other point. So, if three towns wish to have an airport, and access roads will have to be built from each town to the airport, or if there is to be a cable network connecting the towns and cables need to be laid from the towns, the Fermat point may be the cheapest spot for the airport or central switching location.

The result is not only useful, it is beautiful. Notice that the six angles formed by the lines at the Fermat point seem to be equal. In fact, each is a 60° angle. It is surprising and wonderful that even when one begins with a triangle that has no symmetry, one winds up with a point in the middle with as much symmetry as one could have. Many people study mathematics for the enjoyment that seeing, discovering, and proving such results brings.

And, finally, there is mystery. Sometimes it is not known whether a statement is true or not. Recall that a prime number is a whole number greater than 1 that is divisible only by itself and 1. The primes smaller than 100 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97. More than two thousand years ago it was proved that there are infinitely many primes. The proof is ingenious: Suppose you had a list of all primes. Now multiply all those primes together and add 1. The result cannot be divisible by any of the primes you've multiplied, because two consecutive whole numbers are not divisible by the same number larger than 1. So the result must either be another prime or divisible by a prime larger than the ones on your list. This shows that no finite list of primes has them all. So the number of primes must be infinite.

Even with their long history, there remain many things not known about primes. One mystery involves pairs of primes that differ by 2. These are called twin prime pairs. The twin prime pairs less than 100 are: 3 and 5, 5 and 7, 11 and 13, 17 and 19, 29 and 31, 41 and 43, 59 and 61, 71 and 73. Are there infinitely many twin prime pairs? No one knows. About all that we know is that there are very large pairs of twin primes. In 1988, a pair of twin primes with 2,259 digits each was discovered!

Until this century, most people thought of primes as a part of mathematics that had no applications. But in the last thirty years, large prime numbers (with perhaps 100 digits) have become an essential part of the security systems used to protect bank accounts, confidential information, and national security interests. This is one reason why the largest employer of Ph.D. mathematicians in the United States is the National Security Agency outside Washington, D.C.

If Mathematics Beyond Arithmetic Is So Important, Why Have Many Adults Been Able To Get Along Without It?

It is common for adults today to speak of algebra and geometry and other mathematics beyond arithmetic as if they are important only to a few people. For instance, as we were preparing this essay, an article in the sports section of a Chicago newspaper began with this sentence: "When the regular season begins in three weeks, Friday night's Bulls preseason opener will become about as significant as algebra formulas learned in high school."

Doesn't this sportswriter know that many of the sports statistics that are printed in his newspaper are calculat-

ed using algebraic formulas? For instance,

$$A = \frac{T}{G}$$

is the formula for the average number of points (A) a player scores per game if the player has scored T total points in G games. The winning percentage of a team is,

$$\frac{W}{W+L},$$

where W is the number of wins and L the number of losses.

It is likely that the writer does know these formulas, for most newspaper staff are college graduates. However, these writers and many other adults avoid the formulas when they can. They are like people who go to a foreign country but do not know enough of the language to converse with native speakers in that country. If you visit Mexico but do not know Spanish, you can get along, but you will never appreciate the richness of the culture, and you will not be able to learn as much as you could if you knew Spanish. You will be forced to depend on signs that have been translated into English. And perhaps most significantly, you will not even know what you missed.

And so it is with algebra. You can live without it, but you will not appreciate as much of what is going on around you. You might not be eligible for the job you would like to have or the training program or courses you would like to take. You will not be able to participate fully in our technological society. You will be more likely to make unwise decisions, and you will find yourself with less control over your life than others who have this knowledge. You will live in the same world, but you will not see or understand as much of its beauty, structure, and mystery. And, quite possibly, you will not have as much fun! □

BIBLIOGRAPHY

All examples and problems in this article are found in three books of the University of Chicago School Mathematics Project, published by ScottForesman: *Algebra, Advanced Algebra, and Geometry.*

For students who are interested in a particular field, it is useful to consult specific texts relating mathematics to that field. Look for titles that begin *Mathematics for ... (biologists, nurses, electricians, etc.)* or in texts for that field.

Here are some valuable general references:

American Association for the Advancement of Science. *Science for All Americans.* New York: Oxford University Press, 1990, pp. 15-24; 129-144; 165-182.
These chapters give the importance of mathematics in science and industry.

Austin, Joe Dan, editor. *Applications of Secondary School Mathematics: Readings from the Mathematics Teacher.* Reston, VA: National Council of Teachers of Mathematics, 1991.
A collection of articles applying arithmetic, algebra, geometry, functions, trigonometry, statistics, and discrete mathematics.

Consortium. Newsletter of COMAP, the Consortium for Mathematics and Its Applications, Cambridge, MA.
This quarterly newsletter includes "The HiMAP Pull-Out Section" with high school mathematics applications and provides information on COMAP modules appropriate for high schools.

Garfunkel, Solomon, and Steen, Lynn A., editors. *For All Practical Purposes: An Introduciton to Contemporary Mathematics.* New York: W.H. Freeman, 1988.
Based on the TV series of the same name, this book shows applications of linear programming; exponential, logarithmic, and trigonometric functions; geometry; probability; statistics; and computer graphics.

Hoffman, Mark. editor. *The World Almanac and Book of Facts, 1995.* New York: World Almanac, 1995.
Many applications begin with data, and almanacs are excellent sources of data.

Joint Committee of the Mathematical Association of America and the National Council of Teachers of Mathematics. *A Sourcebook of Applications of School Mathematics.* Reston, VA: National Council of Teachers of Mathematics, 1980.
This comprehensive source of applied mathematics is organized in sections by mathematical content (advanced arithmetic through combinatorics and probability).

Kastner, Bernice. *Applications of Secondary School Mathematics.* Reston, VA: National Council of Teachers of Mathematics, 1978.
This book provides applications to physics, biology, chemistry, economics, and other fields.

Kastner, Bernice. *Space Mathematics.* Washington, D.C.: U.S. Government Printing Office, 1985.
Data is provided on NASA missions, and worked problems are organized in chapters by mathematical content.

National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics.* Reston, VA: NCTM, 1989.
These, the first of the current "Standards" in school subjects, call for the inclusion of meaningful and relevant applications throughout the curriculum.

U.S. Bureau of the Census. *Statistical Abstract of the United States: 1995.* 115th edition. Washington, D.C., 1994.
This data source, published annually since 1878, summarizes statistics on the United States and references other statistical publications.

A Sense of Proportion

"Art, music, science, history,
putting on plays,
it was all part of school
and childhood....
Nor was there ever a thought
that the arts were frills."

By David McCullough

ART AND history, culture and history, must not be seen as separate, any more than science and history. Dividers are imposed too often. We have the History of Art over here, the History of Science over there, the History of Medicine, the History of Music made separate, with walls between, as if music isn't medicine. Plain History, too often, winds up with only politics and wars.

But it is all part of human experience. To leave painting and song out of the story, theater, architecture, poetry, is to leave out too much of life, too much that matters above all.

Creativity, innovation, invention are impossible without imagination and without risk. This was true in times past, it is true today. Yet we do too little in educating our children to encourage and reward imagination and the willingness to take risks.

"How many things can you think of to do with a brick?"

It's a question I like to ask students in writing courses. "Take out a piece of paper, make a list. There's no right or wrong answer. Use your imagination." It's wonderful to see how liberating many find that.

History is about who we were. In the arts we show who we are. History is about time. Art transcends time. "Whose statue is that, there in the park, with the pigeon on his hat?" How many politicians have strutted their stuff down the years—hundreds, thousands—confident they were taking their place in history? How few are remembered at all.

But Gershwin lives. Every time, everywhere his music is played, Gershwin lives. Whitman and Willa Cather, Thomas Eakins, Louis Sullivan, Martha Graham, Langston Hughes, speak to us still, touch our lives. Take away our art, our music, the best of our buildings, take away Mark Twain and Julia Ward Howe and Woodie Guthrie and

PHOTO: BRETT SHERMAN/PPG

Above: In 1993, David McCullough returned to his beloved Linden Avenue School for its 90th anniversary celebration. Right: Two students tune up at Peabody High School.

David McCullough is the author of numerous works of history and biography, including Truman, *for which he won the Pulitzer Prize for biography in 1993. He has been the narrator of such distinguished television documentaries as* LBJ, The Donner Party *and* The Civil War. *This essay is drawn from his 1994 Nancy Hanks Lecture on Arts and Public Policy, an annual lecture presented by the American Council for the Arts (ACA), and is reprinted by permission of the ACA. The speech is available for purchase in booklet form (as is each year's Nancy Hanks Lecture) from ACA Books. For purchase information, call 1-800-321-4510.*

Founded in 1960, the American Council for the Arts is one of the oldest continuously operating arts service organizations in the United States. Its mission is to promote public policies that advance and document the contributions of the arts and artists to American life.

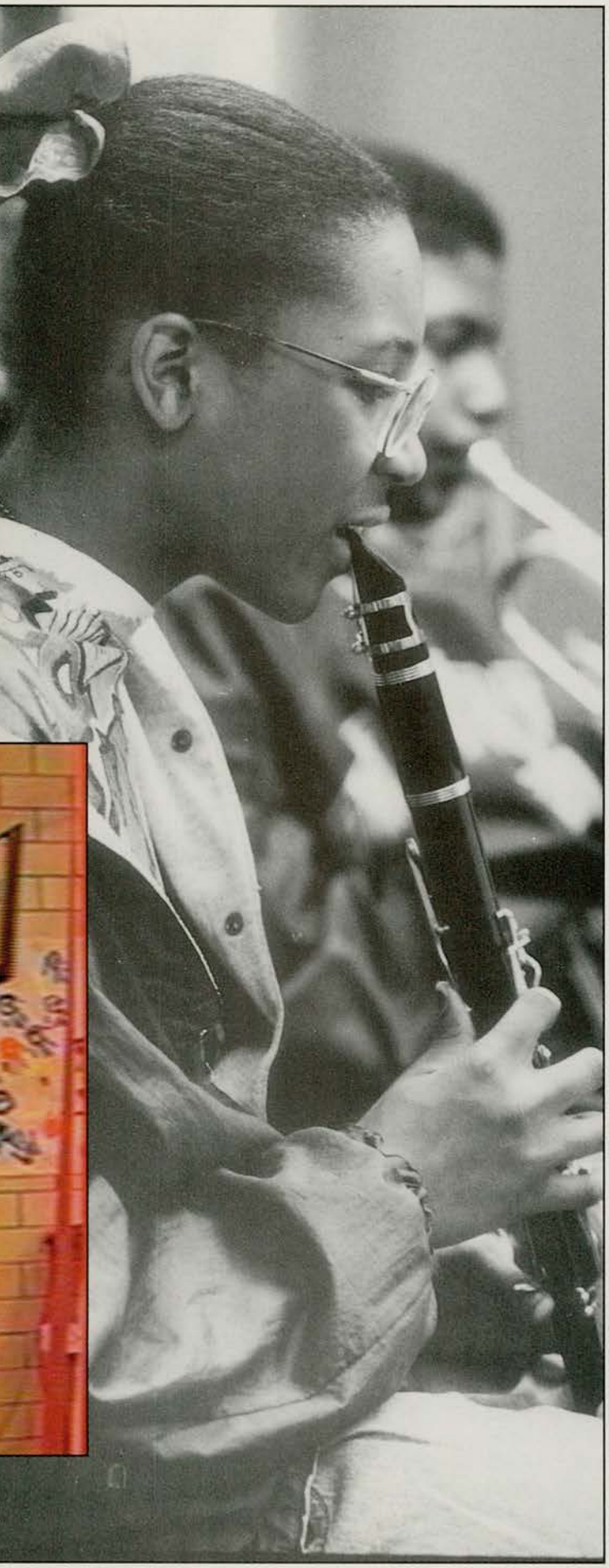


PHOTO: DAVID STONE RUBIN FOR P.P.S.

Scott Joplin and who are we? Take from this our capital city Daniel Chester French's Lincoln or that greatest of the city's works of abstract art, the Washington Monument by Robert Mills, take away the great collections of the Library of Congress, and how then would we feel?

Culture might be defined as what matters to a society. And certainly a good measure of what matters is how we spend our money.

Nearly everywhere in the country libraries are shortening their hours, laying off staff, putting a freeze on book purchases, or closing their doors. The explanation always is that there's not enough money.

Yet in all the years of the Great Depression, not one library is known to have closed its doors anywhere in all the country. Not one, and in the worst of times when our material abundance individually and as a nation was nothing like what it is today.

In Massachusetts, where I live, 20 libraries have closed in the last three years alone. In California, since 1980 more than half the public school libraries have closed. Libraries in Los Angeles are open now only a few days a week. This in California, Golden California.

The Library of Congress, too, has lately cut back its services, closing the main reading room, plus six other reading rooms, on Sundays, a severe blow to anyone wishing to use the Library on weekends.

As a personal note I might add that it was on a weekend at the Library of Congress in the early sixties that I happened to see a collection of newly acquired, rare old photographs taken in Johnstown, Pennsylvania, soon after the calamitous flood of 1889, photographs that led me to write my first book, that led me to writing history as I had never anticipated I would. So I am particularly sympathetic to those with full-time jobs who can only make use of the Library on weekends.

How do we spend our money? For public libraries nationwide: $4.3 billion a year, which is considerably less than we spend on potato chips or sneakers. Less than we spend on our lawns or for cellular phones. Last year, we spent $7.5 billion on our lawns, $9 billion on cellular phones.

Have we changed so much in our regard for libraries since the Great Depression? Not to judge by the demand for library services. Library use, even with all the cutbacks, is up substantially. What is not up is our willing-

ness to pay the price, or more specifically to vote the taxes to pay the price—for a measure of civilization that has long been standard to our way of life and that so many benefit from in ways beyond anything determinable by cost-accounting.

Still more serious, even more shameful, is what is happening to programs in the arts in our schools, and it is this especially that I want to talk about. All across the country arts programs in the schools are being cut or eliminated altogether, and it's a disgrace. We are cheating our children.

"We hold these truths to be self-evident," we teach them from history books, "that all men are created equal, that they are endowed by their Creator with certain inalienable rights, that among these are Life, Liberty, and the pursuit of happiness." But how will they have any idea of happiness—of all that Thomas Jefferson had in mind when he used that word—if they are shut off from art and architecture and music and theater and dance and literature, if they are denied that part of life, that vital center, if they have only a limited chance at the experience of self-expression? Or no chance at all?

There are new figures for what's to be spent by the federal government on the arts. And for the first time there is a specific allotment for art and music in the schools. For fiscal 1995 it's to be $75 million. Federally funded cultural programs—including money for the National Endowment for the Humanities, the National Endowment for the Arts and education in the arts comes to approximately $600 million, while the overall figure, the grand total—which includes money for the Smithsonian, museums, art galleries, and the like—is $882 million. And what's that? It's a pittance is what it is. $882 million is one six-hundredth of one percent of the federal budget.

We need to recover a Jeffersonian sense of proportion. Jefferson, whose passion for education exceeded that of any of our political leaders, worked out his own guide "to the faculties of the mind," as he called it, in his classification system for his library. This was the private collection of 6,500 books assembled over fifty years that Jefferson sold to the government at half its value to create a new congressional library after the British burned the Capitol during the War of 1812. It took eleven wagons to haul the books here and what a picture that must have made, as they left Monticello and started through the countryside.

There were three main categories and he gave them equal importance. First was "Memory," by which he meant history—history civil, history ecclesiastical, natural history, history ancient and modern. Second was "Reason," which included philosophy, the law, and mathematics. The third category, titled "Imagination," was the fine arts, and on this lovely spring evening in the city he helped design, I would like to mention that within fine arts, along with painting, sculpture, architecture, music, poetry, drama, oratory, and criticism, he included gardening.

Three parts equally weighted, and history and the arts are two of the three—history, philosophy, and the fine arts.

I GREW UP in Pittsburgh, Pennsylvania. I was number three in a family of four sons. My father worked with his father in a family owned electrical supply business, McCullough Electric, now run by my brother George.

PHOTO: DAVID STONE RUBIN FOR P.P.S.

I began public school, in kindergarten, in 1938, about the time when the National Gallery was being built here. The building, along with a surpassing collection of Old Masters, were a gift from the late Andrew Mellon of Pittsburgh, about whom I knew nothing, of course, but whose generosity to his country I've come to appreciate more and more. The paintings alone were the largest gift of any individual to any government.

Like McCullough Electric, the Linden Avenue School is still in business, a fine two-story, yellow brick building about midway between Point Breeze and Squirrel Hill, if you know Pittsburgh. To me then its marble halls and great sweeping double stairway to the second floor were grand in the extreme. When I returned last year, for the school's 90th anniversary celebration, I was delighted to find that those marble halls and sweeping stairs are in fact just as grand as I remembered.

We had music at Linden School, lots of music, and Miss Polichio, our music teacher, was perfectly beautiful. For quite a while I was in love with Miss Polichio. We had music several times a week in a room reserved for music. We played tambourines, wood-blocks, and the triangle. (I thought myself something of a woodblock virtuoso.) We

"At Linden Avenue School, there was an auditorium with a stage and real pull curtains, and we were all in plays, the whole way along. There was an art room and an art teacher, Miss Bridgewater, and the day she took her chalk and with a few fast strokes demonstrated two-point perspective on the blackboard, is one I've never forgotten. She had performed pure magic right before our eyes. I had to be able to do that. I had to learn how."

sang, learning by heart most of Stephen Foster, who came from Pittsburgh. There was a school orchestra. My oldest brother played the violin in the school orchestra.

There was an auditorium with a stage and real pull curtains, and we were all in plays, the whole way along. There was an art room and an art teacher, Miss Bridgewater, and the day she took her chalk and with a few fast strokes demonstrated two-point perspective on the blackboard, is one I've never forgotten. She had performed pure magic right before our eyes. I had to be able to do that. I had to learn how. I began drawing and painting and I'm still at it at every possible chance. (One of the particular pleasures of painting is you don't have to work with words.)

By now these were the World War II years, when the steel mills were going at capacity, and at night the sky pulsed red from the flames of the blast furnaces.

There was a library at school, with books on every wall except for where the windows faced the street. It is still that way. The first morning we were declared sufficiently advanced to go to the library—a very great step in the upward march at Linden—we were told we could each go to the shelves and choose any book we wished. What a moment! I remember especially one called *Ben and Me*, written and illustrated by Robert Lawson. It was about a mouse who lived in Ben Franklin's hat and who consequently had much to report.

When my oldest brother, Hax, went to Peabody High School, he both played the violin in the Peabody Symphony orchestra and also stole the show in a Peabody production of *Arsenic and Old Lace*. He was Teddy Brewster, the one who thought he was Theodore Roosevelt and was kept busy down in the cellar—down in "Panama"—digging the canal and burying the supposed yellow fever victims. It was the most marvelous stage production I had ever seen and my first realization of there ever having been anyone like Theodore Roosevelt or a place like Panama.

"How do you pick the subjects for your books?" I'm asked. "Whatever made you decide on Theodore Roosevelt? The Panama Canal?"

There's no telling, I suppose, when the seed of an idea takes hold. But on the first day I went to the Carnegie Library—in Pittsburgh this means *the* Carnegie Library, the mother church as it were—and with my new, first library card took out a book, I was perhaps eleven years old. It was *A Tree Grows in Brooklyn*. About that same time, as I remember, our wonderful science teacher at Linden School, Miss Schmeltz, had arranged an exhibit of bridges of all kinds. They were made of match sticks and I can see them still, lined up along the window sills, flooded with sunlight.

At a party, long afterward, when I told her what I was working on, a Washington socialite boomed loud enough for everyone to hear, "Who in the world would ever want to read a book about the Brooklyn Bridge?"

August Wilson, whose best-known plays are set in Pittsburgh, has described how, in boyhood, the Carnegie Library became his preferred classroom, where he read Ralph Ellison, Richard Wright, and Langston Hughes. "Just the idea black people would write books," he has said. "I wanted my book up there, too."

Art, music, science, history, putting on plays, it was all part of school and childhood, and I loved school, almost every day. Nor was there ever a thought that the arts were frills. Or that everyone had to stay stuck in the same interests, at school or at home. Brother Hax had his music; George, engineering; I had my painting; brother Jim, astronomy. We were not rich, certainly not by Pittsburgh standards. I suppose we could be described as comfortable. Except for engineering, my father had no interest in any of these other pursuits. Neither my father nor my mother played a musical instrument, or, as far as I know, ever painted a picture or had a part in a play. When Hax tuned the radio to the Metropolitan Opera on winter Saturday afternoons, the volume cranked up full throttle, it about drove my father crazy. "Who's getting murdered now?" he'd call out. And while my father and mother willingly paid for paints and music lessons, concert tickets and the like, and mother welcomed such activity, it was really at school that we got the bug, got the chance, and I say this because I think it so important to understand that it is not just children who are economically deprived who benefit from school libraries, from arts programs, from community commitment to the arts for children, and to argue for support of the arts on that basis primarily is to miss the point. All boats rise with the incoming tide.

What I didn't know then was how exceptional the arts program was throughout the Pittsburgh school system, indeed how exceptional it had been for years. And many of the results were exceptional, too, as we now know.

A who's who of those in the arts who attended the public schools of Pittsburgh is strong testimony to just how the whole country benefits from that kind of education: Andy Warhol, Earl Hines, Erroll Garner, Mary Lou Williams, August Wilson, Rachel Carson, composer Henry Mancini.

From Peabody High School alone came Malcolm Cowley, Gene Kelly, Billy Eckstine, Fritz Weaver, novelist John Edgar Wideman.

Gene Kelly, the son of a sales executive, was a football and baseball star at Peabody. He excelled in gymnastics, played the violin and banjo, edited the school paper, wrote poetry, and was praised on his report card for his "vivid imagination."

Erroll Garner, a mill worker's son, played the tuba in the Westinghouse High School band. Henry Mancini, whose father was a steel worker, started on the piccolo at age eight, by twelve turned to the piano. The 1942 Aliquippa High School yearbook says of him: "a true music lover, collects records, plays in the band, and has even composed several beautiful selections. He wishes to continue his study of music and to have an orchestra of his own some day."

(I thought I could also include Martha Graham, who was born in Pittsburgh, but damn, she moved away at age three.)

Willa Cather once taught high school English in Pittsburgh. "So vivid was her personality," remembered a student, "so unforgettable her method of making us see the picture (as she read aloud), that even yet I hear her voice...."

Selma Burke lived, worked, and taught in Pittsburgh through the 1960s and 1970s, founding her own Art Center for Children. She is a sculptor and one of the country's most respected black artists and teachers. If you have a dime with you, you own one of her works. She did the sculpted profile of Franklin Roosevelt.

And then there was Caroline D. Patterson, a name you don't know. She was the principal of Linden School and a force, unforgettable, tall, severe-looking, a woman who brooked no nonsense whatsoever. My friend Richard Ketchum, the historian, who also went to Linden, remembers her looking at least six foot eight. Just the sound of her approaching steps could freeze you cold in your chair. She wore stout black, lace-up shoes with thick high heels hard enough to drive a ten-penny nail. And down those marble halls she would come, making her rounds.

"Boys and girls," she would say, "Remember always you are a reflection of your parents." I'm not sure any of us knew what that meant exactly, except that we'd better toe the line. Yet, I think deep down inside we knew she was right, and that we had potential beyond anything we might imagine.

Miss Patterson, I now appreciate, ran an outstanding school. She was dedicated, far-seeing. A pioneer. She helped found the country's first educational television station—Pittsburgh's WQED, the beginning of public television, and the station that would introduce to Pittsburgh and ultimately to the entire country, Fred Rogers, "Mister Rogers," who in his years on the air has touched and influenced the lives of more children than any teacher who ever lived. The longest-running national program in the history of public television, "Mister Rogers' Neighborhood," broadcast still from WQED, reaches more than 8 million households on some 318 public stations.

I feel I had a huge advantage growing up in Pittsburgh—because I grew up in Pittsburgh. For along with the schools, besides all the programs in art and music, went the Carnegie Library, the Carnegie Museums, and Carnegie Music Hall, all in one great complex in the Oakland section of town, close by Carnegie-Mellon University and the University of Pittsburgh, and, in those days, Forbes Field. I can hardly overstress the importance of

PHOTO: DAVID STONE RUBIN FOR P.P.S.

this—that art, science, music, literature, history, the world of books, were joined, all together, to be taken as parts of the same whole, all under one roof. There were school trips to the Carnegie Museum of Natural History, free Saturday morning art classes at the Carnegie Museum of Art.

Or you could go on your own in perfect safety, "down" to the library or museums by bus or streetcar, though the streetcars were preferable. They were more fun. Annie Dillard, who grew up in my neighborhood, has described them as "orange, clangy, beloved things—loud, jerky, and old." That they were.

The looming stone exterior of the Carnegie then was black as coal from the smoke in the air, and a lot inside seemed gloomy and boring. But not the dinosaurs, or the big scale model of the Parthenon, presented as it looked in its prime. There were some paintings in the permanent collection that I fed on, Edward Hopper's *Cape Cod Afternoon*, for example, and year after year, the great Associated American Artists exhibition came to the Carnegie Museum of Art, with paintings by Andrew Wyeth, Burchfield, Benton, Raphael Soyer, Grant Wood, Horace Pippin, Georgia O'Keefe, Joe Jones, Walt Kuhn, Reginald Marsh. There was something about those Reginald Marsh girls that was beginning to interest me.

I remember also coming into one of the galleries and seeing at the far end, bigger than life, John Stuart Curry's painting of John Brown, his arms flung out, great beard flying in the wind, a cyclone roaring out of the background. How could anyone not want to know about that man, the story there?

The Kaufmann family, owners of Kaufmann's Department Store and staunch supporters of the arts, brought a string of eminent artists to Pittsburgh to paint the city, then staged an exhibition of their work, something that ought to be done again and not only in Pittsburgh. The Kaufmann family also sponsored exhibitions of the work of school children, and believe me, to go downtown with

Peabody High School alone—where David McCullough's oldest brother, Hax "played the violin in the Peabody Symphony orchestra and also stole the show in a Peabody production of Arsenic and Old Lace"*—has produced such luminaries in the arts as Malcolm Cowley, Gene Kelly, Billy Eckstine, Fritz Weaver, and novelist John Edgar Wideman.*

your family to see one of your own paintings hanging in Kaufmann's window, that was something!

Private benefactors like the Kaufmann's should get all the credit they deserve. And so should the many corporations that support the arts.

WHAT IS so important to understand about education in the arts, is that there especially you learn by doing. Think of the lesson in that.

You learn to play the piano by playing the piano. You learn to paint by painting. It's not just a way to learn, it's the only way. "She knew that the only way to learn to write was to write, and she set us to writing," remembered a student of Willa Cather.

Especially in the arts you learn how very much can be learned from a teacher, and that a great teacher is a true God-send, an opener of doors, giver of gifts, a star to steer by. Especially in the arts, you learn to bring out what is unique in you, to express yourself, your feelings, and to experience the incomparable high-octane lift of that. But you learn about working with others, too, of being part of something larger than yourself, as anyone knows who has ever played in an orchestra, ever taken part in a theatrical production.

And—and—maybe it's in the arts above all that we learn most directly, discover for ourselves most immediately in the doing, that the reward is the doing, that the payoff for the effort is the effort.

"I want to show the children that art is not money," Selma Burke has said. "It's a life."

Selma Burke is in her 94th year.

> You can see beauty and creation without ever drawing a line—if you just look ... You can see the beauty of creation in an apple. To many people it's just an ordinary red object. But if you take a bite into it, you transform it. Now you see the white solid juicy inside. If you bite deeper you get to the core and you see the black seeds from which the apple came. Then, if you take that seed and lay it down on paper—it's almost magic! That such a big red apple could come from that seed. It's the fascinating process of creation. The art teacher has to find a simple way to teach that.
>
> I'm hard on my students—to get them to see how important that apple is. To see that—right in your hand—you have the beauty of creation.

"Do all you can—and then some," she would tell her students. "Do all you can—and then some."

Coaching his young son Andrew, talking of the world around them, N.C. Wyeth would say, "You must be like a sponge. Sponge it up. Soak it up."

Andrew Wyeth describes how, at 15, he learned anatomy:

> He got me a skeleton. Had it there and had me draw it from every angle. Every bone. And I did that for about a winter and towards spring he said, "Now you've drawn this enough. Now .... I want to see how much you can remember." So he took the skeleton away. "Now I want you to draw that figure at all angles—what you remember."

Learning to appreciate the miracle of creation ... learning to observe and remember ... learning to see beneath surface appearances to the essential: and yet some deride education in the arts as frivolous, irrelevant.

But listen please to one more teacher. Ann Marshall has been teaching the visual arts at Peabody High School for 20 years and is herself a graduate of Peabody:

> You can teach all of life with art. You learn the lessons of life. You learn that you are unique and that what you make is unique. You learn self-worth. You learn to make decisions, to make mistakes. You learn to take risks. You learn that sometimes what you think are big mistakes can turn into big successes.

Yes, but we must be practical, argue the nay-sayers. All right, let's be practical.

Consider that in Pittsburgh the new Andy Warhol Museum, scheduled to open next month, will bring an estimated 200,000 people to the city this year. With more than 3,500 pieces in its collection, it will be the largest art gallery in the world devoted to one person. Andy Warhol, the son of a coal miner, excelled in the free Saturday art classes at the Carnegie Museum.

Or on a national level, consider the astonishing transformation of Chrysler Corporation. In less than three years Chrysler went from being the "basket case" of the American automobile industry to "leading the resurgence" of the American automobile industry. Chrysler is suddenly the most profitable car maker in the country. And the reason? Above all? Design. Inspired design. The "alchemy of design," as *The New York Times* reported. If there are heroes to the story they are Chrysler's vice president in charge of design, Tom Gale, and his extraordinary young staff. And yes, Gale remembers being inspired first by a fourth-grade art teacher. Designer Michael Santoro remembers looking down from a seventh-floor window at New York City's High School of Art and Design and studying the cars waiting at the red light. "You look out the window and all the cars look the same," he told a

reporter for the *Times*. "I said, 'If I ever get the chance, my car's going to look different....'"

How do you appraise the "practical" value of a program like the Saturday art classes at Carnegie Museum or a school like New York's High School of Art and Design? How do you calculate the return on such public dollars as it takes to educate an Andy Warhol or a Tom Gale or Michael Santoro?

The nation needs artists and designers to work in the automobile industry, in advertising, publishing, fashion, interior design, television, the movies. And musicians and singers and dancers and actors for all the so-called entertainment industry. And teachers. And teachers to teach teachers. Teachers, teachers, teachers—for all the arts and not just for those who will perform but for all who will learn to care and enjoy the arts all their lives. Surely that is obvious.

Talent doesn't just happen. Training, craft, experience can't be summoned willy-nilly out of nowhere as needed. It has to be developed, brought out, brought along with education. And the process has to begin early. The earlier the better.

THE LATE Margaret McFarlan, professor of child development at the University of Pittsburgh and an inspiration for three generations of specialists in child studies, including Fred Rogers, liked to say:

> We don't teach children. We just give them who we are. And they catch that. Attitudes are caught, not taught. If you love something in front of a child, the child will catch that.

So what is our attitude to be here in America? What do we love? What do we want our children to see that we love?

And who will be the leaders with both the spirit and courage of a Theodore Roosevelt, who loved the poetry of Edward Arlington Robinson and on hearing that Robinson was in financial straits, found him a job in the Treasury, then sent him a note saying, "Think poetry first, Treasury second."

I am an optimist, by nature and from reading history. I am also of that generation raised on the belief that we Americans can do anything we set our hearts and minds to. I still believe that.

A new set of national standards for education in the arts has been drawn up and approved by Secretary of Education Richard Riley. The standards are voluntary and national in name only, but a step in the right direction.

We should be grateful for what's being done for the arts here in Washington by people like Jim Wolfensohn, like Sidney Yates in the House, Claiborne Pell, Jim Jeffords and Alan Simpson in the Senate. Jane Alexander is magnificent. But we mustn't count on government only. Congress is always slow catching up with what the country wants. The energy, the commitment, the determination must come from us. That's how the system works. And money, too, that has to come from us.

We must be "the public policy" on the arts.

If we want libraries open again, if we want a generous, exciting, creative education for our children, if we want a culture that counts for something, it's up to us. We must get busy and make it happen—"Do all we can—and then some." □

Time on Our Side

(Continued from page 29)

return from college saying it's a breeze. They're very advanced in inquiry-based learning.

"These skills are the ones that cause trouble for many students, if they don't have them when they get to college. Our students often find themselves leading the discussions in their college classes because they're so used to it."

Time for Teachers in Queens, New York

In New York City, P.S. 62, an elementary school in Queens, is described by teacher Harolyn Fritz as "an overcrowded school in a changing neighborhood." Fritz says the school serves a neighborhood that is "declining." Sandwiched between two large streets in Queens, it is an area of small stores, car repair shops, and industry. "There are lots of single-family attached homes, but now there is more than one family in those homes," says Fritz. With 1,200 students, whose backgrounds range from Russian to Indian to Hispanic to Guyanese, the school is bulging at the seams. It is a Title I school with a large number of non-English-speaking students. "We added a floor to the school, and we used to have two libraries and two teachers' rooms. Now we have one library and one teachers' room," she explains.

As part of their union contract, teachers in New York are guaranteed one preparation period a day. These used to be scheduled whenever it was convenient, but for the last five years, the schedule at P.S.62 provides at least one common prep period a week for all teachers in a grade. Subject-area teachers called "cluster teachers" take over classes for the other teachers during the prep period. Juggling the schedules of 65 teachers to create the common prep periods by grade level was "a nightmare," laughs Fritz. "We were lucky that we had a principal who was a good programmer."

Besides the obvious benefits of closer coordination and mutual assistance among grade-level teachers, the common prep period has aided staff development. P.S.62 is the site of a teachers' center, staffed full-time by a specialist. This is a joint effort by the United Federation of Teachers, the city Board of Education, and the district. The district pays the costs for the teachers' center specialist, while the union and the Board of Education pick up the cost of supplies. Fritz says the teachers' center is literally "a closet—but it's the most used closet in the school and it's beautiful!" The common prep period allows the center to provide specialized workshops, at the teachers' request, to groups of teachers with a common interest or need. For example, if the third-grade teachers want to know more about computers, the teachers' center will arrange training for them during their common prep period.

P.S. 62 teachers have worked hard to integrate parents into the life of the school and the result has been a very active parents group. Parents are members of the school-based management team, and parents and teachers together have made creative use of the common prep period. Parents participate in some of the training and workshops offered to teachers during the common prep period. "This helps keep parents involved in the school during the day," notes Fritz.

PHOTOS: BRUCE GILBERT

It may be small, but it's ours. The "most-used closet in the school," it's actually home to a fully staffed teachers' center at P.S. 62 in Queens, N.Y. Above right: Taking full advantage of the common prep period at P.S. 62.

A Weekly Planning Day in Chicago, Illinois

At Chicago's Hefferan Elementary School, creative scheduling gives teachers an entire day each week for in-service training, planning, or workshops. The school is in a rough neighborhood marked by the familiar inner-city problems of poverty, crime, and unemployment. The dangers are such that it's impossible for the students to go outside for recess. All of Hefferan's students are African American, and 99 percent are eligible for free lunch.

Inside, the school is a haven, with fresh paint, computer and science labs, and flocks of adult volunteers. So many adults help out, in fact, that the school created a Parents' Center, a special room for parents. The school has also attracted substantial support from area companies. The science lab was a joint gift from Rush University Medical Center and Turner Construction, and Ameritech provided a $10,000 grant to help keep Hefferan open after school hours. Students needing extra help now receive tutoring outside regular hours, an alternative to the "pull-out" programs that staff were convinced were cheating students of valuable learning time. Hefferan also offers about 35 before- and after-school clubs that give the students a safe alternative to the streets outside.

Most teachers cannot imagine the luxury of an entire day for planning or in-service every week. But at Hefferan this "Resource Planning Day" is part of the weekly routine. This full day without classes replaces the daily preparation period, which of course fell at different times for different teachers, making it impossible for intensive time together or the coordination of professional development.

Hefferan faculty are divided into six teams, four of them by grade level (K-1, 2-3, 4-6, and 7-8). One team is an administrative team and one is a resource team of teachers in science, physical education, Japanese language, fine arts, music, and computer instruction, as well as a librarian. Each day of the week, a different cluster of students spends a day with the resource team while their regular classroom teachers participate in planning or professional development. Paraprofessionals shepherd the students through their resource classes, and an aide assigned to each team works with that team's students in their resource classes.

Principal Denise Little calls the planning groups "design teams." She says the schedule was created simply to provide more professional development opportunities and planning time for teachers. "The major improvement," observes Little, " has been in the curriculum." The design teams have spent considerable time and energy on the curriculum, focusing on how to write learning outcomes and aligning the curriculum with state education goals, and on teaching techniques like cooperative learning.

The schedule also permits Little to bring staff development to the school. "When I hire a consultant on a topic," she says, "it's for a week and the consultant works with each of the teams. That way everyone in the school gets the benefit of the same ideas."

* * *

Many influences are converging to push schools to rethink their use of time. The increased use of technology, and its great flexibility as a learning method, means that regular class periods may not be the best way to exploit this teaching tool. The growing recognition that some students take more time than others to master the same material and that students can benefit from more intensive relationships with teachers argues for more flexible use of time. The needs of families for before- and after-school care and the awareness that some students fall behind during summer vacations have already led to longer school days and years. It's quite possible that the six-hour, 51-minute, 180-day approach to schooling in America will become a dinosaur by the early 21st century. □

Letters

(Continued from page 6)

and eighth-graders; and Reducing The Risk, for high school sophomores.

Nor do I misreport the rise in teenage pregnancies. According to the Alan Guttmacher Institute, adolescent pregnancy rates increased 23 percent in the years between 1972-90. There has been a dramatic rise in STDs among teens as well.

Contrary to Susan Wilson's charge, I didn't imply that "Learning about Family Life" was used state wide. If I implied anything, it was that Susan Wilson would like to see it used state wide. She helped design it; she promoted it; she defended it before community and parent groups. Nevertheless, she states that the curriculum has been adopted in only 30 classrooms—and not without controversy. In the middle-class community of West Windsor-Plainsboro, for example, approximately 200 students in grades K-3 opted out of the program.

This might have been a more fruitful exchange of views, if either Haffner or Wilson had addressed my main point: namely, that sexual activity is increasing among younger teens and once they become sexually active, younger teens are unlikely to use contraceptives regularly, no matter what they're taught in school. Too, some of the partners of young teenage girls are post-high school males who are beyond the reach of school-based sex education. Consequently, early sexual activity increases the health and social risks for teenagers, especially adolescent girls. Thus, I argue, sex education in the public schools should focus on persuading younger teens to postpone sexual initiation—particularly since the research evidence shows that sex education programs can be more effective in teaching abstinent teenagers to remain abstinent than in teaching sexually active teens to use contraceptives regularly. If sex is delayed for several years, the individual and social gains are considerable.

Moreover, it is chiefly among older teens—and usually the more socially competent and cognitively sophisticated older teens—that sex education is effective in achieving even modest increases in contraceptive use. If the percentage of sexually active younger teens continues to grow, we may see even these modest gains decrease.

Teaching Ancient History

Yurco and Martel are correct to address errors in historical work ["How To Teach Ancient History: A Multicultural Model ... And How Not To" (Spring 1994)]. However, their essays are not free of errors, inconsistencies, or a biased perspective. This is especially true in their attempts to de-Africanize ancient Egypt. These flaws lessen the value of their contributions and may lead to the dissemination of inaccurate information or perspectives. Space considerations prevent an exhaustive critique.

An error was made in stating that recent work examines northern predynastic crania. The remains are from southern Egypt (Nagada). Studies show that early southern Egyptian remains overlap those of more southernly Africans, including Kushites, stated to be the "blackest" of Nile Valley peoples known to the Greco-Roman world. Therefore, claims or the implication that the gene pool of early Egyptians was unconnected to that of any Africans south of Egypt are wrong and misrepresent the cited studies. Early Egyptians are co-extensive with bonafide Africans, as defined by biohistory and skeletal record. Some studies require critical reading to correct for erroneous views about the traits of a "true African," a remnant from a biased non-Darwinian anthropology that had racist preconceptions about the origins of traits like narrow, high-bridged noses and reddish brown skin, which are found in some indigenous Africans. Saharan tropical Africans vary widely in traits, a product of long-standing microevolution, not admixture with non-Africans to any great degree. Readers should have been instructed on this point and the fact that the term "Black Africa" is a European invention with shifting boundaries depending on the discipline or writers involved; the phrase obscures intra-African relationships by manufacturing a false dichotomy, as the late President Nasser noted. Even working from a model of discrete "races" would show the Egyptians to be "mixed," which is "black" in South Carolina. However, it is best to work from the concepts of biohistory, biogeography, and microevolution, i.e., a "no-race" position.

Data from linguistics and archaeology help in understanding the Nile Valley as an integral part of Africa. Archaeology indicates the initiation of recognized Egyptian culture primarily by a fusion of African elements (Saharan and Nilotic). The language of ancient Egypt belongs to a family called Afro-Asiatic, which originated ultimately south of Egypt and is almost exclusively spoken in Africa.

Ancient history must be taught in a comprehensive fashion.

—S.O.Y. Keita
Department of Biological Anthropology
Oxford University

Answers to Algebra Problems

(from p. 34)

1. A Chi-square test on these data supports the view that differences like these can occur commonly by mere chance.
2. The formula gives about 1,458 bricks; more would be needed because of the need to break bricks to achieve straight edges.
3. Nellie, $7996.32; Joe, $7170.38
4. Yes, with 8 hexagons and 4 squares
5. Intensity is 1/16 as strong.
6. Pick the second company if driving 44 miles or more.
7. The ball reached its maximum height of about 14'4", about 157 feet from the batter.
8. $10^{1.5}$, or about 32 times as intense
9. In 1995 or 1996, depending when the population was taken in 1992.
10. $\frac{1}{54979155}$, that is, about one chance in 55 million.

Those wishing a step-by-step explanation of how we arrived at the answers may write to Professor Usiskin, Department of Education, University of Chicago, 5835 S. Kimbark, Chicago, IL 60637.

(Continued from page 13)

the case? It probably says, "We don't have any place to put this kid. He's not a criminal; he's just a youngster who has gotten into some trouble. We want the school to take him back." That's another reason why teachers don't bother to report problems and why administrators don't want to go to court, even if a complaint gets that far. You spend all that time and money, and when you're all finished, you're likely to be right back where you started.

One way to change this situation would be to get permission for parents, teachers, and perhaps even high school students to intervene in these cases and present evidence. When you go to court now, you have the principal and the lawyer for the board of education, the lawyer for the youngster and the youngster himself—one kid surrounded by a lot of adults. The board of education lawyers that I've met don't talk about the effect that a kid's behavior has on other students' learning. They talk about the right of the board of education under the law to do thus and so. On the other hand, the youngster's lawyer probably says, "Your honor, this poor child has had a lot of problems in his life," and the judge feels pretty sorry for the kid. But you know who is not there? The other 25 youngsters whose chance for an education is being ruined by this kid. So if instead of just having one kid standing there and looking like a victim, the court were able to hear from and about the real victims, we'd get a more balanced judgment in these cases.

We should also explore introducing arbitration procedures to handle cases like these, and AFT is looking into that right now. Most labor contracts have a provision for grievance procedures of which arbitration is a part. Now, you can take an arbitration award to court and try to appeal it, but it's very difficult to get a court to overthrow an arbitrator's award because the court assumes that you have already presented your best arguments and gotten a hearing for them. And in order for the court to look into that arbitration and overturn it, you have to prove there was something terribly wrong with the whole process—the arbitrator was prejudiced or incompetent or something like that. With arbitration, a lot of problems are settled without having to go to court.

Why can't school districts establish a fair, inexpensive, due-process arbitration procedure for youngsters who are violent or disruptive? We could create a separate school judicial system that had expertise and knowledge about the impact of these legal decisions on students and teachers and the whole system. Arbitration is much cheaper and faster. This is especially true if you have an expedited arbitration system like that of the American Arbitration Association, which specifies how many briefs you're allowed to write and how much time each side can take. Creating arbitration procedures would keep most of these cases out of the courts and create a system that is inexpensive and fair to the youngster and fair to the other youngsters in the school.

Feeling the consequences

A lot of the tolerance for bad behavior would disappear if we had stakes attached to student academic outcomes—if students knew that they would not be admitted to college or get certified for certain kinds of employment unless they had achieved at a certain level. I think the time is coming when this will be the case for all students. But in Chapter 1 schools, this is going to start very soon. There is a provision in the new Chapter 1 legislation, now called Title I, that students in schools receiving Title I money have to show substantial progress. If they don't, the school will be punished. One of the punishments is reconstitution. This means the school will be closed down, the teachers will have to find jobs in other schools, the students will go elsewhere, and the school will reopen under new management and with new students. Now, for the first time, there will be stakes. The parents will know that if disruption and the poor achievement that comes from it continue, their children's school will close and they'll have to find somewhere else to send the kids. Teachers will know that they won't have a job in this school, and at the very least will have to look elsewhere for one. In other words, we are entering a period where there will be consequences, and parents and teachers are going to be a lot more concerned about achievement.

One of the issues that has stood in the way of our dealing with school violence and disorder is a very difficult one to talk about in our society—that's the issue of race. And whenever the topic of suspension or expulsion comes up, the question of race also comes up. Cincinnati is a good example. When the union there negotiated a good discipline code as part of a desegregation suit, the question of disparate impact came up. Were more minority kids being suspended than others? Who were the teachers suspending them? Were white teachers being tougher on African-American students?

Our position on these questions is very clear. In any given school, you may have more white kids with infractions or you may have more African-American kids or you may have more Hispanic kids. We don't know. I don't think anybody knows. We need to handle that by saying, "Whatever your crime is and whoever you are, you're going to get exactly the same punishment." If we do that, I'm sure that the number who will be punished will end up being very small. Because, as a young kid, if you see that there is a consequence, you will change your behavior.

The Ohio minimum competency test, which students have to pass in order to graduate from high school, demonstrates how clear consequences affect behavior. When the test was first administered, a huge number of students of all ethnic groups failed the exam. It's not a very tough exam—the questions are at a seventh- or eighth-grade level. Nevertheless, only 55 or 60 percent passed it three years ago and 40 percent failed. Now you've got over 90 percent passing. This shows that if you tell youngsters they are not going to graduate unless they pass this test—and you stick to it—they will sit down and learn the material. The same thing will happen if you've got a discipline code you enforce. Youngsters who now know there are no consequences for bad behavior will behave differently once they realize that they will be held responsible for what they do. So we're not talking about suspending, expelling, or punishing the huge number of youngsters who are now engaged in violent or disruptive behavior. We're talking about doing something that will change that behavior substantially. As a result, we'll end up with a small percentage of youngsters who really have

some severe problems. The overwhelming majority of youngsters who become part of that peer culture because their leader encourages them to do it, won't be doing it, because the leader is the kid who's going to be removed.

We have another big problem, and we're going to try to deal with this in legislation. Thanks to the law that governs the education of youngsters with disabilities, we have two different standards for classroom discipline. A youngster who is not disabled can be disciplined under whatever code of behavior is in force. But a youngster who is considered disabled cannot be suspended for doing exactly the same thing as his nondisabled classmate. The law protects him from a change in placement while hearings pertaining to his behavior go on. These proceedings could take six months, a year, a year-and-a-half in court, and meanwhile that youngster, who could be engaged in some threatening or dangerous behavior, has to stay in class. This makes no sense. We have a lot of support in the Congress on this issue, and we think we have a good chance of changing the law.

WE ARE hearing cries for vouchers, for choice, for charters. But what people really want are their own schools back. They want their kids to go to those schools and they want the schools to be safe and orderly. It is insane to set up a system where we move 98 percent of our kids away from the 2 percent who are dangerous, instead of moving the 2 percent away from the 98 percent who are okay. We need to have disciplinary codes that spell out unacceptable behavior and the consequences of that behavior—and we need to enforce those codes, strictly and fairly. We need changes in our legal system. And we need to have one standard for all students.

How are we going to accomplish all this? First of all, by talking to our colleagues in the schools and then by taking the issue of violence and disorder in the schools to our communities. Independent surveys and our own polls show that the overwhelming majority of Americans put school safety at the top of their concerns. That includes African-American parents. Indeed, their support for the removal of violent and disruptive students is higher than any other group in our society. This support is not always apparent because, when a youngster is removed, some advocacy group starts making noise, and the school system doesn't stand up to the pressure.

It's time for us to turn to business groups, it's time for us to turn to parents' groups. When youngsters commit such acts, and when they've gotten their due-process rights, we need to have a system of public support. We need to have a lot of decent people in our communities who will stand up and say, "Look, we don't want to punish this kid, but for the sake of our children, you're going to have to keep that one away, until he is ready to come back and live in a decent way in society with all of the other youngsters."

I'm sure that if we take this back to our communities, and if we work on it, the appeal will be obvious. It's common sense. And it will help us save our schools and provide a decent education for all our children. □

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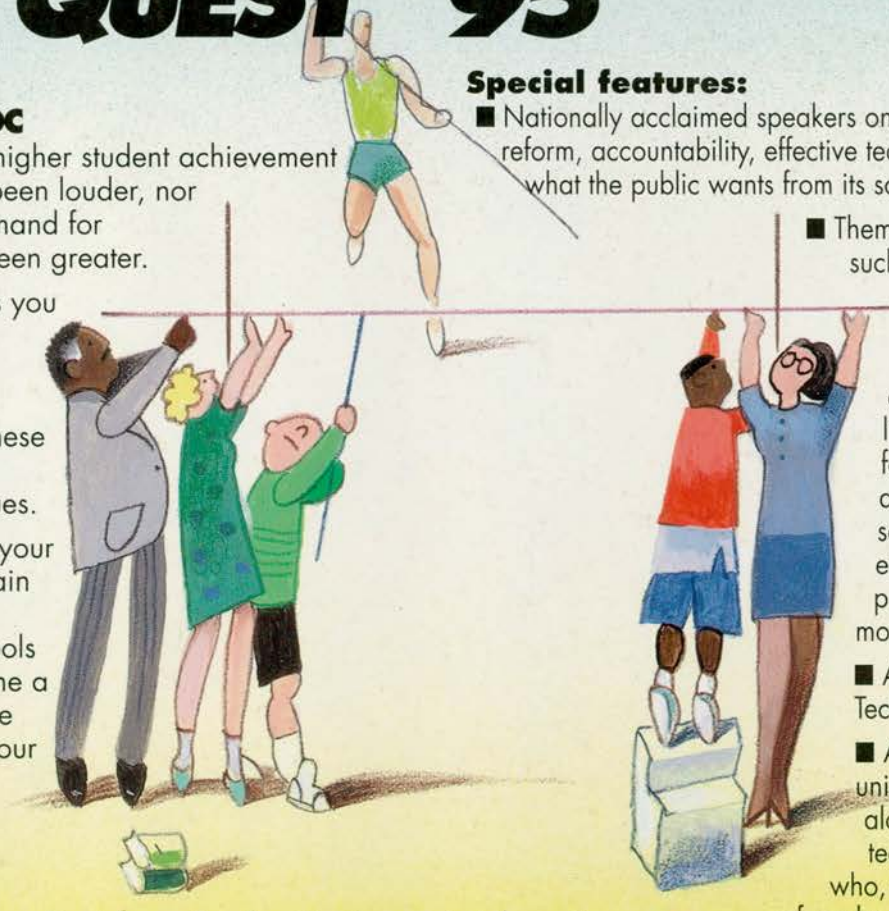

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