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Technical Workshop - Education in the Space Age

Canaveral Council of Technical Societies

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EDUCATION IN THE SPACE AGE - WORKSHOP

Welcome to the Canaveral Council of Technical Societies Workshop to discuss Education in the Space Age. By way of starting off this panel meeting I have asked the speakers to present a few thoughts and ideas on certain aspects of the education in the Space Age. I'd like to start off by calling on Dr. Keuper for his assessment of the role of the private college in education in the Space Age.

I would like to say a few words about the impact that I feel space is NOT making on education. By space I mean the space program as exemplified by NASA and the Dept. of Defense. I believe that there is an urgent need for a marriage of space and education; unfortunately as of this date, I am afraid that they are not even very well acquainted. It should be, I think, abundantly clear that progress in the space program depends largely upon the quality and number of technical people available to the program. "Money that has been allocated or will be allocated, I suspect, is probably adequate. An improvement of the program can be made if either or both the quantity and quality of scientists and engineers in the program is increased. This can be accomplished only, I believe, by a marriage between space and education.

Recall the history of the development of atomic energy. It came out of the university and was fostered by university men brought into active partnership with AEC. In the years immediately following 1945, every self-respecting physics laboratory in every college had its share of AEC research contracts and thousands of budding young scientists and engineers flocked to careers in atomic energy. The space program has been too urgent and too immediate for this kind of long range planning, but long range planning cannot be avoided, and space must be impacted on education if our space program is to be successful. I believe private institutions have the one very important factor of flexibility which they can use to advantage to protect leadership which they have established in excellent and extensive research programs such as those at the Lincoln Lab at MIT, at Stanford University, at Tampa Research Center and the Jet Propulsion Lab at Cal Tech. Now looking at space education in somewhat more detail, you might ask, "What is the space curriculum and why give a degree in space?" Does it not consist of the basic courses?"

Well, the answer is "Yes", but like atomic energy, space amplifies particular aspects of these various basic courses which deserve a special status, a special treatment and a special curriculum. In short, I believe we need to train professional space engineers. At Brevard Engineering College, we started on this kind of program 4 years ago, and today we have over 100 engineers studying for masters degrees in space technology in a curriculum which includes missile guidance, propulsion, space medicine, electrohydrodynamics and the like. Now, I'm absolutely convinced that no amount of money alone will make that trip to the moon feasible. But it is technical people with stars in their eyes that will make it possible.
Now I'd like to ask Dr. Wilson to talk about the goal of the junior college in space education. Let me quote one short statement that will help me to emphasize a point. Dr. Walter M. Arnold, Assistant Commissioner for Vocational Education, U. S. Office of Education, stated, "That we have at the present time some 600,000 engineering and industrial technicians; it is predicted by 1975 that we will need 1,400,000." He further stated, "We actually need to develop educational programs that will permit us to prepare some 100,000 technicians each year in this country compared to our present output of about 16,000." This morning Dr. Walter Williams said that in Florida we have presently 7900 technicians and will need 60,000 by 1970. I think this points out a tremendous job for all of us and the need to tax our imagination to the point of developing programs that will permit us to prepare the individuals we will need. To give you an idea about the community junior colleges in Florida, may I go back to 1956 when we had enrolled about 30,000 students in all the colleges and universities in Florida. Today over 30,000 students are enrolled in our Florida junior colleges alone. It was also predicted in '56 that by 1970 there would be 150,000 students enrolled in all Florida institutes of higher learning; now this estimate is being enlarged to 170,000. Back in '56 we had 10 publicly-supported community junior colleges. The '57 Legislature appropriated money to create 4 more for a total of 14; the last session authorized 3 more junior colleges for a total of 17.

In Brevard County we started in 1960 expecting 250 students at Brevard Junior College. Our entering class numbered 768; the second semester we had 1123 students; our 3rd semester, over 1400; our 4th semester (ending last June) 1968; and our present 5th semester, 2395 students. We operate from 8 in the morning till 10 at night and we have plans to start scheduling some classes between 1, 2 and 3 in the morning because of the tremendous problem. And this, to me, indicates a tremendous need for educational programs and for preparing individuals for the level of higher education.

What are the objectives of publicly-supported community junior colleges in Florida? The law reads that we must offer three programs. The first is a curriculum designed for students who are interested in completing their freshman and sophomore years at our institution, for which they get the associate or arts degree, and then transfer to a 4-year college or university. Within this area we have the normal majors of the 4-year schools, e.g., pre-engineering, pre-med, teaching, and so forth.

The second phase deals with technical and occupational education designed for the individuals who are interested in completing their educational experience with us, and then entering their chosen field of work. This program prepares a person for work at the technician level. Our third area offers educational experiences of all levels to adults in our immediate county area. In this area we have short courses, workshops, seminars which deal with particular topics to meet particular needs of certain groups in the community.

Next, I'd like Dr. Halvey to discuss the role of universities in education and the space age.

We have heard about this so-called "space university" and we are unhappy about it. The reason is not because we are afraid of any sort of
competition -- I think education is one of the very few fields where we welcome competition because it is an incentive to improvement. But we are not too happy about this space university because unless the term is defined and the term has been quite misused lately. What do we mean under education; is education accumulating knowledge? I do not think so. I feel that a man can be extremely knowledgeable, yet uneducated. I feel that a technical or scientific education in which we are interested here must be based on a broader horizon of an individual, because the disciplinary nature of all the sciences, and space sciences in particular, requires that a person should have a broad horizon and should be educated in many fields, not just physics, if he is a physicist, or chemistry, if he is a chemist. If he is, he is just a glorified technician. Let me state right away now that I feel that the vocational education of technicians should be far removed from the skillfulness of a robot. The technical education of the technician must also be based on education on a broad scope even if he does nothing else all year but assemble gyroscope platforms. He should have some knowledge about other endeavors of mankind. But let us get back to the university role in space science. In my opinion, the universities of the United States must bear in mind that space sciences are not just a scientific endeavor, but are an aspect of our national survival. We cannot neglect certain patriotic duties which this problem imposes on us. Don't let us be ashamed of a pure scientist who looks at the present necessities of the country and directs his interests into those areas which both satisfy his scientific curiosity and at the same time serve some practical purposes for our survival. To my great pleasure, there has been response from our university to create an inter-American Aerospace science institute which brings in from Latin America teachers, students and people who want to learn about this subject. Here they can study our customs, our culture and our knowledge in this particular field. A survey I made in Central America indicated that they are eager to get this educational aid from us, and I feel it might be much more rewarding than the mainly material hand-out of millions of dollars which these relatively poor countries cannot refuse. They accept it but by necessity and with some hurt pride. But they do not feel that it would hurt their pride to accept from us knowledge and cooperation in the field of education. This is why we have established this Inter-American Institute for Science Education, which is now in development along with a similar council where each of the governments from Latin America sends a delegate to headquarters in Tampa. How can we help these people most? Especially in teaching, because there is no question about it that there is a bottleneck in scientific manpower in the high schools. The high school science teaching needs improvement. How can we do that? Only by teaching the teachers; by bringing up better science teachers for high school. This is one of the endeavors foremost in our College of Education. Thus, here you see one of the efforts to foster aerospace science education not only in Florida but in the Hemisphere. Let's hope that such cooperation will fertilize itself to bring about results and automatically snowball this help to help us improve space age education.

I've asked Dr. Williams to tell something about the role of vocational and adult education in the Space Age.
If I may, I shall turn the clock back to a childhood memory. We had been near the city of Nenking, China, only a short time. I remember vividly the arrival of our new language teacher. His clothes were not always new; as a matter of fact, he usually wore a repaired outer garment which showed patchwork. But he carried himself with a bearing which would do credit to any group, for on the top of his little hat he had the scholars' knot. Furthermore, if there were any question about his status, he could always withdraw his hands from the long sleeves of his garment and reveal fingernails ranging from 2 to 5 inches in length. He had the daring of a scholar, poor as a church mouse though he was.

The China which learned to respect the wise sayings of Confucius and other ancient predecessors is no more. In my generation, those enthroned values which had held for centuries, those academic positions, were brushed aside by tidal waves of Communism. The education of China could not withstand the needs of the hour; I submit that an education must take into account not only past values, but it must also take into account current issues. If these issues are not faced, it adds up to oblivion for a civilization of people. It is plain, however, that if the exclusive province of education is to produce scholars with long fingernails and a code held without change for centuries, then we are shortchanging education. May I invite your attention to the fact that education can be in error as well as in truth. Remember how the youth of Germany flocked to Hitler only to become a lost generation with no place to go when Germany collapsed? Their education had led them astray. Education also led Japan astray. Perhaps the education of the United States was not in true perspective with the needs of the hour at the time of Pearl Harbor, for few understood what happened to us. Perhaps it was because our educational system was only devoting less than 2% of textbook space to the understanding of over 2/3's of the world's population.

During the past week, you and I are less concerned about education than about what 5000 Russian technicians may or may not do in the days ahead in Cuba. These technicians are not graduates of universities, and they are led by a man who has not had the experience of a university education -- in fact, at the age of 18, Chairman Khrushchev was, by general description, an illiterate. But this brilliant man, with keen observance and ability, has since projected himself into a role of uncanny, unequalled leadership of a great nation. May I stand before you as one concerned for the individual who will not have an opportunity to reach his full potential technically and in other related vocational areas if the public schools fail to give the understanding and opportunity. I feel the future hope of America is to provide broad educational opportunities helping everyone to achieve his greatest potential because, in the final analysis, democracy is predicated on the fundamental concept and belief that, other things being equal, the well-informed individual will make the right choice. Not only does he need to know how to perform with his hand, but he must also have the right to education -- this is an overriding philosophy which gives meaning, intent and purpose to life. And this learner is the human element who operates and masters the machine. We need technicians because we must be master of our machines rather than individuals who are enslaved by machines.
Mr. BARNES: I think it was clearly established this morning that there is a grave shortage of trained scientific and engineering personnel, and in the next decade this will include technicians for sure. It has been pointed out that the Soviet Union is believed to be graduating engineers and scientists at a rate at least 12% greater than the U.S. It's also believed, or suspected, that the quality of their education is at least as good as, or perhaps better than, ours. I am taking a graduate level math course; the introduction to this book states that it is generally included in the undergraduate curriculum for engineers and scientists in the Soviet Union. I'm convinced there is a shortage of scientific people because my business takes me into the market place to find these people -- and I know they are scarce. On the other hand, most predictions now for the long term future create the paradoxical situation that a period of saturation will occur 20 to 25 years in advance. I mean that the growth rate for scientific education will probably have to be deliberately closed if one looks at the long term future and accepts the projections of others. So, to achieve at least the short term growth, there are probably a number of avenues open to us. Perhaps the most important of the many problems we have to solve is how we can improve the quality of our education in the U.S. I'd like to open the discussion now and encourage those in the audience to participate.

The requirements of a broader education may conflict with your immediate requirements. You would like to give them a broad background, and yet you want something special. In industry we need specialists and we need people who are interdisciplinarian. This means the person whose capabilities, for instance, would be not only in chemistry but also physics and aerodynamics. We have tried to cover the gap in education existing between high schools, undergraduate and graduate schools. Now we apparently have a new gap appearing between graduate school and industry. It exists because the student is so submerged in his major that he does not have the interdisciplinary background to meet the requirements of industry. It's hard to know what to do in industry today, and industry faces this fact. But if they get an interdisciplinarian very frequently, they do not know how to use him. And if they get a specialist they saw him down so now the man is in another dilemma. Of course this is part of life, but it doesn't give the man satisfaction, nor industry, nor his professors. So I think the problem is filling the gap in high school and college and graduate levels and beyond. Thus everybody is going to have to get into the education act -- student, teachers, industry. And industry in the past few years has instituted its own courses to bridge this gap. I think we are going to have to set up, first of all, qualified people to help bridge this gap, and they must be inspired. This inspiration could be well covered if the people are well paid. And a lot of people forget that the educational system of the U.S. requires that the teachers keep up-to-date. This is hard because a textbook is already 2 years old when it is published; and as far as space is concerned, you were 3 months behind 2 weeks ago when you put the book out. Rather than require people to live on their dignity, we are going to have to use every modern tool including competition to help you in education, being careful to avoid getting into a cycle which would lead to stagnation. In using these tools, the people are required to . . .

DR. HELVEY: This is not a very good panel because everybody agrees. I would like to ask if it was said that incentive can be given by raising salaries?
"I said, 'Well paid,' " A man has to be paid in proportion so that he maintains a dignity. An empty stomach creates many of the problems we have today. And many professional groups are relatively low-paid compared to the requirements put on them for their hours, time and effort. When I see a janitor making more than a teacher, I have a hard time resolving what the man's education means to him. What kind of person should a technician be? Is he really only an extension of the engineers' hand; do we really need him to have a brain; do we need to give him an education in the broadest sense?

I know a good technician who was not able to make creative suggestions but I could call on him to grasp what I was saying and to carry out things that I wanted done. This individual picked up much education after he came to work for me -- I don't know what education, if any, he had when he came. Sometimes we see students as far along as master's degrees who don't quite have what it takes to originate ideas, who would be wasted if they turned aside completely.

MRS. KERR: A technical person must never stop studying and broadening his mind. But under someone who does have ideas, he can be an extremely eager helper and worth his education.

I've noticed that about 1/3 of the enrollment of scientific and engineering colleges drop out in the first 2 years. It seems to me these people just lost their way. They have some ability, but not at that level. They would probably develop into very fine technicians if there were a program for them to go. I wonder if we're not losing a fine opportunity to further develop and guide them immediately when they begin to drop out.

Now some drop out for reasons other than lack of capability, finances, family, etc. Some technicians had to develop themselves till they are as good as some engineers. They take courses and do everything possible. Some eventually work back up to engineering status. Being a technician may partly be choice, but it also may be partly environment.

There is much opinion that the bright students should be singled out and segregated and tutored in special groups to advance at a much faster pace. Is this really the answer to developing the outstanding scientists that we need?

I'm Dean of Sciences at the new Florida Atlantic University in Boca Raton, and we have a problem that some of our junior colleges are not supplying the type of students we need in science. The problem is to adequately prepare all students so that they will be ready for junior and senior level courses when they reach that level.

In Florida we have only 2 members of the National Academy of Sciences -- membership in this is considered one of the finest honors a scientist in American can have. We are talking about a space university, and yet we have so few who rank in this group. California has 146 members.

A few days ago, a representative of Atlantic University stated that they would like to use junior colleges as their lower division. If this happens you may
suffer drastically. The real problem is that the students we send would be capable of earning the necessary grade point average, and I'm wondering if some agreement could be reached. For example, the upper divisions of the universities might assume the responsibility for all of the specialized courses for students when they arrive at the university. The junior college has a tremendous responsibility just dealing with the general education and development of the student.

The 1960 census reflected higher education opportunity for between 15 and 16% of Florida's white population, but only 2.8% for the non-white group 21 years and over. Let us keep focused on the whole of Florida's population as we think of educational opportunity. I believe this will be non-credit as well as credit work of a college nature. The junior colleges today are performing a very great function for those who do not even plan to graduate from them or obtain a degree. I mention this because I cannot forget the burden to provide educational opportunity of a part-time, short-term type as well as of a terminal type. It's been proved that confidence in each individual is needed, not only to round out both his life and welfare and that of his family, but also because it is needed in a free nation and a free world.

I think it is probably well to let bright young students develop into higher courses in high school, but if they sacrifice a thorough understanding of the fundamentals, they're really losing as they go on. We have students in college who give us a big problem now because of lack of fundamentals — they constitute generally a 50% fatality in the progress of the course, even though they had the interest to enroll.

I wonder if education has suffered from the statistics quoted by Voltaire Brody, which show that the percentage of teachers earning doctor's degrees in the whole U.S. has decreased by 15% in the last 8 years, and the percentage of teachers with only bachelor's degrees has increased by 10%.

I feel that much greater emphasis should be given to adult education, to permanently and constantly exercise the brain and improve retention? If you don't keep teaching, the incentive to refresh is lost, and your efforts as a teacher are wasted to a great extent.

I feel that you're going to have to bring your grammar and high school and college courses forward. The only way to make up these differences in college is to institute survey courses of fairly high caliper.

The reason why California has such a preponderance of able, technical personnel is first of all they have a tremendous industry out there that has warranted it. The second thing is the momentum of the educational system in California. This is so tremendous that I dare say you could roll most of the eastern seaboard into their educational expense. In the past 6 years in the Los Angeles area, they have created high-caliber junior colleges, like Long Beach State College, to accommodate in the next 10 years approximately 110,000 students. They have separated their technician training and do it in high schools and the technical institutes such as Northrop and Lockheed and others supported by industry. I think this is the route you're going to have to go into if you want Florida to become first and to appreciate its role in the Space Age.
DR. WILLIAMS: I am reminded of the pathetic utterance, "Without education the people perish." It's true in California and Florida as elsewhere. Learning is an individual process. Schools, libraries, faculties are just for the individual to learn how to stand individually. Let us not write off people simply because of some stage. Let us build upon the strength they possess, and give them the full measure of opportunity to help us as individuals and as a nation.

GEORGE MEREDITH: What is being done to take care of the estimated 15,000 school children supposed to be coming into Brevard County by the end of 1963? I'd like to see the faculty and schools increased to do this and the emphasis placed where it belongs to give them the basic foundation so they can go on and educate themselves if necessary. We cannot brainwash or force them to learn -- we've got to motivate them. If you don't, something's wrong.

DR. CARROLL: One of the fundamental things we're touching on here is how can this be financed?

Is it still the rule in Florida to have a significant proportion of gasoline and other taxes, rather than direct taxes, support education?

In California, with their fantastic education problem, none of the automobile taxes are used to support education -- they are used solely for roads. They have uniquely taxed the person in California to support this, and I think your taxes are going to have to go up in order to bring your education level up in Florida.

If we go to the Federal Government and ask them to support our schools, we are turning our school system over to the Federal Government.

No! No! No!

DR. HELVEY: The point has been brought up that some work needed in advanced divisions in college can't be included because students don't have the preparation during the first 2 years. It comes back to the high school curriculum where the student is not yet ready to judge which way to go and what to include at the high school level.

I feel electives should be eliminated from high schools because a student chooses what course he'll take by whether or not Jim is taking it, it's a snap or the teacher is nice. You could gain a lot in updating their background by giving something with which they can go ahead. Seriously, how does one go about reshuffling the high school curriculum. Is there so much inertia that it takes 20 years to do?

The crucial point is high school science teacher education. Teach the teacher first to do a good job. In our school, University of South Florida, we have put up this motto - "Upgrade high school science teachers so that we have a future student body which then will fit to the university's requirements."
I feel that our whole problem here is that in order to be able to teach little Johnnie, we've got to have teachers that have, first, qualifications in terms of the academic background, and next, a desire to do this. In terms of a scientific background, most of our grade school teachers either don't have the interest or the experience in math to keep Johnnie's interest from being killed right there. I think we should supply extra courses in the junior colleges to enable students to fit the university requirements, but we should set certain standards and require them to be met.

HOMER CRAIG, Dean of Science at Florida Atlantic University: Our school will take its first class of 2000 juniors and seniors in September 1964. We expect 4000 students the next year and 10,000 by 1970. Between now and next July 1st, I must hire some 62 men for the science department; this will have a terrific impact on the Boca Raton area. We are fed by the junior colleges of the state primarily, and some of them need their science programs bolstered and raised in level. I have been trying to get them to do this, but they tell me that they can't because the high school students coming to them are not prepared. We will appreciate any help you can give us.

One thing that California has done this past year is to regrade their system so they can accept within their educational system as a teacher any qualified person in the field. It's the most fabulous thing I've seen in education. They are not afraid to regrade their people and to regroup themselves. I think Florida is going to have to do this to meet the challenge.

In the field of communications, we've gone from smoke signals to Telstar and similarly in other fields. But in learning and education, we're still stuttering. We're still teaching through the audio and optic nerves. Why can't we come up with some computer method of electronically storing knowledge in our brain without the waste of time of reading, listening and computing?

This becomes ridiculous. How can we program into a computer the sensing of life?

GEORGE MEREDITH: I object to this whole idea of computer education. You teach somebody about the computer, and the next thing you know our whole educational system is going to be depending on the computer. The only thing they know is what the computer tells them. There is no free thought. We've become a static civilization. When your educational system is dependent upon a computer, we've stopped.

Now that our universities are going on a tri-semester program, I wonder how much thought has gone into putting our grade schools and high school on tri-terms? The Tallahassee High School is trying it this year.

It would be a good idea to decide if this is good for the universities before changing the high schools.

Where is the money coming from to provide the space for this educational program we've got to have? I am heartily in favor of any program to provide it.
You can't get rid of split-sessions. California has been on them since I can remember, and we have a county-wide expected increase of 35-40% in students each year.

This is the second major build-up in Brevard in the last few years, and we get through the first one all right. It was painful, we had double sessions, but I personally don't look for miracles to happen and buildings to appear overnight.

We should not devote our full attention to the scientific aspect of education. There are other things we should consider in stating what the impact of the space age is on education.

I think the university teachers and their educational systems in Florida are far apart. Let's report this.

One of the major problems of the Space Age in modern education is, in many cases, the lack of responsibility in the parents.

May I formalize your words by saying that you want to put in our resolution that adult education should be accentuated more in order to bring up the parent's knowledge in matters of the Space Age.

Can we start with the beginning and state "It is essential to improve the quality of education in the Space Age?" (General agreement).

Would it not be well for us to pose a statement reflecting the quality, such as the crisis of the present time demands that we improve the quality and extent of educational programs. We will need to improve the quality of instruction through the improvement of teacher training programs.

Could we phrase it: "The crisis of the present times demands the improvement of quality and extent of educational programs. In attainment of this, we must of necessity improve training programs as one means of obtaining this end." This improves the students as well as the teachers.

The next item we should improve is the facilities at a far more rapid rate than they are being done. You can't teach them in a lot. Everybody knows this, so this seems not worthwhile. We have reviewed or talked about the need for re-examining what the education of a technician should be and improving this education.

It might be calling for in the second resolution a careful evaluation with the view of extending technical education through (1) higher education, (2) private and allied services, professional services, and (3) taking care of public schools. That would take into account the full range of education groups represented.

I think this covers too much. I had in mind education of technicians needed in the Space Age.

Actually, we do have a number of studies of technician training in Florida. Dr. Newbauer, could you report briefly on the study you made which revealed the technical education needs at that time?
Well, it is simply the needs expressed by employers. It has nothing to do with quality instruction. I believe the general trends hold, but it needs revision.

Could I offer for consideration the resolution that we are unanimous that methods for furthering technician training should be increased, implemented and improved?

I think that we should put in here that the pattern of education should be changed in order to coordinate the education in all levels, starting at the elementary and continuing through the senior level of colleges.

I think what he was telling me was that we need to place additional emphasis on the articulation between all levels of education.

Articulation?

He has used the word "articulation" instead of coordination. This means you have a pattern where you educate a child in the elementary school to go into high school, in high school to go to junior college, and then to college where he doesn't have to be taught how to read and do elementary arithmetic by Ph.D's. at college level.

I think we need a plan to adequately finance the overall educational program. It needs to be developed.

DR. WILLIAMS: We need training to raise all educational standards.

Are we going to educate people just to take part in the space program, or are we going to educate people to be human beings?

I say that we should just simply say that the Space Age put a special need of added funds to education in Central Florida.

I don't think we need to stress where the money comes from necessarily. I think if we could we should limit the words of the resolution to say, "Additional finances will be required to meet and continue the educational needs of Space Age impact here."

DR. KEUPER: I haven't said much because I have enjoyed listening and because I have not disagreed with anything I have heard. I'd like to back up to the area of teacher training. At Brevard Engineering we have many come to us who are Brevard teachers. They say they'd like to take certain courses, but these courses are not approved for teacher training. I think we need to stimulate teachers to take courses, to go out and study just to learn.

The End.
The Canaveral Council of Technical Societies Workshop on "Education in the Space Age" adopted the following resolutions at the Daytona Beach meeting:

1) That the crisis of present times demands the improvement of quality and extent of the existing educational program. In attainment of the above, we believe it necessary to improve the utilization and instruction of teacher education programs.

2) The conference is unanimous in recommending that technician education and training must be increased and improved.

3) Additional emphasis must be placed on the articulation of elementary, high school and higher educational institutions.

4) That additional finances will be required to support the special needs of education in the space age.