Restore classical education to the secondary classroom

Part 2, by Lyndon H. LaRouche, Jr.

On July 26, 1985, Lyndon LaRouche addressed an open letter to Albert Shanker, president of the United Federation of Teachers, putting forward a program for reforming American education. The letter was published as an appendix in EIR*'s April 1986 Special Report on "The Libertarian Conspiracy to Destroy America's Schools." We publish below the second of a two-part series of excerpts from that report. Part I appeared in our Aug. 28 issue.*

LaRouche's document introduces a new series on the issue of curriculum reform. Contributions to the debate are welcome, and, if thought-provoking and moral in their outlook, will be published even if the editors do not agree with them.

The text published here continues LaRouche's section subtitled "topical composition of public education." The author argued that all teaching is properly subsumed under three general classifications of language: 1) the language of vision; 2) the language of hearing; and 3) the language of well-tempered polyphony. The language of vision is founded upon synthetic geometry, and leads into both mathematical physics and the plastic arts, LaRouche wrote. Here, he continues that discussion.

The language of vision

The notion associated with the misleading term, "imaginary numbers," arose, beginning in the 16th century, because the existence of any physical action corresponding to such numbers, was deemed to lie outside the universe as defined by delusions of sense-certainty. The significance of the work of Gauss and his collaborators, is that they showed that all physical reality lies ontologically in a complex domain, such that complex numbers represent merely a way of stating the elementarity of cylindric or conic forms of circular action, as an algebraic description of this locus of action.

This references a problem which Plato had already adduced by aid of proof supplied by the Cyrenaic temple of Ammon, that in Euclidean space only five kinds of regular polyhedra can be constructed, the "five Platonic solids." The existence of forms in physical space-time, which are incommensurable with construction in Euclidean space, suffices to demonstrate that efficient existence lies beyond the bounds of Euclidean space, and that a naive variety of sense-certainty is a false representation of reality.

The methodological root of the difficulties is most easily located from the vantage-point of classical philology. Prior to the emergence of neo-Aristotelian, Ptolemaic nominalism in grammar, Panini had already shown that the correlative of experience of physical space-time, is the transitive verb, not the noun. We experience physical space-time as finite intervals of perception. What we experience, is not a "thing" as such, but rather a transformation of the phase-space perceived. Thus, the transitive verb expresses the action (transformation) perceived, and the other elements of the statement, associated with the transitive verb, have the function of delimiters, "benchmarks," of the action perceived.

Naive sense-certainty corresponds to the Cartesian manifold, of point-masses moving in a straight line unless acted upon by intervening forces. The fact, that any point-mass must have "infinite" density of mass, never seems to trouble the conscience of a fanatical Cartesian. Nor is the Cartesian troubled by the fact, that perception of infinitesimals never occurs, that the smallest unit of action is the quantum of action.

Beginning with the discoveries of Nicolaus of Cusa, as reported both in his 1440 *De Docta Ignorantia* and his sermons on the subject of his studies of Archimedes' quadrature of the circle, through the work of Pacioli, Leonardo, Kepler,

Benjamin Franklin, the scientist and master-statesman, at work in his laboratory. "History taught from a republican vantage-point, affords the student a wide variety of 'models' of lives which either succeeded, or should have been permitted to succeed, for the advantage of then-present and later generations."

and Leibniz, the method of this current of modern science has been the method of synthetic, or constructive, geometry. In this method, only circular action acting upon circular action has self-evidently elementary existence, such that all other forms, including points and straight lines, are merely products of construction by means of circular action upon circular action: singularities. The isoperimetric principle, the later elaboration of Cusa's "Maximum Minimum Principle," becomes Leibniz's Principle of Least Action.

As distinct from Euler's definitions of singularities in Euclidean or quasi-Euclidean space, the Weierstrass definition of discontinuities in a continuous function, exposing the fallacy embedded within Fourier Analysis, confronts us with a higher order of singularities, of which so-called elementary particles are one example. This leads, in the work of Riemann, to the proof that physical space-time is spherical, and characterized by hyperspherical functions correlate with the principle of the Riemann Surface.

From the Cartesian standpoint, mathematics is axiomatically distinct from physics, to the degree that a "pure mathematics" is essentially an axiomatic-deductive form of symbolic philosophy. In contrast, among Gauss and his collaborators, all mathematics is properly defined as merely a reflection of a higher order of synthetic geometry, the synthetic geometry of Riemannian physical space-time. In this latter case, geometry is implicitly in precise correlation with ontology, to the effect that mathematics and physics are one and the same.

Thus, the plastic arts and mathematical physics are sibling children of synthetic geometry.

Take the instance of the history of the differential calculus.

To construct a necessary determination of the solar orbits, Kepler required that the laws of the universe subsume harmonic orderings consistent with the Golden Section, relying upon the work on biology and geometry of Pacioli and Leonardo to this point. Contrary to popular legend, Kepler's starting-point was not Copernicus, but the solar hypothesis of Nicolaus of Cusa, correlate with Cusa's *Globusspiel*. Kepler modified Cusa's solar hypothesis, by defining the Golden Section as the metrical characteristic of astrophysical laws. He employed the relationship of the Golden Section, as characteristic of the determination of the five Platonic solids, as the basis for elaborating what is most usefully and strictly defined as a topology of solar space.

Contrary to much classroom and other legend, Kepler's laws are the most accurate devised to the present date. Unfortunately, Kepler's texts have been so far only partially translated into English, and most of the commentary on his work has been plainly based on ignoring those texts. However, in this work, Kepler encountered two principal problems whose solution he explicitly recommended to his successors. The first, was the analysis of elliptic functions, principally solved by Gauss and his collaborators. The second was Kepler's

requirements for a differential calculus, attempted by Pascal, and solved, during the 1673-76 interval, by Leibniz.

If we substitute conic self-similar-spiral action, as the determinant of the solar orbits, rather than simply circular action in Euclidean space, the determined orbits are elliptic to the effect of Kepler's Laws. This projection is necessary, since any physical space-time characterized by the harmonics of the Golden Section is necessarily a projected image of conic self-similar-spiral action. Kepler's determination, of both the necessity for the existence of an exploded planet between the orbits of Mars and Jupiter, and his supplying the harmonic values for that planet's orbit, was later first proven by Gauss to be the orbital values for the principal asteroids. In short, Kepler's laws have this crucial-experimental corroboration.

Pascal's work on differential-number series, prefiguring Euler's work in topology, provided Leibniz the point of reference for constructing the differential calculus. From this vantage-point, the elementary functions of the differential calculus are directly obtained by geometrical constructions, without resort to either algebraic-deductive mystification or Cauchy's notorious triangles. If the relevant items from the internal history of science, from Cusa, through Pacioli-Leonardo, Kepler, Pascal, and Leibniz, were consulted by putative historians of science, the matter would be accurately and irrefutably clear.

The point to be stressed is, that if the primary and secondary mathematics curriculum adopted the standpoint of synthetic geometry, advancement in mathematical comprehension would be more rapid and comprehensive, and the student would have the advantage of independent verification of principles, without resort to "drill and grill" in axiomatic-deductive arithmetics.

This Riemann stressed to Betti. The Italian school of hydrodynamics, from Betti and Beltrami, through Levi-Civita, et al., was a direct offshoot of Göttingen, beginning in the late 1850s. Betti and Beltrami's closest collaborator at Göttingen was Riemann, who spent the last years of his life, dying from tuberculosis, chiefly in Italy, where he collaborated most closely with Betti. Already, political interferences were destroying Göttingen's vitality—until the later attempt to revive it under the leadership of Felix Klein, et al. Riemann was concerned to assist his Italian friends in reproducing and continuing the Göttingen tradition of Gauss in the Milan-centered circles of Cavour. Betti's notebooks, and some of the continuation of Riemann's work in electrodynamics by Beltrami, afford us today the most precise indication of the content of the collaboration. In their conversational walks, according to Betti, Riemann stressed most strongly, the importance of grounding the education of scientific workers in Jacob Steiner's elementary program in synthetic geometry.

Mathematics instruction today, ought to be reshaped from the standpoint of mastery of both the elementary synthetic geometry of Steiner, and the obvious elaboration of this as the synthetic geometry of the Gauss-Riemann domain. From this advanced vantage-point, crucial features of the internal history of modern science should be selected as the elements of progressive classroom work in secondary education.

This should include suitable reconstructions, in modern language, of the contributions of Nicolaus of Cusa, and should linger over the work on geometry and hydrodynamics of Leonardo da Vinci. This should be keyed to bringing the student through a program in synthetic geometry, up through the materials covered in the 10th through 13th books of Euclid's *Elements,* but using only the methods of synthetic geometry, not including any resorts to axiomatic-deductive methods. At this level, the student is equipped to assimilate the crucial contributions of Cusa, Pacioli, and Leonardo.

Beyond those foundations, the student is prepared to plunge into the works of both Gilbert and Kepler, and to work his way through as much of that as a modern standpoint requires. Then, selections of the work of Desargues, Fermat, and Pascal, followed by key selections of the work of Huygens and Leibniz. Key selections of the work of the Bernoullis and Euler should follow. Benjamin Franklin's work on electrodynamics should be presented. The work of Carnot and Monge on the theory of machines and initial founding of the theory of functions follows. Then, the student is prepared to face the elementary contributions of Gauss.

The better part of a semester is profitably spent upon working through Gauss's treatment of the arithmetic-geometric (and harmonic) mean in terms of conic self-similar-spiral action. The student thus comprehends what the term "elliptic function" signifies, without the usual mystification. The student is prepared, now, to undertake the elements of the functions of a complex domain, together with some basic geometric topology.

During this process, physics is introduced by means of classical crucial experiments, with emphasis on reproducing the elementary crucial experiments referenced by the sources used. This should be aimed to strengthen the student's sense of the correlation between experimental design and synthetic geometry.

It would be most useful, if we could secure two or three relatively higher altitude desert locations, each at different latitudes, at which secondary students reconstructed the kinds of solar-astronomical calendars we have from Vedic sources. The proposition might be: "Imagine yourselves a primitive people, with no textbooks, no calendars, no clocks, no telescopes. Construct an accurate solar-astronomical calendar." They would compare solar sightings by day, with corresponding night-time stellar configurations. They would construct their own instruments, of stone, wood, and metal. They would mark their observations, and would be encouraged to cheat to the point of using photography to assist them. Their efforts would be complemented by informed discussion of what they would discover, if they continued the right methods of observation for, first, five years, and then a score

of years. The difference in results at different latitudes would be compared and discussed. The hours not spent on the observations and constructions, would be passed with attention to other kinds of crucial experiments, or in classical drama and musical activities.

Again, the objective is to impart and nurture a sense of independent scientific authority in the students. Through the nurturing of such sense of independent scientific authority, the student is aided in adopting the standpoint of the creative thinkers encountered in source-materials. We must free our students of the habit of babbling what they hope will be mistaken for "right answers," to the effect that they attempt to get inside the skin of independent creative thinkers of the history of science, to become able to report why such and such a thinker must have necessarily approached a problem in a certain way.

There are two, complementary aspects to our chore of fostering the creative potentials of secondary-school graduates. First and foremost, we must situate the mind of the student in the way the history of progress was effected by creative personalities of the past. The student's sense of personal identity in current history must become a sense of being part of continuing the legacy of progress bestowed from the past to present and future generations. The student must develop a justified sense of acquiring the independent authority to render such judgments. Second, we must situate the nurturing of this general potentiality of the individual student, in respect to the kind of challenges which are emerging to dominate his adult life. This, respecting science, we know to be the three primary areas of scientific breakthrough we cited earlier.

This training in mathematical physics, should be accompanied by attention to the sibling-child of synthetic geometry, the plastic art-forms: painting, sculpture, and architecture. Simple Albertian perspective is a beginning. Then, Leonardo's corrections to Albertian perspective are introduced. The methods of Dürer are readily introduced to upper-level elementary as well as secondary grades. Observations of plants, in terms of Golden Section harmonics, are obvious undertakings. The notion of the harmonics of the Golden Section as the essence of the form of beauty, must be combined with the challenge of function. For example: Design the proportions of the interior rooms of a house, proportions which are both beautiful and functional.

History

Friedrich Schiller, Jena University Professor of Universal History, otherwise the leading dramatist and poet of Germany during his lifetime, and leading intellectual figure of the Weimar circle, emphasized, that all modern history can be studied from the vantage-point of the opposing models of society represented by Solon's republican reforms at Athens, as opposed to the model of slave-society represented by Lycurgus' Sparta.

"Objectively non-partisan" history, is a hoax. All known history, particularly of the cultures of the Mediterranean, is a continuing struggle between the republican currents traceable from Solon's reforms, through the Golden Renaissance and through Franklin's leadership of the American Revolution, against the opposing model of society. Spartan slave-society is one example of that opposing model. So are the ancient Mesopotamian empires, from Ur through the Achaeminid, and also the Roman, Byzantine, Ottoman, Hapsburg, Russian, and British empires. It is the ebb and flow in the power of the one form of society, with respect to that of the opposing model, and the relative development or retrogressions of societies founded according to republican principles, which are the central themes of competent history.

Our federal Constitution of 1787-89 established for the first time, a democratic form of sovereign constitutional republic, whose constitution and law-making processes were placed under the governance of that body of natural law whose modern articulation flows through the work of Cusa, Grotius, and Leibniz. The duty of teaching of history in public education, is: 1) to locate the identity of the student in the historical fact of the establishment of the United States; 2) to trace the history of the United States in terms of those forces which, respectively, aided or opposed the establishment of this constitutional republic; and 3) to trace the continuation of that factional affray, internationally, since the the period leading into and through the two wars against Britain, 1763-1815, and into our nation's struggle for continued existence after 1815, against those forces associated with Metternich and Castlereagh in the establishment of the Holy Alliance, at the 1815 Congress of Vienna.

The task of public education, is to elevate the student above the false patriotism of chauvinistic hostility to "outsiders." The task is, to inform the student that the creation of this republic, in face of its mortal adversaries, had a high moral purpose. The task is, to show what that purpose was, and whence in the history of Europe this cause originated and developed. The task is, to contrast the republican cause over the centuries preceding, accompanying, and following our revolution, with the wickedness of the adversary conceptions of society. The task is, to show what forces, in Europe and the Americas, rallied to make the establishment of our republic possible, and successful. The task is, to show the role which our republic is properly obliged to perform on behalf of the advancement of the republican cause throughout the world.

The focus of such education, is to impart to the student a proper sense of the potential importance and limitations of his own individuality. On the one hand, all discoveries, in science, in artistic production, and in public policy, originate within the bounds of creative reason of the individual in society. Insofar as the individual contributes so, the individual's contributions have universal importance to present and future generations. Yet, the isolated individual is mortal, and is relatively weak, relative to the forces of society at large.

The possibility that an individual may succeed in contributing good to society, depends upon the disposition of institutions of society, to foster the good and abhor the evil. It is through such private and public institutions of society, that the individual's contribution is either nullified or made efficient. It is the shaping of those institutions, in such respects, which therefore ought to be a prime concern of the individual.

Such propositions render the study of history a science. The student discovers how acts of commission and omission in meeting the challenges of public policy, cause the doom, or the success, of nations. The student discovers, from the laboratory of history, how individuals have acted, or have failed to act, to contribute to necessary changes in both choices of policies and also habits of policy-shaping. These matters, the student judges by the yardsticks of republicanism, in terms of the continuing conflict between republican and opposing forces.

Pompous sentiment purports to answer the question, "What will be the outcome of what I do with my life?" by regurgitating the old saw, "Only future historians can tell." What a silly, useless, species of historian that would be! It is within our means today, to precalculate what would be the consequences of the policies we promote or simply tolerate today. What do I care, while I am alive, what the judgment or lack of judgment upon my existence will be rendered by any body of future opinion, historians or others? I must know that I am doing the right thing while I am alive; I must include in that, reflection on which choices are more appropriate; it is that with which I must live. What some future opinion might say of me when I am dead, is altogether useless to me. The most I can know, and this I must know, is whether future opinion ought to judge my life a useful or useless one.

History taught from a republican vantage-point, affords the student a wide variety of "models" of lives which either succeeded, or should have been permitted to succeed, for the advantage of then-present and later generations. Whether the individual's efforts are successful, is only in small part that individual's responsibility; he is obliged only to make those efforts as successful as he has means to do. The major part of the responsibility lies with the more powerful institutions of society, which more or less efficiently dispose of his efforts. The individual must hold himself responsible for "doing the right thing," and must measure rightness in terms of duty to be useful to the republican's work of maintaining and improving the institutions and culture of his society. If he lives so, the individual has the right to walk in joyful self-esteem: "I am a useful person."

The included function of teaching history from a republican standpoint, is to afford the student the foundations for judging these matters.

American history proper begins in 1440 A.D., when the Council of Florence assembled maps for a proposed voyage to the new continent known to exist across the Atlantic, maps later used in part by an illiterate Genoese sailor, Christopher Columbus, for the voyage of his flotilla. The history of the United States is rooted in the proposals of Robert Dudley and other Tudor statesmen, to oust the Hapsburgs from their genocidal looting operations in the Americas, and to establish republics among the indigenous populations of the Americas. This deferred project began to be realized, in a modified form, by the founders of the Massachusetts Bay Colony.

From its founding, until the imposition of the Andros dictatorship, the traditions of the Winthrops and Mathers pioneered in all those features of democratic republicanism, including public education and the promotion of technological progress, which later came to distinguish the best features of the institutions and character of the United States.

The ruin into which the monarchies of Charles II, James II, and William of Orange plunged the English colonies in North America, began to be remedied during the latter part of the reign of Queen Anne. The leading feature of this brief upward turn in the politics of Britain, was the proposal to establish Gottfried Leibniz as prime minister of England, a scheme which intersected the influential Jonathan Swift and the adversaries of Marlborough. The appointment of Hunter and Spotswood as royal governors, and the alliance of this British faction with the faction of Cotton Mather, remobilized the republican forces of the colonies, and led, in the next generation, to the rising role of Benjamin Franklin, and of the family of later President George Washington.

Franklin, contrary to the fraudulent deprecation of his scientific and political work during the 19th century, was a giant of the 18th century. He was called "the Prometheus of the 18th century," and hated by the anti-electricity Mary Shelley of "Frankenstein" on that account. Beginning in 1766, he emerged in Europe both as a leading scientist and a master-statesman, rallying all of the republican leaders of Europe around his leadership. Leopold Mozart sent his later-famous son Wolfgang to Paris, to be in the milieu of the Franklin, for whose instrument, the glass harmonica, Mozart wrote a composition. Ludwig Beethoven dedicated the Ninth Symphony to Schiller's "God's sparks" reference to the great Franklin.

It is not distance which makes Franklin, Washington, and Hamilton appear, like Abraham Lincoln, relatively giants today. Relative to any leading party-figure of the present century, they were each and all towering giants.

The U.S. federal Constitution of 1787-89, and the efforts, by Lafayette's faction, to establish a French constitutional monarch informed by the U.S. precedent, prompted the ideals of the American constitutional democratic republic to be known worldwide as "the ideas of 1789." At that point, the course of history seemed to turn backward.

The first blow was the rise of the Jacobins in France, leading to the Jacobin Terror. The Jacobins were the political asset of Franklin's old Paris adversary, the Duke of Orleans. Orleans, backed by Swiss financier interests, organized and personally directed the storming of the Bastille, and later the

bloody abduction of the king and queen. Danton and Marat, trained in and dispatched from London, turned the Jacobin rule into a bloody tyranny. Lazare Carnot's role in overthrowing that tyranny was relatively short-lived, Carnot's defeat leading into the rise of a tyrant with delusions of Roman imperial power, Napoleon Bonaparte.

The cause of the "ideas of 1789" was then revived around the circles of Friedrich Schiller in Germany. The defeat of the Prussians at Jena, created the vacuum into which Humboldt, Scharnhorst, and Stein moved, both to introduce sweeping reforms into Germany, and to plan and direct the defeat of Napoleon's tyranny. Yet, the 1815 Treaty of Vienna undid most of the work of the German Liberation Wars, with Castlereagh conspiring with the owners of Metternich, to throw Europe back into deep feudal reaction.

After 1815, the relatively isolated United States, threatened from both Britain and the continental forces behind the Holy Alliance, lived a precarious existence, culminating in the civil war of 1861-65, out of which latter the United States emerged as the most powerful military power in the world, and as a new agro-industrial giant. Many of Lincoln's accomplishments were undermined by the Specie Resumption Act of the 1870s, and the succession of deep and prolonged monetary crises leading into the 1913 establishment of the Federal Reserve System. European rentier-finance and its extensions within the United States, established increasing control over the U.S.A.'s currency, banking system, and public and private debt.

So, during the recent hundred years, there has been an increasingly sharp contrast between the influence of trans-Atlantic rentier-finance over U.S. public and private institutions, and the American tradition of republicanism and fostering of scientific and technological progress. Since the full onset of the "post-industrial society" drive, approximately 20 years ago, the role of traditional American values in shaping the outlooks of the majority of the population, has been greatly weakened, to the effect that the political philosophy of the Tories of 1763-1815 is presently hegemonic in both public policy and the shaping of direction of changes in public opinion.

The critical period of change, which made the recent 20 years' "cultural paradigm-shift" possible, was the period from the assassination of McKinley to the death of Franklin Roosevelt. It was Teddy Roosevelt who ushered into play a comprehensive, systematic destruction of traditional American values. The overthrow of President Franklin Roosevelt's anti-colonialist postwar policy, consolidated at the State Department within approximately 48 hours of the President's untimely death, ensured that the American republican tradition would win the war only to lose the peace.

Today, those so-called developing nations and their governments, which seek nothing different than the United States sought in the war of 1776-83, and promised in the 1823 Monroe Doctrine, are confronted from the United States government with the same policies against which the Founding Fathers of the United States fought the war for American independence.

That summary is but a leading aspect of American history, but it serves to illustrate what American history ought to represent as a subject-matter.

In such a view, the most important lessons of history are not examples of simple successes. Usually, in fact, the wrong faction succeeds by a wide margin. The most important lessons are the apparent failures of well-chosen and well-served causes, which, despite the immediate lack of success, lay the foundations for subsequent accomplishment, through the impact of a well-fought fight radiating into later times.

So, it was well said of the July 20, 1944 effort to overthrow Hitler: Although crushed, had they not fought, Germany later would have had no memorably honorable heroes from that period. They were the more honorable, because the Allied governments, already committed to the Yalta agreements for the postwar division of Germany, refused to assist in making the revolt—which would have shortened the war by 10 months, and saved many, many lives—a success, for fear a German overthrow of Hitler would obstruct the division of postwar Germany. Should they have tried as they did? Of course.

The teaching of American history in secondary schools during the 1920s and 1930s, was already poor stuff on many counts. The textbooks were already permeated with what were readily provable, from primary sources, to have been substantially frauds. Yet, what was taught had at least a general resemblance to teaching of history. Increasingly, over the postwar period, especially the recent 20 years, the students are abysmally miseducated by the relative standard of the 1930s.

This shows most conspicuously, not only in the U.S. news media's treatment of foreign nations, but in the embarrassing behavior of U.S. official representatives and private citizens in various foreign nations, and in discussions of foreign policy in the U.S. Congress. We Americans nowadays, are ignorant chauvinists on foreign matters. We know nothing important about the history, culture, and leading concerns of governments and peoples of other nations, and we seem to care less whether or not our prejudices in these matters have any connection with fact. We are more less equally disgusting in our lack of knowledge of our own national history.

A proper approach to American history, is congruent with the historical method we require for mastery of all topics under the rubrics of the languages of vision, hearing, and music.

Methods of education

The shapers of public policy in education, seem to have failed to grasp, thus far, the nature of the difficulties of at-

tempting to provide equal quality of education to victims of "ghetto poverty." Barring the proverbial exception, it is impossible to impart high standards of literary, to pupils who live their out-of-school hours in the Hell of such neighborhoods. This becomes especially difficult, as the peer-groups of the school day are representatives of the peer-groups of the "poverty-ghetto" neighborhoods, and as the drug-culture and its correlatives become a dominant feature of the lives of students generally.

We proposed, during the 1960s, to extend quality education to all students. Yet, by the standards of the 1960s, most of those admitted, under these reforms, to what had been nominally quality-education classrooms, failed to achieve "passing-grade" levels of academic achievement. This was treated as a failure of the classroom, not the student; so, educational methods and standards were adjusted downward, to show that an increased portion of the student population achieved "passing grades." Essentially, the problem lay not in the classroom, but in the neighborhoods. Could we induce the student to embrace the prospect of upward mobility, as the compensating price for breaking with "neighborhood culture"? How could this be possible under circumstances of the declining economy of the past 15 years' slide into a drug-ridden, counter-culture-ridden, "post-industrial paradise"?

The essence of education is that it must be education for a purpose. It must be a means by which the potentialities of youth are developed in readiness for a meaningful life. It requires a background environment of cultural optimism, of exciting prospects visibly in progress. It must be circumscribed with the child's "When I grow up, I'm going to be—."

Education can never be more than an integral part of culture, of "enculturation" of the young, a mere facet of a total process, which process includes the home, the neighborhood, and the prospects of adult life. National policy, partly explicitly, partly by default, has transformed family, neighborhood, and prospects of adult life, into a dionysiac nightmare.

The time has come for a national youth-rehabilitation program better than the Civilian Conservation Corps (CCCs) of the 1930s. It is past time to match the lost generation of demoralized unemployed youth, with the needs of fresh-water management and other major elements of a wasting national basic economic infrastructure.

Had we our wits about us, we would enlarge the assignment of the U.S. Corps of Engineers to include a work-education program, through which credibility of upward mobility provided the motivating environment for remedial secondary education. Until we persuade youth generally that there is a meaningful future for them, the dionysiac cultural pessimism of the present will persist and grow worse.

Generally, there is no solution to the problems of education, unless we reverse the "post-industrial" drift, to increase rapidly the percentile of the total labor-force employed in industrial operatives' occupations. A very large and growing portion of the youth are not qualified for such employment, unless we provide a new environment, with credible circumstances and credible longer-range goals, which transforms the unemployables into qualified operatives.

There is no solution to the problems of education for children and youth in general, as long as these rotting ghettoes of poverty, resembling more and more bombed-out cities in postwar Europe, persist as the fate of so many. The percentile of the population sliding into poverty, is growing at a rapid rate. This we see in falling standards of nutrition, in housing, in collapsing levels of medical care. What used to be called "the middle class" is falling rapidly into these brackets, by market-basket standards. The bottom layer is being crushed.

The essence of education is that it must be education for a purpose. It must be a means by which the potentialities of youth are developed in readiness for a meaningful life. It requires a background environment of cultural optimism, of exciting prospects visibly in progress. It must be circumscribed with the child's "When I grow up, I'm going to be—." The basis for an optimistic belief by a child to such effect, is the perception that the society in general is moving in an upward direction.

In addition to the urgent reversals in national monetary and economic policy, indispensable to an environment for successful education, education requires a society which is adopting a prevailing consensus as to national goals. Economic justice on Earth, and the prospect of colonization of the Moon and Mars, are the obvious goals needed. Without both types of changes—changes in monetary and economic policy and in adoption of national goals—promises of successful educational programs are a delusion.

What the United States, and western civilization generally, both require urgently, is a commitment to unleash a new renaissance, not unlike the 15th century's Golden Renaissance. Classical education is an integral, indispensable feature of such a renaissance, but only an indispensable feature.

The launching of the kind of educational reforms indicated in this memorandum, could not be introduced simply across the board into public education today. A preparatory step is wanted. We must have "experimental schools" which pioneer in these reforms. Such schools should be fostered and established wherever peculiar combinations of factors determine that such a voluntary undertaking is feasible.

This signifies a group of parental households inclined to support such a policy. It indicates the development of the curricula needed by assistance from senior specialists. It requires teachers who already know methods of teaching, and who can adapt these mastered methods to enriched materials. The funds required would be larger than could be mustered by local communities' normal resources, but if such pilot programs were supported by broader associations which understood the larger importance of success of such experimental programs, adequate financing could be mustered even in these hard times.

While the battle is fought on the broader front, to reverse the recent decay in education, such experimental programs would represent the resource from which tested new directions in secondary education could supplement the broader effort. The more concrete general benefit of such experimental programs, is that these provide the means for assembling the educational materials for more general use.

The general feasibility of developing historical source-materials for the indicated uses, is already established in principle, through cumulative researches in the relevant archives of Europe and North America. Much work needs to be done, for such purposes as abstracting from the work of Cusa, the Leonardo codices, the work of Kepler, of Gilbert, of Pascal, and so forth. The entire history of Leibniz's 1672-76 development of the differential calculus, for example, exists, largely untouched, in the Leibniz archive in Hanover, Germany. The writings of Gauss which were not published during his lifetime, contain the keys to his published accomplishments. The same is broadly true for political history, for the history of music, and so forth. A number of task-forces would be required, for selections of the most suitable source-documents, for English translations of numerous of these, and so forth. Task-forces are also needed to standardize reproduction of crucial experiments and so forth from history. Task-force thought is needed, to assemble such materials into the form of a well-ordered curriculum. In summary, the undertaking is already shown to be feasible, but much work by specialists is needed to bring the mass of materials available into the form required.

The included results are: 1) source books in selected primary materials for each element and grade of the curriculum; 2) materials supplied to students and teachers, respectively, on experiments and other constructions; 3) materials supplied to teachers on proposed lesson-outlines, with emphasis on the sequences of conceptual steps required, to foster the students' ability to assimilate concepts as independently verified knowledge.

Method as such

The method of instruction used throughout, should be the Socratic method, strictly defined: the critical examination of the axioms implicitly underlying assumptions, as illustrated by Plato's dialogues.

One of the significant problems in this connection, is that Benjamin Jowett has been the pace-setter in English translations of Plato and other classical-Greek authors. It has been shown that Jowett garbled the meaning of Plato in translation, wherever Plato's writing was contrary either to a conception of Jowett's, or to the picture of Plato which Jowett wished to convey. Jowett's mistranslations of key terms, then worked their way, as preferred putative meanings, into the standard Greek-English lexicon. The condition of the German translations is significantly better.

On condition that such problems of translation are remedied, or in classes in classical Greek, it would be helpful to have the dialogues enacted as dramas, on condition that the students were rehearsed for their parts. It would be useful, similarly, to introduce Leibniz's synthesis of his own Socratic dialogues into the mathematical physics program, and to have these acted dramatically as a classroom project.

With aid of such exposure to classical Socratic dialogues, students should be assigned to construct their own Socratic dialogues, on the subject of some significant conceptions of the courses. The included object of such exercises, should be to wean the students away from tricks of rhetoric. Rather than seeking to defend an adopted position by tricks of debating, the student should desire to discover the truth of the matter, by aid of Socratic methods of criticism, and develop a self-critical attitude toward his own assumptions in this way. The Socratic method should become the accepted form of discussion between the students and teacher, and among the students themselves. This method should acquire moral force in the classroom, as the moral way of resolving issues in the educational process. The student's need to achieve independent authority respecting his knowledge and opinions, requires the establishment of some set of rules for this purpose. The rule employed to such effect, should become the Socratic method.

The teacher, and persons engaged in working-through proposed lesson-plans for classroom use, should bring forth in the subject-matter those issues which pose the conceptual problems in terms suited to Socratic dialogue.

The rules include:

1) Popular opinion has no intrinsic authority proximate to truth.

2) So-called authorities are often proven to have been mistaken, sometimes badly mistaken.

3) The fact that something appears to work, does not mean that that exhibition is not deceptive.

4) Even what has been proven true in a seemingly conclusive manner, is usually not the whole truth; scientific progress is chiefly a record of proof of the fallacies embedded in what are proven to be only half-truths.

5) What are the obvious or hidden assumptions, on which a reported conclusion depends? Let us examine these assumptions, before tying ourselves up in debate of the proposition based upon those assumptions.

6) All other necessary conditions being met, what you know is what you can construct.