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Apr 29th, 1:00 PM

Paper Session III-C - Improving Public Education Beyond 2001

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Improving Public Education Beyond 2001

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ABSTRACT

The following paper is an investigation into deficiencies in the current education system, the assumptions upon which it is founded, and possible corrective actions. Suggested actions for remediation include: training, selection, and designation of Master Teachers, and extending their classroom availability through video and computer access; modifying the over-extended practice of tenure, along with an improved evaluation process to remove poor teachers and reward outstanding ones; the nation-wide establishment, and enforcement, of high performance standards; increased opportunities for above-average students, as well as segregation of problem students into an environment appropriate to them; elimination of large amounts of the administrative bureaucracy; and greatly expanded access to higher education and/or wider professional vocational training based on ability and effort, regardless of financial limitations.

INTRODUCTION

Without adequate education, our next generation will not only not be equipped to carry on the work begun by the pioneers of scientific research and space exploration; they will not be capable of coping with even the basic demands of survival of six billion people on a planet whose resources are rapidly being depleted to levels where recovery demands high technology or major expense. The current public education system was devised to meet the demands of a nation barely through the industrial revolution, and with a population of less than half of today's. Universities were designed for small numbers of the social elite, and high performers going into specialized fields. The idea of world-spanning businesses and globally-interdependent research was unimaginable. Yet we continue to utilize this outmoded system of teaching in an era when even concepts such as "Future Shock" are decades obsolete.

We need a major restructuring of an inadequate educational system in order to meet the challenges of a world-wide social and technical infrastructure. This paper presents potential solutions for overhauling public education to meet the demands of the next century.

Although there are students performing at high academic levels, they are significantly in the minority. The average student's SAT scores -- the most basic indicator of academic knowledge and critical thinking competence -- remain at an abysmal level.¹ It's considered "progress" that the percentage of fourth-graders who met the National Education Goals Panel's math standards rose from 13 in 1990 to 21 in 1996. For eighth-graders, it rose from 15 to 24. For 12th graders, from 12 to 16. Reading achievement was level for fourth- and eighth-graders, but the percentage of 12th-graders meeting the panel's standards dropped from 40 to 36 between 1992 and 1996.²

Scholastic performance is most closely linked, not with gender or race, but with income level, reflecting the education level of the parents. (See attached chart.) Common sense tells us that, if the parents are uneducated or uninterested, then the children are most likely to be, also. Extrapolation tells us that if we do not intervene to break the cycle, then an increasing number of children are going to be raised by parents who are themselves poorly educated.

We cannot count on just the few students who excel to adequately staff all the science, medical, engineering, and research positions that will be not only available in, but necessary to, the 21st century national and global infrastructure.

Today, reading and arithmetic are more important to surviving in society than at any previous time in history, and yet we see increasing numbers of students who graduate without those basic skills, not even counting those who drop out. College-level education is becoming a prerequisite for all but the most menial jobs, and yet the cost of that education is increasingly out of reach of the average student as the disparity between the wealthy and the middle-class grows wider. This results in a vicious cycle, eliminating the possibility of ever reaching the high-paying jobs for a growing pool of citizens, and leaving the potential of more and more of our would-be future engineers and doctors forever undeveloped.

According to the Third International Mathematics and Science Study (TIMSS), "Despite generally positive signs at the fourth grade level, by the time our students are ready to leave high school, they are doing so with an understanding of science that is significantly weaker than their peers in other countries. Our idea of "advanced" is clearly below international standards. And there appears to be a consistent weakness in our students' performance in physical sciences that becomes magnified over the years."³

A National Science Foundation study⁴ concluded that pre-college science education is so poor that the introductory college science and math courses screen out, by discouragement, all but the most advanced students, leaving most non-science/engineering college graduates -- including most prospective teachers -- virtually scientifically illiterate. (In a 1997 Gallup Poll survey, 70% of the respondents did not know how long it takes the Earth to make one orbit around the sun!) Because the teachers do not have the science instruction that stresses skills of inquiry and investigation, they simply never learn to use those methods in their teaching.

"No printed word nor spoken plea, Can teach young minds what they should be
Not all the books on all the shelves - But what the teachers are themselves." -- Sendecki

The first step in ensuring that students learn the essential skills is to demand that educators know the skills they themselves are expected to impart. This requires a two-pronged attack on the teaching establishment. "Tenure," originally intended to shield teachers from summary dismissal "without cause" (for example, in what today we would classify as sexual harassment), has been over-extended so as to make it nearly impossible to remove a bad instructor.¹¹ At the university level, tenure may still be necessary due to research and publication requirements, but in a public school system, it must either be drastically modified or eliminated. Competent teachers must be recruited, and a pay scale corresponding to subject knowledge and teaching skill must be established. In other words: pay good teachers what they're worth, and establish a way of proving they're worth the pay.

At the same time, incompetent or untrustworthy ones must be removed. A teacher who cannot adequately teach his subject, who belittles or physically endangers students, who allows personal problems to affect the classroom environment, does lasting harm to the student.¹¹

A DETROIT NEWS article reports the lack of relationship between teacher salary levels and performance (Naylor, 10/27). "Whether their graduates are marketable or can function in a complex workforce isn't factored into pay decisions at all," Charlene Haar, president of the Washington, D.C.-based Education Policy Institute said. According to the paper, the public is not upset over salary increases. They are frustrated that teachers "aren't required to prove they can produce good students." The recent release of new high school proficiency test results caused the furor, according to the Detroit News: "two-thirds of students taking the test flunked." The newspaper mentions that three states now link student and teacher achievement to pay increases; although merit raises are given to entire schools, not individual teachers.

Teachers should be evaluated by students as well as the school administration, instead of the current practice of relying on just one or two personal opinions to rate every teacher in a school. Student surveys are not, of course, a technical indicator, but with the questions tailored for age group, trends can easily be spotted. In the first three grades, empathy and the ability to

simplify concepts so that young students can grasp them for the first time is of highest importance. If more than half of the class rates the instructor as a "bad teacher," then that teacher is not suited for that position. In the second three grades, standard tests must be evaluated along with student questionnaires. If the majority of students are significantly behind in verbal or mathematical skills, then that teacher's competence is in question.

"Educators and communities should not look the other way if a teacher is not performing up to standard."¹⁶ Sixty-two percent of teachers say that teachers should be required to pass a state board exam to prove their knowledge in the subjects they teach, in addition to meeting college requirements for a teacher's certificate, yet the percentage of high school teachers with an undergraduate degree in their main teaching assignment is dropping (from 66 to 63 between 1991 and 1994.²) To improve standard performance, all teachers at the high school level should be required to take a national test such as the regular student SAT. They must score in the upper quartile of the subject they are teaching, and the upper half on general scores. Teachers who cannot score higher than the students they are supposed to be teaching are certainly not in the students' best interest.

Standardized requirements are absolutely necessary. (67% of teachers say all high school students should be required to pass a standard nationwide exam in order to receive a high school diploma.²) While liberal arts electives may provide long-neglected perspectives (history, ethics, etc.), the fact remains that mathematics, chemistry, biology, and physics are vital basic building blocks in a technological society. Access to computers and training in critical thinking are also indispensable components of contemporary education. (Eighty-five percent of public school teachers said providing all students with access to global electronic communication systems such as the Internet is important, and 84% said the primary purpose of public education is "to prepare students to become responsible citizens,"² which absolutely requires that citizen to at least understand the impact of scientific knowledge on their lives.)

The administrative bureaucracy of the educational system must also be overhauled. Whether local school boards and their staff are even necessary is questionable, being purely political entities. Certainly their salaries and support requirements are disproportional to their few actual responsibilities. Teachers and the public agree that local teachers are the group most committed to improving education. Few teachers responded that their governor and state legislature are committed to improving public education.²

School administrations are assigned two separate functions: physical upkeep and educational selection policy. The former would be best served by selected businesses qualified to evaluate the condition of existing structures, determine and prioritize the extent of necessary repairs, and perform engineering oversight on the construction, removing the function entirely from the education system. The latter is overly-politicized and under-standardized. A full range of updated curricula needs to be selected at the national rather than local level, with input from both educators and vocational specialists. Local levels should only be responsible for allocation of certain resources, such as computers, and evaluation of individual teachers.

Nationwide policies must contain specific guidelines for educational assignments, including directives on homework and field trips. Many teachers today do not assign homework at all, unwilling to take the time to prepare or grade it. Parents who wish to be involved in their child's education are frustrated because they have no idea what subject the student is covering or how well he or she is doing. Tests are also often not graded or returned in a timely manner, depriving the student and the parent of important indicators of where extra effort is needed.¹¹

The policy on out-of-the-classroom activities varies widely even within the same school, affording some students a much more eclectic range of experience than others. Some school-sponsored extra-curricular activities depend on the parent's ability to pay, others on individual teachers. Obviously the teacher who organizes a trip to a science center or museum is benefiting her students more than the teacher who takes a class to watch a sports event.

"Children with special abilities and skills need to be nourished and encouraged. They are a national treasure. Challenging programs for the 'gifted' are sometimes decried as 'elitism.' Why aren't intensive practice sessions for varsity football, baseball, and basketball players and inter-school competition deemed elitism? After all, only the most gifted athletes participate.

There is a self-defeating double standard at work here, nationwide."

- Carl Sagan, The Demon-Haunted World

The trend toward "mainstreaming" or "leveling," while noble in theory, has in practice proven a dismal mistake. Students of average and above-average potential are dragged down to the lowest common denominators of the class. Not only is the potential of the fair and good student not developed, while attention and energy are focused on the slowest students, but the brighter students become bored and disillusioned with learning in general. Pretending that all students have equal capacity for learning is cheating those who need extra instruction, cheating those who are ready to learn more, and cheating us all of their future potential. Without challenging and stimulating learning environment, dropping out of school actually occurs more often among average or above average students than among borderline students. (An average of 3,878 teenagers drop out of school daily; an estimated 1 million drop out every year.)⁵

Lack of gifted programs deprives society of its best performers by limiting their ability to reach their full potential. Levels of ability shown in science fairs and academic competitions differ greatly from school to school, not because of any socioeconomic factors relating to the neighborhood -- many draw from a variety of neighborhoods, and public and private schools in the same area compete. The decisive indicator for high achievement is directly related to the quality of the advanced classes offered.

Advanced Placement classes and the College Level Examination Program (CLEP) have proven successful in increasing the scholastic level of those going on to college, and there are now resources on the Web for independent study for gifted students.⁶ However, particularly at the elementary and middle school grades, most schools still treat all their students as if they were at the same level. Thus in the same science class you have a few students who are ready to start laboratory work, and some who are still struggling with the concept of atoms. This frustrates both the gifted students and the slow ones, fostering resentment on both sides.¹¹

"Anyone who cannot cope with mathematics is not fully human. At best he is a tolerable subhuman who has learned to wear shoes, bathe, and not make messes in the house."

-- Robert A. Heinlein, author and engineer

Some object that labeling students as "average" or "below average" will have a negative effect on their self-esteem and will to learn, but the opposite seems to be the case. Research conducted by Harold Stevenson and James Stigler, psychologists who examined academic skill levels of elementary school students in Japan, Taiwan, China, and the U.S. According to their study, Asian students outperformed their American counterparts; however, U.S. students exhibited a significantly higher self-evaluation of their academic prowess than their foreign peers. "In other words, they combined a lousy performance with a high sense of self-esteem," writes Shokraii. (See DRC 12/4/92 for a report on the Stevenson/Stigler cross-national studies). Stevenson and Stigler also found that American teachers focus more on sensitivity to student egos, whereas Asians concentrate on their ability to explain things clearly; that American teachers rarely exposed a student's poor performance, while Asian teachers viewed mistakes as an index of what remains to be learned through persistence and increased effort.⁷

Hostess to guests: "I have exciting news! My son just finished his first book."

Newspaper publisher: "That's great! How old is the little fellow now?"

Hostess: "He'll be 23 next March." -- Fred Krupski, Editor, News Observer, January 1, 1998

At the other end of the spectrum are the students with discipline problems, unable or unwilling to learn regardless of ability. Current practice is to lump these "troublemakers" in with the student body, resulting in higher rates of violence and illegal activity within the schools. Overall student drug use is increasing, with 40 percent of 10th-graders reporting use of any illicit drug in 1996, compared with 24 percent in 1991. The number of drug sales reported at schools rose. Teachers reported increases in threats and injuries, from 10 percent of teachers in 1991 to 15 percent in 1994. Secondary school teachers reported an increase in class disruptions by students, from 37 percent in 1991 to 46 percent in 1994.²

It is not conducive to a learning environment when a student fears for his or her safety, or when a teacher is forced to contend with chronic absenteeism and disruptive behavior. These students should be removed from the general student population and placed under an authority capable of dealing with their lack of interest. Those teachers who do not qualify for a position in more academically-oriented classes may choose this avenue, or other specially-trained instructors may be recruited. (In 1984 and 1989, teachers blamed low salaries for the exodus of teachers from the profession. Today, teachers, for the first time, point to discipline problems as the main reason their colleagues leave teaching.⁷)

The cost of additional testing and evaluation of teachers, and establishment of expanded tracks for different learning capabilities, is not as prohibitive as the "old school" may believe. Consider the budget of the Department of Defense: \$400 Billion, as opposed to the Department of Education's paltry \$27 Billion. A portion of the military budget goes to retraining recruits who enter the service without the skills they were supposed to have learned in public school. Consider the cost to industry when many of the entry-level workers can barely read or write, and many of the technical workers have so little grasp of basic math and science that they must be taught to perform by rote. Industries estimate that they spend billions every year training new workers at entry-level skills. Shifting these costs back to the public schools where they belong would drastically reduce the lost productivity, uncertainty, and reluctance to create new jobs of businesses faced with a workforce whose education is unreliable.

For example, only the upper 8% of high school students in California are admitted to the University of California. The entrance requirements are intended to weed out the non-learners: at least a B+ average in two years of math, two years of language, one year of science, one of history, and three years of English. And yet a solid half of this upper elite 8%, old enough to vote, cannot pass a basic literacy test and must take remedial English in college.

If students would graduate high school able to read at the level of a 12-year-old at the turn of the century, there would be no need for wasting university funding on remedial programs, and greatly decreased costs for adult high-school equivalency classes. It should be possible to realign the Department of Education's present budget to absorb the costs of changes by eliminating obsolete and unworkable program expenses without additional funding. After all, NASA's entire budget for all 18 space and science centers is less than half that (currently less than \$13 billion). And in addition to federal contributions to schools, states and counties also levy taxes intended to be spent on education. In my county, for example, every thousand dollars of value of your house (after a \$25K homestead exemption) is taxed \$5 for the School Board. The Florida state lottery provides an additional \$800 million (approximate), or about 7% of the state's total educational spending, every year.⁸ Schools already receive approximately \$80,000 per teacher for operating expenses.⁹

"A man's ethical behavior should be based effectually on sympathy, education, and social ties; no religious basis is necessary. Man would indeed be in a poor way if he had to be restrained by fear of punishment and hope of reward after death." -- Albert Einstein

One politically popular proposal is "school vouchers." But the poorly-disguised attempt to fund parochial schools with government money is simply **not an option**. The badly

misnamed "school choice" movement will lead only to four highly undesirable end results:

(1) public schools will become "educational ghettos" where only the poorest children go, as again more money is channeled into fewer hands. There will not be enough resources left to properly educate the children with intellectual potential who cannot afford private school, nor to provide the special training required by the physically challenged and mentally or emotionally handicapped. Public schools are already facing enormous financial burdens simply to meet the need for basic supplies and maintenance. Diverting funds from schools which serve all children to profit the elite few, in the name of expanding the numbers of those few, would leave schools for the lower-income children even poorer, a criminal misuse of citizen's tax money. And we, as citizens, would have no say in whether our taxes go to support a certain sectarian school.

(2) standards of quality among private schools already vary widely, following the standards of their individual owners, with the curriculum all but uncontrolled. With the obvious increase in the number of private schools created to meet the increased number of subsidized students, there will be no way of ensuring that they educate students with the necessary basic grounding in math, science, communications skills (i.e. reading and writing), and history. Each school will have its own criteria, subject material, and even specialized parochial allowances for graduation (i.e. a passing grade in religion cancels out a failing grade in science, which has been made public in a number of private schools) according to the whim of local administrators.

(3) a "preferred religion" will be reinforced according to money and power associated with the religious backers of the sectarian school, resulting in increased religious bias. Too, since "private" schools are not required to abide by the principles of non-discrimination, there will be increased prejudice on the basis of gender, race, and disability.

(4) "voucher money" encourages private schools to inflate their tuition by a proportional amount, particularly those "upper crust" schools which wish to maintain a limited clientele -- transferring yet more funds from the lower and middle class to the control of the very wealthiest.

And there is always the truly destructive possibility that private elementary education will become vulnerable to the same sort of influence-peddling that now goes on at some private universities. Junior's flunking math? Quick, dad, provide new computers for the school.

According to a mail survey of 2,000 public school teachers nationwide,¹⁰ teachers oppose government-sponsored vouchers by a 4-1 margin. Those pushing for tax-funded vouchers claim that this is "because teachers' unions want to protect bad teachers," when in fact the opposite is true: incompetent teachers are better protected at parochial schools than in public ones.¹¹ And good teachers are often hamstrung by parochial limitations.¹² Disturbingly, the well-funded campaigns by religious organizations to gain more power over the educational system have resulted in 43% of the general public responding in favor of government vouchers, and 36% who favor having tax money pick up the entire tab for private schools.

(The general public also demonstrates other uninformed beliefs, such as responding that the dropout rate is higher now than 25 years ago, although government data shows the dropout rate itself declining steadily for the past 50 years. Lack of parental involvement was the largest problem faced by public education, according to the teachers, although the general public tended to blame "society," citing drug abuse as the schools' number one enemy.)

"Home Schooling" also seems to be increasing in popularity, at least in the media. There are two valid reasons for invoking the Home School option: a threat to the child's well being, or to the classmates'. A chronically ill child may be better off outside the classroom environment. In areas where violence is pervasive and inescapable, the stress may make it impossible for a child to learn; staying home may be necessary to their sanity or their life.¹³ (See recommendations for segregating the student offenders.)

Home Schooling is not recommended except in those extreme conditions, however. One, the student misses out on an important part of social development in learning to interact with peers. Two, few adults are competent to teach their children a variety of subjects. Three,

those most likely to prefer home schooling are those least likely to impart scientific or factual knowledge: the most common reason given for keeping children home from school is "I didn't want them to learn (fill in the blank)," evolution and sex education being the most common. Obviously, prevention of knowledge is exactly contrary to our purposes.

Since it is impossible to eliminate home schooling, increased efforts need to be made to improve it. The student should, of course, take the same standardized test as the peer age/grade, deficiencies noted, and no passing grade issued until they are corrected. The World Wide Web is a resource only recently available and still expanding in scope. However, most home schooling sites remain mostly on the Public Relations level, with links containing articles on support groups, political news, and how to fill out the paperwork, but little on education topics themselves.¹⁴ At very least, home-schoolers need to be provided with the name of the books the age/class peers are working from (and/or its equivalents), and the annual schedule.

"Cyberspace schooling" is in its infancy, but there are already hundreds of links with programs of various usability. Cyberspace participation in education should be considered purely extra-curricular until there are national (or even world-wide) standards established for accreditation in any subject via on-line schoolwork, similar to taking classes by mail.

"Block scheduling" has been touted as a way to allow more intensive teaching, improve discipline, and save money. However, there are some serious problems with the concept¹⁵, including the limitations of student attention spans, and the loss of potential loss of some subjects. The concept may have some application, but should not be universally embraced.

"If you need to recruit and train a thousand superb people, in any field, the best way to do it is recruit and train a million people, and then pick the best ten percent. ...The result is, even though there are as many jerks as ever, they are all jerks with jobs, generally good jobs, with homes and cars and something to lose, so they behave themselves. No such thing as high crime areas anymore." - Buzz Aldrin, Encounter with Tiber

As an extension of the above, there are two proven methods for increasing both student and teacher performance, one old and one new. In fact, the two can now be combined.

There has long been a program of designating Master Teachers -- instructors who had been recognized as being the best in their field. The current federal budget allows for 100,000 teachers in the next 10 years to be accredited by the National Board for Professional Teaching Standards, and awarded the status of Master Teacher.¹⁶ These Master Teachers need not be limited to their own schools, or to mentoring other teachers in their own locales.

Today, Instructional System Development (ISD, an Information Technology System) is common -- teaching by computer and video. Master Teachers should not only be sought out, but their lessons preserved on interactive computer programs and videotape, for use in teaching all over the country -- all over the world -- and for teaching future generations. This mitigates the problem of having enough teachers to maintain small classroom sizes by effectively adding to the teachers' time and resources.

Another improvement which can be immediately implemented with just a policy announcement is expansion of "reality based" (or "hands-on") education. Many classrooms are not even using the simple tool of having solid objects in the room to demonstrate weights and volumes. Vocational ("real life skills") classes should be offered to all students. Relating book learning to its real-world application increases both student interest and retention of the material. Role models can be employed via videotape, from non-traditional speakers (female construction workers, male nurses) to celebrities (astronauts, sports stars) talking about the commitment needed to get where they are. The perception that science is "boring" can easily be countered by enthusiastic scientists and engineers describing the thrill of discovery.

Expansion of the internet into schools is vital not only for the students' sakes. A high proportion of the teachers' and administrators' time is taken up filling out attendance and

performance forms by hand, and recopying the information in different formats for the various required reports. What would take ten minutes on a spreadsheet and e-mail often takes ten hours a week at many schools.¹¹

Finally, in order to meet the demands of new technology in the 21st century, access to higher education must be drastically improved for all students with the ability and the willingness to learn. Current financial aid programs (scholarships, loans, student jobs) are not sufficient for many middle and lower class children to afford a four-year college. Post-graduate education is unattainable for many. Students with the potential to go on for technical Master's and Doctorate degrees should be able to do so without having to "drop out" to support themselves. In addition to federal government grants (over \$30 billion to more than 7 million students each year), ways must be found for private industry and universities to help increase accessibility in exchange for high performance. Low-cost housing should be available for research students, supplemented by a wage for part-time teaching or work in their field. Ownership of developments resulting from up-front expenditures could encourage companies with interest in the applications of certain fields to fund graduate education, but pure research for the sake of research must also be well-funded. Many valuable discoveries have been made by serendipitous accident.

The only way to meet the challenges of space exploration, as well as survival here on Earth in the face of rapidly changing technology, is to invest in major changes to the educational system from the ground up. More now than ever, and old cliché is applicable:

"If you think education is expensive, try ignorance."

¹ U. S. Department of Education, "National Excellence: A Case for Developing America's Talent," October 1993

² The seventh annual report of the National Education Goals Panel compiles findings from numerous studies, national examinations and surveys. The panel comprises eight governors, four members of Congress, four state legislators, Education Secretary Richard Riley and his senior adviser, Carol H. Rasco.

³ National Center for Education Statistics as of June 10, 1997: Compared to the 41 nations, U.S. 8th graders score below average in mathematics achievement and above average in science achievement while U.S. fourth graders performed above average out of the 26 TIMSS countries in both mathematics and science achievement.

⁴ Shaping the Future: New Expectations for Undergraduate Education in Science, Mathematics, Engineering, and Technology

⁵ Center of interdisciplinary Study of Dropout Prevention and of Youth Opportunity Unlimited

⁶ For example, the Education Program for Gifted Youth, Stanford University, Stanford CA

⁷ The DAILY REPORT CARD, published by the American Political Network with support from the Annie E. Casey Foundation, 8 November 1996

⁸ Florida Department of Education Commissioner Frank T. Brogan, November 1995. The Florida Lottery is required by law to return 50% of the proceeds for prize payout, 38% to the Educational Enhancement Trust Fund, and 12% for administration.

⁹ Significant Budget Detail, School District and County Office Revenue Limits, 1996-97.

¹⁰ The 28th Annual Phi Delta Kappa/Gallup Poll of the Public's Attitudes Towards the Public Schools, Stanley M. Elam, Lowell C. Rose, and Alec M. Gallup, September 1996. The margin of error was plus or minus 5%.

¹¹ Personal Experience

¹² In Florida, for example, it is standard practice for religious schools to preach the Bible as literal history, and to require that Creationism be taught as a valid alternative to Evolution.

¹³ Mrs. Marji Holt, Santa Maria, CA, ssjx82a@prodigy.com

¹⁴ Homeschooling Information and Resource Pages, www.home-ed.com/

¹⁵ <http://www.athenet.net/~jlindsay/Block.shtml#tips>

¹⁶ "Talented Teachers in Every Classroom," President Clinton's Call to Action for American Education in the 21st Century