EDUCATION AND NATIONAL STRENGTH

4 December 1963

CONTENTS

Page

INTRODUCTION--Colonel Edgar J. Ingmire, USA, Member of the Faculty, ICAF 1

SPEAKER--Dr. James E. Russell, Secretary, Educational Policies Commission, National Education Association 1

GENERAL DISCUSSION 15

NOTICE

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Publication No. L64-78

INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

Dr. James E. Russell, Secretary, Educational Policies Commission, National Education Association, was born 18 September 1916 in Nashville, Tennessee. He received his A.B. (1938) from Princeton University and A.M. (1939) Colombia Normale Superieure, Paris. He was instructor in government and assistant to the Dean of Columbia College, Columbia, University, 1946-1949, and assistant professor of political science, Johns Hopkins University, 1949. In 1950, he returned to Columbia University where he served as professor of education and deputy director of the Citizenship Education Project at Teachers College until the summer of 1957 when he accepted his present position with the National Education Association. He has served in the Federal Government several times. In 1941 and 1942 he was executive assistant of the National Citizenship Education Program, Department of Justice. Since 1951 he has been in charge of the revision of citizenship materials for use in all services, and consultant to the Departments of Defense, Army, Navy and Air Force. He has served as consultant to SHAPE on problems of orienting U.S. and Allied service men to their present missions, and recently served as special assistant to the Assistant Secretary of Defense for Manpower and Personnel. During World War II he was senior assistant to the deputy commander, U.S. Naval Forces in Europe. Dr. Russell is author of "Federal Activities in Higher Education after the Second World War," (New York, King's Crown Press, 1951) and editor, "National Policies for Education, Health and Social Services," (New York, Doubleday, 1955). He was a member of the International Affairs Committee of The National War College during the first semester 1952-1953, and a visiting lecturer on several occasions. This is his first lecture at the Industrial College.

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COLONEL INGMIRE: In our study of resources we will consider this period a somewhat intangible, but nevertheless real asset: Education.

Our speaker on the subject is Dr. James E. Russell, Secretary of the Educational Policies Commission. This Commission, formed in 1935 as a 20-member deliberative body of educator-statesmen, functions under the auspices of the National Education Association and the American Association of School Administrators. Among the members of the Commission have been such well-known statesmen and educators as Dr. James B. Conant; Mr. Ralph Bunche; President Dwight D. Eisenhower--of Columbia University, that is; Dr. James D. Killian, and Dr. Benjamin C. Willis, General Superintendent of Schools, in Chicago.

Obviously, the statements of the policy of the Commission influence American education because of the contributions of the distinguished Americans who serve on the Commission.

The position of our speaker today, in a term clear to this audience, can be described as "Chief of Staff" to the Commission. Dr. Russell brought to my attention that while his biography says that this is his first lecture at the Industrial College, it is not his first lecture to the Industrial College. For many years, at Joint Sessions of the War College he spoke to both the National War College and the Industrial College.

Dr. Russell, we are indeed pleased to have you speak to the class on the subject of "Education and National Strength."

DR. RUSSELL: General Stoughton; Mr. Chairman, Gentlemen: It is a pleasure to be asked to appear here in John Millett's place. I am sorry he cannot be here, but I welcome the opportunity

to speak to you on this subject. I think it is unusual--in fact I know it is--that you would be asked to listen to a speaker, some of whose effusions you have already read. I know that you have received a revised version of a lecture that I gave a few years ago at the neighboring day school. I do not intend to say anything I said in that lecture, but to take off from that point, and go on and say a few things that have come to my mind in the intervening years.

In speaking of the relative strengths of American education and how it contributes to or is associated with national security, I do not intend to say much about the Soviet schools. I have said something in the lecture you already have. I would add one point. There is an appalling amount of misinformation about Soviet education which is being deliberately propagated within the United States.

Not long ago--within the last couple of years--a certain American critic appeared before a Congressional Committee and presented a series of examination questions in the field of trigonometry which were given to Soviet students at the end of the Ten-Year-School, for their certificate. And he asked them to ask their teachers if American children could do the same problems. The questions were clearly above the abilities of most American high school pupils. He not only showed the exams, he also stated that the Soviet students who took these exams have "mastered the subject and it is theirs for life." You can imagine how this statement looks to persons who know the actual Soviet situation. The major journal of the Soviet educators is Sovietskaya Pedagogika published by the Academy of Pedagogical Sciences of the RSFSR. In the issue for the month in which this statement was made by this critic there was an article by N. K. Goncharov, who is the Vice President of the Academy, saying of the typical Soviet student that what he does is memorize answers to questions which he then forgets as soon as the exam is passed and that this is the typical Soviet situation.

I wonder whether a man who is the Vice President of the Academy of Teaching Sciences of the RSFSR is less well-informed than an American critic. I also wonder why, when this material was presented to the Congressional Committee, it was not also said that these questions are printed in booklets which are sold in Soviet bookstores from 3 months to 6 weeks in advance of the examination, and that the students know not only that these questions are going to appear on the exam but that they are going to have a choice of the questions.

The usual examining process is one in which a student comes to the teacher's desk, takes a piece of paper by lot, and looks at the questions. If he does not like them, he puts them down and takes another piece of paper. And on these pieces of paper there will typically be three questions, two of which will be drawn from these booklets which have been published in advance. The effect of this system is, of course, simply to produce a memoriter learning situation, in which the pupil spends months in advance of the exam memorizing answers to questions. Do you really think this is a significant type of learning or that it produces mastery of a subject and it is "his for life?"

So much for this. The truth is that the Soviet Ten-Year-School is not a challenge to the American school, and the newer Soviet Eleven-Year-School, which represents, as a matter of fact, a shift toward the direction in which American education grew, is also not a serious challenge to American education. The Soviet devotion to and support of education may be a challenge to us, but nothing going on in Soviet classrooms is a serious challenge. And we would not be talking about it were it not for politicians and persons who are seeking to have an impact on the general pattern of American education by political influence and headline-hunting. I therefore pass from this subject, which I think not worthy of significant attention at the Industrial College, to one which I think is.

This is not to identify the specific characteristics of American education--they are, I am sure, better known to you than they are to me--but to try to evaluate it. Take our system of education--the whole structure--the enterprise of education; public and private; higher and lower; pluralized as it is with its multiple goals and its fantastic diversity; does this system work? Well, how are you going to tell? You can ask yourself some questions: "Does it contribute to the well-being of an individual?" "Do people who have more schooling make more money?" "Is the nation better off?" And the answer is yes. In fact, you can measure it out and prove it. There is what we call a linear correlation. The more years that a human being spends in an American school, the more money he makes, on the average. You can prove it in terms of productivity of the person. And the thing checks out; it literally checks out year for year. Six years of schooling is better than five. Five is better than four.

Or you can take it in terms of military effectiveness. Look at draft rejections or any other measure of military effectiveness. This linear correlation recurs. Now, since this correlation is there, you have to say, "Well, irrespective of its quality, no matter what it is that they seem to be doing in these schools, for all their diversity, the fact is that the more time people spend there the better off we are. Therefore it must be okay." There is a whole school of people who argue this way. I suppose there is some validity to the argument. This is the same kind of argument that is made by the people who are talking about the carcinogenic effects of cigarette smoking. They establish these relationships and that proves their case. The only trouble with this line of argument is that it has proved the wrong case.

What it proves is that the planning we did for American education in, let's say, 1918, was sound. That was a great watershed year in American education; it was the year a little booklet called "Cardinal Principles of Secondary Education" emerged. This was the highwater mark of what I call the "behavioral movement" in American education. It said that the great goals of education are: command of fundamental processes; effective citizenship; good use of leisure time; ethical character; vocational competence; things of that sort. The pluralizing of the philosophy of American education dates from that time.

Was it wrong? Well, from the fact that we have proved that the schools we built on that philosophy are producing, in some sense, well for us, I take it that it could not be wrong. It had to be, in some part, right for then. But if you start to talk about policy; if you take education from the point of view from which you gentlemen must take it, you get a different answer. We must ask different questions. It is not enough to ask whether things that we did 50 years ago have been of benefit to our country. Our real concern is to decide what will we do now that will benefit our country in the future.

Furthermore, the future we must look at is not close. If you are proposing some kind of structural improvement which you might make in schools within a practicable future, you are referring to a rather distant future. If you knew what to do now--as of this minute--how long would it take before you could have constructed the legislative consensus at the national, state, and local levels that would enable you actually to impact what is done in schools? How much time would go by before you had political

effectiveness? Let us be unduly optimistic and say that if you are really clever at it, you could do it in 5 years. I do not think so, but just for the sake of argument let's say 5 years. How long, then, would it be before you really changed the school structure in any important way? Probably another 5 years.

How long would it then be before the children who are going to have this improved education would be through these schools? Certainly another decade. And how long then before they would have established a sufficient position for themselves that the improved education that you gave them would make any difference in American life? At least another 5 years. So, even on these minimum projections--all of which strike me as ridiculously tight--you are talking about something a quarter of a century away.

The scientists tell us that they have learned half of all that they know in the last decade. And they expect in the next decade again to double what is known. Changes are going on at a pace which tells us that our children are going to live in a different kind of world from the one we live in. Is there some device by which we might look at what we think will be the kinds of challenges our children are going to be facing a quarter of a century hence? If we can take that kind of a look, will we then see something we ought to know about what our schools should be doing?

I am asking you to shift the frame of reference with me; to take a look at the long future and then ask whether what we are doing now in American schools offers promise of meeting the challenges of the future with a degree of effectiveness parallel to that which we have already established for the past.

I think there is a way to look at what is going on in the world and to read out of it the educational challenges. If you look at what is changing the world today, what you find is a series of changes which we call profound. I am thinking of things like the technological revolution; revolutions in communication and transportation; the changing character of the American population; the movements of people from rural areas to urban areas, and from urban to suburban areas. I am thinking of the race for space and the harnessing of the atom and the cold war and the rising expectations of the underdeveloped peoples; pick your changes, any of them. These are things that we call profound. None of these changes ought to be called profound--any one of them. Every one of them is nothing but a surface reflection of a single change. There

is one thing changing, one only; that one thing is the role of the human mind in our lives. It is the role of the rational part of the human mind.

There are a great many things in life that are not changing in any appreciable degree. This has to do, for example, with the religious aspects of life. It has to do with the superstitional aspects; with the aesthetic aspects; with the emotional aspects. I think that human beings are going to continue to worship God, fall in love, admire beauty, and avoid black cats. But the ability to think is a a growing thing in our lives. And it is having an ever-increasing impact. Let me illustrate the point.

Take, for example, the deterioration of the cities. Look at Washington, D.C. What is it that is happening here? What is happening is that the white middle classes in Washington are moving out of the city. They are, in effect, fleeing. Well, why do they go? The real reason is the influx into the central city of people whom we are calling "disadvantaged." They are not all Negro, but they are largely Negro. They are people who move off the land of the South and bring into the city cultures which cannot be reconstituted in the city. These people cannot make a satisfactory adaptation, and they are producing a problem which is eating at the vitals of every American city.

Well, if they cannot make a successful adaptation to the city, why, you may ask, do they come? The reason they come to the city is that they have lost their economic role in the places they come from. Well, why have they lost their economic role? They lost it because it has become more profitable to harvest the staple crops of the South by machine than by hand. The crops are harvested better; there is better quality control; and you make more money. Consequently, what happens is that the person who owns the land encloses it and forces these people off the land. They leave the land, and they show upin the cities.

Well, why, you may ask, after 25,000 years of technology is it only now that mankind has come to the development of these machines? Clearly this is because of the development of the more basic sciences upon which technology depends. Why, you may then ask, do we come only now to scientific developments of this sort? And what you find as you go back down this route is that you come at last to a system of thought. What you are looking at is the rational tradition of the West. It is that force of the mind which

underlies modern science; underlies modern military science too; underlies the forces of change in jurisprudence, international relations and comparative theology; and any field you can think of.

This is a tradition which we can identify in terms of certain common symbols; things which the people who use these symbols understand in common; certain common processes of the mind such as synthesis and deduction; and certain common standards of accuracy--understanding of the meaning of such terms as consistency and relation; and common views of what constitutes logic, logical consistency, and the applicability of available evidence. It is this tradition which is changing our lives, and at such a rate that we are unable to keep up with it ourselves. I can illustrate the way it is doing it.

Take an object in one dimension. You say the dimension is X. I understand that what you are talking about is length, and I am happy with length. I have the sense that I have dealt with pieces of string and I know what it is. Take an object in two dimensions each of which is X, and you say X^2. You are talking about the area of something, and I am comfortable with you. I have bought and sold land and handled pieces of paper. You take an object in three dimensions each of which is X, and you say X^3. And I say yes, you are describing the volume of a cube; I am happy with that; I make martinis too. Then you say, all right, let us take an additional dimension, to make four, each of which is X. And you say X^4. Now you are describing the volume, or whatever you want to call it, of something in four dimensions.

But now you are no longer talking about an object. This is not something that anybody ever saw, or felt, or heard; this is a rational construct; something in and of the mind. Now, there was a concept very similar to X^4 which Einstein derived from the mathematics of Minkowsky when he made the shift from the special theory to the general theory of relativity. He used specifically--of course, he was using Cartesian coordinates--a fourth coordinate which he handled precisely as if he had gone up to X to the fourth power. And it was this insight which led to the additional insight that there would be gravitational effects on light passing through sufficiently strong gravitational fields, and that led to the hypothesis that if you could somehow blot out the sun you would see apparent displacements of the stars at its margin, because their light would be bent as it went past the sun.

And this led, of course, to the expeditions to West Africa and Brazil in 1919 when Eddington and other astronomers went out, got the sun blotted out, measured, and found these displacements. This was more than just another useful idea. It was not merely a pragmatic application of something; this was an event that told man the way to look at the world and know what is really there is not to follow commonsense; not to follow the evidence of the senses alone; but to look with instrumentalities that are independent of sense; that are not related to human behavior; that derive directly from the rational tradition.

This particular work was done between 1913 and 1915. The elucidation of it occurred in 1919. Yet, it was in 1918 that American education put itself firmly on the behavioral front. This was what I have called the "20th Century Fallacy." It was a fundamental error for purposes of our own future. I am not saying it was an error at that time; I am saying it is an error now.

You look at the force of the rational tradition and try to explain to yourself why is it that this thing has this power? Partly, of course, it is because people who build bridges, if they follow these lines, build bridges that stand up. This is a good way to organize production and win wars. But there is more to it than this.

On the one hand there is the ability of the rational tradition to cross cultural lines. Let me illustrate. If you use terms like beauty, decency, justice and freedom, you are using words with which we could disagree as to specifics, but I am sure we would all agree that these words mean something in our culture.

You can cross over into the Communist culture and you will find they use the same words. But you will find that although those words have substance there, the substances are not parallel. Consequently, for purposes of cross-cultural communication the use of these value-laden terms, far from introducing a factor of communication, actually introduces what the communicators call "noise." They are a positive source of confusion.

But look what happens when you move into nonverbal systems of communication. The workers on the Aswan Dam are working from engineering drawings made in the Soviet Union. To the extent that they have any words on them, they are Russian words. These people speak no Russian, but they build dams. Or look at

the International Geophysical Year in which scientists from over 50 nations were able to get together and establish an agreement as to what they were going to look for; what kinds of data they would seek; how they would evaluate the data; and what they understood they meant; all of this, pulling together across cultural lines. Or, to use an even more abstruse example, the expression $E=mc^2$, means in Peking exactly what it means in Washington. It is derived the same way; it has precisely the same function; it means the same thing.

Not only do you have a sort of universal system of communication in the rational tradition, you also have a common point of view as to what is real. There is a sort of metaphysical unity within the rational tradition. This was once not true. You recall when Dr. Johnson and Bishop Berkeley were arguing about the nature of reality and the Bishop said, "My good doctor, that stone there, how do you know that's a real stone?" The doctor reared back and kicked it and said, "That, sir, is how I know it." He broke his toe in the process. And this was always thought by history to be the proper riposte; Dr. Johnson has traditionally been thought to have won the argument.

But Dr. Johnson did not win this argument; he lost it. He was just plain wrong. Bishop Berkeley was a lot closer to the mark. What a modern mind will tell you today is, "We may not know what reality is, but we do know that it is certainly not what most people think it is." Most people impute reality to their own senses, to exactly Dr. Johnson's answer. "I know that stone is real because I can feel it." This is commonsense.

Einstein said of commonsense that it is a layer of prejudice laid down before the age of 18. To the extent that a matter is commonsense, in Einstein's parlance, this is prima facie evidence that the thing is probably wrong. The chances of its being right are not good enough to take seriously.

Most modern thinkers would agree that truth is not absolute but relative to point of view; that there are many ways to look at things; that, for example, a proposition derived from sense experience--let us say, "That is a chair"--such a proposition can be true only within the realm of sense experience. In effect, it is a chair to the person who sits on it. But a physicist cannot look at it and say it is a chair. What he says is, "It is a phenomenon of waves and particles in some probablistic relationship." He would

point to a probablistic universe, saying that,

> "In effect, those particles only make up anything that is that firm simply because there are so many particles there that the chances of their being in the state that they appear to be in are the overweaning chances, and you are not conscious of the remaining ones."

What emerges is a probablistic universe in which truth--to the extent there is any--is a property not of something objective, but of the mind of man. As Norbert Wiener said, in that elegant and trenchant phrase, a view of the world is emerging ". . . on which Bishop Berkeley might have smiled with pleasure."

This common view as to what is real also underlies the rational tradition. A typical assertion of this view would be: $E=mc^2$ may not be true, but it is truer than any preceding explanation of the same data. This would be a modern statement consistent with this view of the world.

Behind all these shared powers is a system of thinking. And this system of thinking is universal in its application. Here is an example. It is not a proposition, but concerns how the formula $E=mc^2$ was derived. This is a part also of the work done in developing the general theory of relativity. It is a different process of thought from that which went into the special theory.

In it, deriving from work done in relation to the special theory, Einstein had some equivalencies, in which the factor E appeared and the factor mc^2 appeared; and there were a lot of other factors. And he solved these equations for E so that he had an E on one side and the other stuff on the other side of the equal side. And then, thinking about these various factors he said of them--and incidentally, this is one of the rare cases where the man who did it has written a description of it: his own essay called "Relativity; the General and Special Theory," which he wrote in 1919. It is available in paperback. You can buy it in any paperback bookstore. There is a good translation of it.

What he concluded was that certain of these radicals were capable of being zero. Specifically, the velocity would be zero in the case of two bodies that were at rest with respect to each other. All of the radicals in the formula contained a velocity factor except the E on one side of the equal sign and the mc^2 on the other. Therefore, Einstein reasoned, mc^2 must equal the latent energy of an object at rest, and therefore energy and mass must be equivalent in this constant relationship.

Then he said in this 1919 essay that he was convinced of the validity of the formula; but, of course, it could never be put to empirical test because the magnitudes involved were so far beyond human capabilities. What irony. I imagine that, of all of the thinking of Einstein, this particular thing is the one for which the greatest empirical evidence exists. It must, I suppose, have made as large a change in the affairs of man as any single act of the human spirit. It is, as I said before, a universal phenomenon, independent in some sense, of cultural traditions. Or, at least if it is not independent of them it is internal to a tradition which is itself shared across all cultures. And if we can believe the evidence of our eyes, every culture in the world is moving in the direction of maximizing the role of this particular tradition in its own affairs. This is true even in those cultures where the leaders deny they are doing it. It is as if every society in the world were trying to climb the same mountain; we are all seeking our way up; we are all revolutionizing our own lives as we go about it.

What does this mean for education? We do not know what our children will face. All we know is that it will be different from what we face. There will be wholly novel problems presented to them predictably within the lives of children now alive. And it may, for all we know, be equally true for ourselves.

When they come to the novel what will they do? They will not be able to look to their own experience. There will not be any relevant experience by which they can solve these problems. They will not be able to look to our experience. They will not be able to look even to the accumulated experience of the human race. It will do them no good to panic. It will do them no good to withdraw from the situation. Whether they can appreciate its aesthetic or moral aspects will make no difference. It will not even be good enough to pray. They will have to think.

The machine which is cranking up the changes in the modern world is the human mind. The child who will in the future establish for himself the conditions of his own dignity will be a person who can harness that machine. He will be a thinking man.

And, by extension, the nation which will in the future establish for itself the conditions of its own dignity and its own security will be a nation whose citizens are thinking men. This means to me that the kind of education that is going to be needed is going to be the kind that develops advanced intellectual capabilities; persons

who have found in themselves, in their own resources, the means to make a variety of adaptations we cannot now foresee.

Against that sort of requirement, how do you evaluate American education? That some people become thinking beings through American education I find incontestable. But do all? Do anything like the number who need to?

I could take you to a school here in Washington where I could show you a large number of 16-year olds learning automotive maintenance and repair. Well, I am glad somebody learns it because I certainly cannot maintain and repair any of my cars; they are far too sophisticated. But the modern car which these people repair is an expression of the nature of the internal combustion engine, which has certain characteristics. It is heavy, and this means you have to have all sorts of boosters, steering arrangements and the rest of it. And the engine can only go in one direction. So, that means you have to have brakes and boosters on that end as well. And what you end up with is some of these over-blown Detroit bubbles of the type we all drive.

The instrumentality which will obsolete this particular vehicle is probably already in existence. There are some theoretical advantages in the gas turbine which I think are going to change things. What will happen is that you will have a device which packs a lot more power with a lot less weight. This means the elimination of the booster arrangements. It means the elimination of all these sophisticated timing devices that are associated with the internal combustion engine. It means the elimination of the brakes because you have a thing you can squirt this way or that way. In other words, the power that is used to propel can also be used to decelerate.

The characteristics of this vehicle are probably not fully seen, but I take it as likely that within a decade they are going to be on the road in great numbers. We will, I suppose sustain an attenuated manufacture of internal combustion engines for those uses for which this particular engine is demonstrably superior. And I am sure there will be some. We will maintain a number on the highways, but we are going to be obsoleting cars with internal-combustion engines over the course of a decade or more, and we are going to eliminate from the highways some substantial share--something like 70 or 80 percent--of the number we have produced.

What will this do to employment in this field? It will probably mean that employment in the field of maintaining these particular vehicles will become marginal. In the case of marginal employment, who gets the jobs? Those with seniority and experience. Who are the people in these circumstances who are the least secure? The young and the inexperienced. So, here is the lesson: this 16-year old boy studying automotive maintenance and repair in the District of Columbia is not being educated for employment, which is what we have told him we are doing. We are educating him for unemployment. And I think that simple honesty would require us to make that plain to him.

We have today a tradition, which we have accepted, that it is the school's job to teach this child something that he can use for employment on graduation. Yet we are moving into an age in which we cannot see the future of any specific skill. We do not impute to any skill a 10-year life, as of now. I do not know what we will do later. Here is a question we should ask ourselves. "What skill can we teach, of which we predict that it will help a person in employment for 10 years?"

After a rather considerable search, my own answer to that question is that there is none; there is no specific skill that is going to hold a person for 10 years. No goal of education whatsoever will be achieved short of a general up-grading of the quality of the person. For us to achieve any of the old goals--vocation; citizenship; ethical character; homemaking; the worthy use of leisure time; command of fundamental processes--any of the traditional goals will be achieved only as we achieve the development of direct intellectual power; the development, I should say to those of you who are not psychologists, of transferable intellectual skills. And when I use that word "transferable," I say to a professional what this central challenge is.

We are operating within a pedagogical tradition which tells us that there is no such thing as a transferable intellectual skill. There was a time when people held that there was. You were supposed to study Latin in order how to spell English. History was supposed to teach patriotism and literature was to teach morals. Well, what we found out is that if you study Latin, what you learn is Latin; you do not learn how to spell. If you study history, you learn history. There is no such thing as transfer of training. The route to the abstract to most children is through the concrete. A child learns through specific example, and this is the only way we have to learn.

How, I ask you, are you going to learn an abstraction for which there is not any concrete? That is, if this is your philosophy or psychology. And yet, this is the existing psychology of most American education. I think it just will not do. It calls on us for a shift of the frame of reference within which we conduct education. And I think that this shift of the frame is being demanded by the events around us, which, though we look at them, we cannot see the shift because we are looking with our old eyes; eyes in which the layer of prejudice was laid down before age 18, and it is keeping us from seeing much that is there to be "seen."

But, think back, and think hopefully about the nature of man as it has been revealed in his past behavior. Look for evidences of the shifts of the frame and see what they mean. As persons concerned with war, think of the killing questions. We are told that our problem today is religion; it is their beliefs versus our beliefs.

There were other times when the great issues were posed in religious terms. Whether you were a Christian or a Moslem was a killing question. People killed each other over religion, and then the killing stopped. Did they settle the question? They settled nothing. The question is today the same question it was then, but the killing stopped. What happened was a change in the frame of reference within which the question rose. People looked at the same data and drew different operating conclusions.

Or, consider the Wars of Reformation. Whether you were a Catholic or a Protestant was a killing question. And then the killing stopped. Did they settle that question? They settled nothing. The question is today what it was, but the frame changed, and people again looked at the same data and drew different conclusions. I think what is happening now is that the frame of reference within which we look at these questions is undergoing a shift. Man is now on the edge of doing with his mind things that we always believed to be impossible.

Our children are going to look at these men who do these impossible things and see something different from what we see. You and I can look at a man like Colonel Glenn, and what we see in him is a fellow whom we know as a colleague. He puts his pants on one leg at a time, just as we do, and he shares much of our common background. Consequently we do not see anything very unusual. But I have a feeling that when a 13-year old looks at these people he is going to look with eyes different from ours and he is going to

see something different. What he will see is a new image of what a human being might become.

No one knows what may be the full human possibility. It is obvious that man will do with his mind things of which we have not dreamed. This is where our children are going, and this is where I think the American school must help them to go.

Thank you very much.

QUESTION: Dr. Russell, it is not my intent to defend Admiral Rickover regarding his talks about education, but first I'll make a statement. I personally have always been amazed over the fact that the educational profession itself always jumps to its own defense. We in the military, I think, are sympathetic because we day after day in the business management field, for example, receive letters from teachers, plumbers, and various people in various professions, complaining about how we do our job for which we are specifically trained, for example in the business management field. So, we are sympathetic.

But, looking at this question, what is wrong with a man like Admiral Rickover talking about and developing a thesis for the educational system of this country? What is wrong with that? If, for example, you in your speech project what as an educator is going to be in the future of the automobile and the mobility instrument in America. I am not being sarcastic. My intent is, what difference is there? It seems to me that we all have areas of understanding in various fields.

DR. RUSSELL: I would have to say that what I said about the automobile is my opinion. And if this gentleman you named would take the same approach, I would not mind. But I do not think he does. I have no intention of replying personally to him from this platform. But let us look at the form of criticism towards which some educators appear defensive. I refer to headline-hunting, the search for the sensational. That there is such criticism is a simple fact. I could document it for you over and over again.

Now, I do not know how you deal with it. In the little lecture that you have already seen I tried to find a rationale for the headline-hunting. I think that it is a very tragic thing, and it causes me a lot of concern. I worry about the nature of national communication in the United States. I worry about the fact that a person who

knows nothing of education can get a far more respectful hearing from the national Congress and the national organs of opinion than any educator can get. There isn't a person who has real knowledge of the Soviet schools or of American schools who can begin to get the attention that these people get. I think this is something that is wrong. I think it's very seriously wrong.

I could document it to an unbelievable length. Life Magazine ran an article on facing pages--the life of a "typical" American boy compared with a "typical" Russian boy. It shows the American in a high school marching band, athletics, and all that stuff. The life of a typical Soviet boy shows a real student; and the one they pick is from the Moscow school which is their front-rank school. They pick a guy out of the Soviet upper 5 percent and they pick a fellow out of the 50 percent level of American culture and they say these things are comparable. This has been done so often that it is sickening. There is no answer to this.

I think the only answer the educators have, and I do not agree that they are unduly defensive; I have never seen one I thought too defensive. I think that they have no really effective spokesman of any sort. They are not headline-hunting. And they are faced with people who are. Now, what do you do in these circumstances? I think there is only one thing to do, and that is what is, in fact, underway; it is to make the decisions locally and make them through people who are responsible locally. You will find that you can get amazing support this way.

Just two weeks ago; I guess it was more than that, perhaps a month ago, there was a meeting in Arizona, at the Arizona Town Hall, and they asked me to come out and talk to them. This was a leadership group in the state. Were they for Goldwater? 100 percent. They were talking to me about education and they wanted to know what I thought needed doing. So, I spoke to them and I said some of the same things I said here awhile ago. And they then got on the question of the financing of education and how you are going to pay for it. And, as I said, they were 100 percent for Goldwater. So I didn't say anything about Federal support of education. I thought, "Why should I bother? The audience must already have its mind made up."

And then, following my talk a man got up and said, "I move that this conference go on record as opposing any Federal funds for public education in Arizona. This was debated a bit and put to a vote. They voted the motion down by an overwhelming majority.

it was nearly unanimous. To some of them afterward I said, "I do not understand; I thought you said you were for Goldwater. Why don't you support his position on Federal aid to education?" They replied: Oh yeah, but Barry doesn't know anything about education. He is a nice guy and a wonderful fellow, but, of course, we are going to have to pay for education, and we must be practical.

The point is that as you get this issue down to where people are responsible for its problems, you get away from sensationalizing and get into a context where you can really find the needed answers to the tough problems. So I'm for localism in education.

QUESTION: Doctor, your comments with relation to the American schools and the Soviet schools, these may be true. However, would you care to comment on the level of teaching in the American school system at, say, high school level, as compared to other European schools--Sweden, Germany, Holland--where, in each case, the high school graduate comes out with an equivalent of our junior college graduate?

DR. RUSSELL: Well, I would comment first by saying I don't think there is evidence of your last assertion. You hear this all the time. And we have spent some considerable time trying to find this evidence; we do not find any at all. What you do find is a system, which has been traditional in Europe, of a very high degree of selectivity regarding entrance into the secondary school, the prototype being, of course, the French Lycee. But this exists, of course, in all of these European countries. There is no European country where the planned pattern of education was to put as much as 20 percent of a given age group into this so-called Lycee, Gymnasium, Grammar School, or any of the names given in European nations to their elite schools.

If we applied the same standards of selectivity to American high schools we would certainly not come out with inferior performance. In fact, in the few places where we can check it, what we get is superior performance. It is a good question to ask a man who is responsible for advanced education of advanced minds what is happening in American education. Take, for example, as you probably know, the case of CalTech. In the last 4 years CalTech has eliminated all of the courses that were formerly their required freshman courses. They have cut out freshman English and freshman calculus. Today's kids are entering with the material already mastered. The decision was that the numbers that required these courses were so small that they would rather not offer them at all.

And this sort of thing is going on all over the United States. I heard a Professor of Chemistry at the University of Minnesota talking from this very same point of view, telling his colleagues, "You sit around and criticize the high schools; what are you doing to keep up with them. We are getting kids coming into our advanced chemistry classes right out of high school."

So, I do not think the evidence is by any means one-sided. In fact, if you will now go to Europe and look for their evidence of what they are doing, what you will find is, in every country in Europe, including the Soviet Union, a tremendous ferment out of which is emerging a trend towards the American type of secondary school. You will get a very good look at this in the course of the next election in England, because it is going to be a major issue. And it is going to be put this way; that the existence of the elite school is damaging to the other kids; that the kid who goes to this lesser school, called "Modern School" in England, is being deprived of something. All of these nations are increasingly aware that they need means of moving easily from one kind of school to another.

This is very strong in England. In fact, as you probably know, in the case of London the distinction between the Grammar School and the Modern School has been abolished. And this is going to go on also in other places. In effect, I think that the next revolution in European education is going to be to move in the direction in which American education moved in the years 1910-1960. Take that half-century. The characteristics of American education will, I think, proliferate.

But the American society is going to be moving on into its next major phase. Our system is much more mature and much more advanced, even from the point of view of basic science, which has been said to be the unique contribution of European education. It is common to hear people say that the great basic scientists emerged from these advanced academic schools. I think that the lesson to be learned is that some did; that there was unquestionably a form of education which did good things for some advanced minds. But the larger question is, how many advanced minds? Did it really support the maximum benefit of the maximum number? And partly, you see, that is a question of a diversified offering, of doing the most for each person at each level. Our thesis is that if you do do the most for each person at each level, you are going to get still larger scientific gains; that is, great basic scientists and great other qualities, too. And I think that is what is being demonstrated

now in American education. That is, the ability of the comprehensive high school to generate on a mass scale, very advanced abstract intellectual abilities.

Now, how do you raise the abilities of kids who are not at this very advanced level? I do not know, and I do not think anybody else knows. I think that there are any number of theoretical problems here that are of grave difficulty principally because we know so little about the human mind. We have no sense of the structure of the mind. We are unable to establish the elemental character. We cannot get down to the bits and pieces of which neurological phenomena are made. We lack models of the mind.

If there were in the science of cognition a significant breakthrough, we might move into some new era. I personally feel very hopeful about that. Of course, I am sorry to say that the promising developments are not coming from educators. I do not know any educators who are really working in this field. I have on my staff a few people who I am trying to train. I perhaps ought to say a word about it, although I am giving you too long an answer.

When Einstein, working from the Michelson-Morley experiment developed the Special Theory, he did not use his own mathematics; he used mathematical models which had been developed in several places independently--Lorenz in Germany and Fitzgerald in England conceived of a series of mathematical equations which would explain the phenomenon that turned up in the inability to detect the ether drift. But these men who made the models did not take them seriously. They said, "These are models, but ha ha, aren't they ridiculous?" Einstein comes along and says, "No, they are not ridiculous. Because these models explain the data, they must be right." In other words, the insight that carried the lesson came to the mind of a person different from the gamesplayer who constructed the answer.

I look for something like that. I can see these way-out types with all their crazy computer circuitry, impedances and other things that I cannot understand; I can imagine one of these fellows happening on a way to hook a thing up that would be a true analog of some piece of mind or some mental process. But I can imagine him not knowing it. There has to be another fellow who understands this fellow and also understands the nature of the problem. I am trying to train some of those. They are going to spend some

time in my factory and then they are going to go over and work for Mr. IBM for awhile. And maybe by some sort of marriage of these backgrounds we will be able to get there. But pending the time when we do, the only thing we can do is to lean on experience which, as far as we can tell, is relevant. And as I analyze what goes on in other nations, I think that very little of it is relevant; that the most advanced situations are here.

QUESTION: Doctor, in examining the 25-year time that it has developed, and also the ponderous educational machinery that starts with parents, teachers, school boards and all the way up to the national level, at what point do you apply a lever and how do you apply this lever that will allow, first, your policies to get carried out, and second, present the calendar time for implementation?

DR. RUSSELL: I wish I knew. You know, back 20 or 30 years ago a group of educators began to study this question of what they called, "The Diffusion of Practice;" what is it that really makes these schools become what they are? And we learned a lot about it, or we thought we did. We learned, for example, that you cannot diffuse something that is not practical; you have got to prove that it is practicable or it is not going to go; that the diffusion process is one of leadership; that you do not diffuse, for example, through teacher education. The new people who come into a school system do not bring in new ideas. The new ideas come to people who already have status in the system. This is a function of leadership--partly of administration--but more, of people who are themselves teachers and are people of status within the school building. These are the introducers of change.

Well, we had enough of a background on this, so that when I started with the Citizenship Education Project at Columbia; which was in 1950, we thought that we knew what to do and how to spread it around, how to make schools adapt. We had money. We had jack running out of our ears. Millions of dollars were put into this project. We had every kind of support. You cannot imagine what the situation was. Even the President of the United States was pulling for it. I never got any opposition from any superintendent. We went into thousands of high schools. We were working with 45,000 teachers and practically every one of them was sold on it. I could give you 100 examples of things that we did in schools that were subjected to extensive evaluation by independent experts, and

everybody was so enthusiastic. Yet this thing today is just as dead as a doornail. It does not exist in any school. This fact leaves me feeling humble.

When I left this project in 1957 it was a great success. And even then, President Eisenhower was still interested in it. This apparent success but real failure means that the process of change occurs at a deeper level and one harder to get at than we thought. Maybe by some multifaceted approach we can do it. But I do not feel like going out and trying to propagate answers to questions in American education when I turn inward with as much doubt as I turn inward with.

My present impression is that American education is surrounded by people who are awfully sure of themselves. I think this is the essence of the problem of the sensation-hunting critics. They have the answer. I know a lot of people who have the answer. But as I look at the nature of change, as I see it and ponder the things I have said here today, what I emerge with is a great sense of transience. I think things are changing in very, very profound ways. And instead of wanting to go out and propagandize for my answer, I feel just the other way; I feel I do not want to go out and propagandize for anything except a few simple truths about which there is substantially no question.

I think that these are some things we have learned. I will give you a few examples. We have learned that learning is the act of the learner and not of the teacher; that the learner does his learning when he makes some sort of response; that the thing he learns is the response; that the response tends to be elicited through his own energies and enthusiasms which are difficult to manipulate.

Also we have learned that you cannot cure an educational pathology by passing it on. When you find a kid in the 9th grade who cannot read, he also could not read in the 8th grade, the 7th, and 6, 5, 4, 3, 2, and 1. And the time to do something about an educational pathology is the earliest time you can find it.

We have learned that the basis of education is laid in the elementary school; that the forces which are going to limit the potentialities of every other school are forces which are operating in the elementary school and that therefore the elementary schools are more important schools than any other schools. In other words, what we need is an exact inversion of the pyramid of prestige that we are operating on now.

Propositions of this type seem to me to be things to which we can and should hue. But to be wandering around the educational landscape, propagandizing for somebody's gimmick; this strikes me as very poor policy. And I might add, you can judge from this what I think of a lot that is going on in American education. I think that the mother lode that is going to give us the answers is going to be in the direction of a science of cognition. It is going to be an understanding of the synapse.

Most of us would accept the proposition that thought is neurological in its base. Well, how is it neurological? What is it that accounts for the fact that a child of 75 IQ and a child of 175 IQ are structually identical? We cannot point to differences. Is there a chemical factor operating here? What is it that crosses these synapses among the neurons? What is the nature of the structural process? Are there things we might be doing that would influence the environment in such a way as to change the basic capabilities of a person? Do we know how to do this? Do we know whether it is the permeability of synapses, for example, that accounts for differences in apparent learning ability? What is it that we sold ourselves 50 or 100 years ago on the thesis that abstract learning could only be by the concrete route and therefore today every first-grade teacher has a set of blocks. We teach Johnny that "two blocks plus two blocks equals four blocks."

Even if Johnny is a real thinker, we set up a circumstance where Johnny ends up thinking that the number system derives from experience; it is natural; it is God-given, if you will. What we thus do is to take a series of synthetic abstract definitions and conceal what they are from this little fellow.

Now, how are we going to get our structural thinking reversed, so that we recognize that "two blocks plus two blocks equals four blocks" conveys and erroneous lesson? What we should do is to teach Johnny that "two plus two equals four." It is an abstract definition and it is purely arbitrary. It just happens to be the way we press the shape of our minds on these kinds of data. When we can go into this realm and we can come out with some solid conclusions I will be ready then to propagandize. But for now I feel very much less sure of myself.

QUESTION: Doctor, we occasionally see lists of the 20, 30, or 50 outstanding high schools in the country; also the colleges. For instance the examining boards classify colleges X, Y, and Z.

Ay question is, how are these standings derived, and how valid are hey in really measuring the quality of our schools?

DR. RUSSELL: Well, you mentioned two lists; I will take your econd list first. That is based on empirical data; that is, actual ecords of people in terms of SAT scores as to how they fare in hose schools. These things are rather simple correlates to work ut mathematically. They are just saying that in this particular ollege their success record is such that it is the span of SAT scores etween A and B that seems to fit there. And as you move up to chools which make the effort to establish more rigorous academic tandards it becomes possible to tell in terms of their admitting and xcluding practices what happens to the kids when they are in there, nd it is possible to get a mathematical figure for about how they re going to work. This, of course, assumes some constancy in he marking processes.

But I think that this is at least an indication that there is an ntellectual base which has some validity. You understand that in ny statistical situation the route to the statistical result is one hich eliminates the individual case, by some kind of an averaging. o, it is always possible for Johnny to be an exception to these ings, and they try in their literature to point this out; that you annot be sure.

I remember once I put a kid into Columbia Law School. He was student of mine at Johns Hopkins and he came up with a 390, or omething like that, on the law aptitude test. And Columbia Law chool would not consider anybody under 500. Basically they would ot even pay attention to people much below 600. And this boy's core was hopeless. But it also happened that I had been the pre-aw advisor in Columbia College. I had had a hassle with the Law dmissions Committee because they had admitted a student of mine ho scored something like 772, who was an immature child; per-aps 18 years old chronologically, but he was not even that old.

They admitted him in advance; that is, after his third year of ndergraduate work. I told them I thought the boy was immature nd would not stand up under the discipline required in the Law School. They admitted him anyway and he flunked right out. And o, my stock was pretty high. I told the Law Admissions Com-nittee,

"This Johns Hopkins boy is not bright; in fact, he is dull. But he has a fantastic hunger to be a lawyer and to

come out of Columbia. He works like hell. I have never seen anybody work so hard. He is certainly not going to make Law Review, but I think he can get through Columbia Law School."

And they took him. He was more than 100 points below their minimum on this test.

I am not saying the test was inaccurate. I think the test had him about right. But this kid did get through Columbia Law School. As I say, he had to do it by sweating blood. But he did go through. So, there are exceptions.

Now your other point. I do not know about these lists of 50 high schools, but I would be very suspicious of any of them. I do not know what the basis is upon which you can judge. What you tend to find when people talk about good schools is schools which are uniquely favored by the community environment. The American society is not classless; it is highly class-oriented. We have upper class suburban communities where the upper-class can and does dominate the schools and where they think of a school as a college preparatory institution, and where they are aiming their children for the prestige colleges.

I very much doubt the value to the American culture of the aristocratic tradition in education, which is not only strong but becoming stronger. And it is going to be very difficult to overcome because a college which has prestige attracts the ablest kids. It gets to pick the ablest kids. They then succeed in society, which proves that the college was right; thus it builds it prestige, and so it attracts more of the ablest kids. This thing feeds on itself. I do not know just how to correct it, but I think that there is no evidence that a school, some of the famous ones around here, is really a better school in the sense that it succeeds better with the material that it gets.

There are some ridiculous measures of quality, for example, the number of national merit scholars. As if this were a measure of something. More than anything else, it is a measure of the professional status of the parents who happen to live there. Professional groups are the ones that breed up the major share of these verbal-type kids who score high on that kind of test. But this does not prove the quality of a school.

COLONEL MARTHENS: Doctor, I want to thank you for a most stimulating and interesting morning.

DR. RUSSELL: Thank you.

(2 March 1962--7,600)H/en:dc

☆ U.S. GOVERNMENT PRINTING OFFICE : 1964 O—726-641