SPECIAL ANALYSIS I

FEDERAL EDUCATION PROGRAMS

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Detail may not necessarily add to totals because of rounding

OFFICE OF MANAGEMENT AND BUDGET
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SPECIAL ANALYSIS I

FEDERAL EDUCATION PROGRAMS

PART I—OVERVIEW

The 1972 Federal budget provides outlays of $13.5 billion for aid to education, an increase of $0.9 billion over 1971. This amount comprises 5.9% of total Federal spending in 1972 and represents about a fivefold rise in education outlays since 1962.

Federal education programs may be viewed as serving two functions. First, they support education directly by aiding educational institutions and individuals attending them. This function is served principally by the programs of the Office of Education. Also included are Head Start projects, now administered by the Office of Child Development, assistance for former servicemen under the GI bill, payments to students who are children of deceased or disabled social security beneficiaries, and education of American Indians and overseas dependents of U.S. military personnel. Loans for college housing provided by the Department of Housing and Urban Development also fall within this category. These programs constitute 60% of total Federal spending for education.

Table I-1. **MAJOR FEDERAL EDUCATION ACTIVITIES (in billions of dollars)**

Program	Outlays		
	1970 actual	1971 estimate	1972 estimate
Office of Education programs (HEW)	4.1	4.4	4.8
Head Start (HEW)	.3	.3	.4
NSF science education	.1	.1	.1
College housing loans (HUD)	.2	.1	.1
Education of American Indians (Interior) and overseas dependents (DOD)	.3	.4	.5
GI education benefits (VA)	.9	1.5	1.7
Social security benefits for children in school (HEW)	.5	.6	.6
Subtotal, direct support	6.4	7.5	8.1
Research at academic institutions [1] (20 agencies)	1.5	1.5	1.7
Health and other scientific manpower training [1] (7 agencies)	.6	.6	.5
Training of Federal and other public employees at educational institutions (12 agencies)	.4	.4	.4
Agricultural extension (Agriculture)	.1	.2	.2
Education aid to foreign countries (AID)	.1	.2	.2
Child nutrition (Agriculture)	.6	.8	.8
All other	1.2	1.5	1.6
Subtotal, other education	4.5	5.2	5.4
Total	**10.9**	**12.7**	**13.5**

[1] Excludes portion included in Office of Education.

Federal programs also support education as a means of meeting other national objectives. Examples of programs in this category are: University research to extend medical knowledge, training of manpower to improve delivery of health services, agricultural extension services, Agency for International Development assistance to schools and colleges abroad, and professional training of military officers. Such activities account for 40% of total outlays for education.

Federal outlays for education have risen almost $11 billion since 1962. Of this amount, $4.6 billion has been allocated to elementary and secondary education, a fivefold increase. Federal investment in higher education has risen $4.7 billion and is now four times the 1962 level. Of the total spending in U.S. education institutions, Federal education funds account for 23%. Table I–2 summarizes the trend in Federal outlays by level of education since 1962.

Table I–2. **FEDERAL OUTLAYS FOR EDUCATION (1962–72) (in billions of dollars)**

Category	Actual									Estimated	
	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Elementary and secondary	0.9	1.0	1.0	1.3	2.6	3.3	3.7	3.6	4.3	5.0	5.5
Higher	1.3	1.6	1.7	2.0	2.7	3.6	4.4	4.4	5.1	5.8	6.0
Adult and other	.6	.6	.8	.8	.9	1.0	1.2	1.5	1.5	1.9	2.0
Total	**2.8**	**3.2**	**3.5**	**4.1**	**6.2**	**7.9**	**9.3**	**9.5**	**10.9**	**12.7**	**13.5**

The remainder of part I of this analysis highlights Federal education policies and budget proposals for 1972 and indicates the degree to which different Federal agencies are supporting education. Part II discusses the principal Government programs by level of education. Part III contains technical notes on coverage and scope of the analysis and the relationship to other analyses in the Federal budget.

EDUCATION POLICIES AND THE 1972 BUDGET

In education, as in other domestic fields, the Federal Government is emphasizing *reform and renewal* to improve performance and concentrate resources on meeting urgent national problems.

Over the next year a number of significant proposals will be made:

- The administration will recommend a new and expanded program of special revenue sharing with the States and localities for elementary and secondary education. This proposal will draw together the wide array of overlapping and bewildering authorities for categorical grants into four broad areas of national interest and provide additional funds during 1972.
- One of the most pressing public concerns for the past 20 years has been the attempt to overcome the adverse educational impact of racial isolation in our Nation's schools. Progress in school desegregation has been accelerating, particularly in the last few years. To expedite and encourage the early completion of this change, the administration is requesting a total of $1.5 billion in 1971 and 1972 for grants to desegregating schools.
- To insure that no qualified student who wants to go to college will be barred by lack of financial resources, a basic revision of the existing Office of Education student aid programs will be recommended.
- To spur innovation in institutions of higher education, a National Foundation for Higher Education will be proposed under new legislation. As a new independent Federal agency, the Foundation will assist colleges to experiment with new educational forms and techniques.
- The administration also has requested that a National Institute of Education be established within HEW to bring to education the intensity and quality of research and experimentation which the Federal Government has developed in space and medical research areas.
- Education will be affected fundamentally by administration proposals to (a) share a fixed and growing portion of the Federal tax base with the States—to use as they determine—under a program of general revenue sharing (see Special Analysis P) and (b) reform the Nation's failing welfare system to free States of a significant portion of fast-growing welfare costs and lead to a more stable home environment for thousands of children. (See Special Analysis L.)

The significant increases in outlays for education in 1972, compared to those in 1971, are (in millions of dollars):

Special revenue sharing for elementary and secondary education	92
Emergency school assistance	200
Education of children from low-income families	59
College student assistance	264
National Foundation for Higher Education	30
Academic research, all agencies	160
National Foundation for the Arts and the Humanities	26
National Institutes of Health	147

FEDERAL SUPPORT OF EDUCATION BY AGENCY

Table I–3 provides a summary of total Federal outlays for education by administering agency. It shows that only 36% of these outlays are for programs administered by the U.S. Office of Education, the Federal Government's principal agency for education programs. Other parts of the Department of Health, Education, and Welfare account for 16% of all Federal outlays for education, primarily for medical education and research programs conducted at colleges and universities.

The remaining 48% of total Federal education outlays are distributed among 28 Federal departments and agencies, of which the largest shares are accounted for by the Department of Defense, the Veterans Administration, the Department of Agriculture, the National Science Foundation, and the Office of Economic Opportunity.

Table I-3. **FEDERAL OUTLAYS FOR EDUCATION BY AGENCY**
(in millions of dollars)

Federal agency	1962		1970 actual	1971 estimate	1972	
	Actual	Percent			Estimate	Percent
Agriculture	454	17	910	1,244	1,225	10
Defense	467	17	1,042	1,087	1,104	8
Health, Education, and Welfare:						
Office of Education	543	20	4,109	4,443	[1] 4,830	36
Other HEW	381	14	1,820	1,969	2,204	16
Housing and Urban Development	227	9	216	235	167	1
Interior	84	3	249	319	364	3
National Science Foundation	183	6	464	502	546	4
Office of Economic Opportunity			456	430	290	2
Veterans Administration	161	5	916	1,514	1,734	12
Other [2]	264	9	706	879	1,072	7
Total Federal outlays	**2,764**	**100**	**10,888**	**12,662**	**13,536**	**100**

[1] Includes $92 million for special revenue sharing for elementary and secondary education.
[2] Includes Commerce, Justice, State, Transportation, AEC, AID, EPA, NASA, National Foundation on the Arts and the Humanities, Small Business Administration, Smithsonian Institution, TVA, USIA, GPO, and Library of Congress.

Part II—Federal Outlays for Education by Level

Preschool, Elementary, and Secondary Education

In 1972, outlays for preschool, elementary, and secondary education will amount to $5,458 million, an increase of $471 million over 1971. Federal funds supply about 11% of national expenditures on elementary and secondary education in public and nonpublic schools. Table I-4 displays Federal outlays by agency and major program. Nearly 48% of the total is for grants to States and local school districts under programs administered by the Office of Education. Another 11% is for Head Start and other demonstration projects which are developing new approaches to education.

Table I-5 displays Federal outlays by sublevel and type of support. The following paragraphs describe current Federal actions by sublevel.

Table I-4. **FEDERAL OUTLAYS FOR PRESCHOOL, ELEMENTARY, AND SECONDARY EDUCATION BY AGENCY AND PROGRAM (in millions of dollars)**

Agency and program	1970 actual	1971 estimate	1972 estimate
Agriculture: Child nutrition	593	808	816
Defense: Education of overseas dependents	131	139	159
Health, Education, and Welfare:			
Office of Education:			
Emergency school assistance		100	300
Grants to States and school districts	2,350	2,492	2,661
Demonstration projects	300	317	305
Office of Child Development: Head Start	330	335	351
Interior: Indian education	134	157	182
Labor: Neighborhood Youth Corps in school	58	62	72
National Science Foundation: Science Education	37	41	35
Other Federal agencies	344	536	577
Total	**4,277**	**4,987**	**5,458**

Table I-5. **FEDERAL OUTLAYS FOR ELEMENTARY AND SECONDARY EDUCATION BY SUBLEVEL AND TYPE OF SUPPORT (in millions of dollars)**

Sublevel and type of support	1970 actual	1971 estimate	1972 estimate
Total, elementary and secondary	4,277	4,987	[1] 5,458
Preschool	356	402	425
Elementary and secondary	3,298	3,785	4,046
Vocational education	197	262	286
Other	426	537	611
Current operations	3,519	4,065	4,332
Facilities and equipment	166	208	249
Student support	177	206	219
Teacher training	220	248	252
Educational research	200	260	314

[1] Total includes an undistributed amount of $92 million for special revenue sharing.

Preschool.—Research findings strongly support the contention that a child's potential is determined to a significant extent by the nature of his environment during the first 5 years of life. In order to break the chain of inherited disadvantage from poverty, it is necessary to reach children before they enter school. Many questions remain unanswered as to what action should be taken by persons outside the family and what objectives are to be accomplished. The Federal Government is supporting the exploration of such questions through several complementary efforts. Those included in this special analysis are:

- The new Office of Child Development (OCD), located in the Department of Health, Education, and Welfare, to provide leadership and coordination for all Federal programs for preschool children.
- Head Start, operated by OCD under delegation from the Office of Economic Opportunity, demonstrating and providing a variety of services—educational, medical, and social—for 263,000 3- to 5-year-old children. In 1972, Head Start will give special attention to serving the children of persons eligible for assistance under the proposed welfare reform.
- Kindergarten and prekindergarten supported under grants to schools for the education of the disadvantaged at the option of local school districts.

Other programs, not included in Special Analysis I tabulation, also support services which have a potentially significant impact on the development of child learning abilities:

- Day care services provided in conjunction with Federal manpower and social service programs. Principal efforts include Work Incentive training and day care, and funds for social services supported by Assistance to Families With Dependent Children and Child Welfare grants under the Department of Health, Education, and Welfare. The administration has proposed in the welfare reform to expand and improve day care services for welfare recipients. In 1972, these improved services will be provided to 200,000 children at a cost of $850 per child.
- Nutrition programs of the Department of Agriculture and health research being conducted by the National Institute of Child Health and Human Development.

Table I–6 provides details on the enrollment of children in federally supported preschool programs.

Table I–6. **NUMBER OF CHILDREN ENROLLED IN DAY CARE AND CHILD DEVELOPMENT PROGRAMS** (in thousands)

Program	1970 actual	1971 estimate	1972 estimate
Head Start:			
Full year—full day	89	89	89
Full year—part day	174	174	186
Summer [1]	209	209	150
Office of Education (preschool-kindergarten)	342	370	400
Subtotal, included in education analysis	814	842	825
Training related day care for welfare recipients (HEW)	58	117	200
AFDC supported day care (HEW)	264	348	400
Other (manpower, OEO migrant, child welfare services)	36	39	41
Subtotal, not included in the education analysis	358	504	641
Total	**1,172**	**1,346**	**1,466**

[1] Reduction in Head Start summer program reflects a continued conversion from summer to full-year programs.

Elementary and secondary.—The 1972 budget reflects a commitment to improve the effectiveness of Federal efforts by reforming programs to insure that Federal funds are allocated to areas of greatest need.

An important element of the administration's reform of Federal grant programs will be a proposal to adopt an expanded program of special revenue sharing for elementary and secondary education. This proposal will pull together the large number of narrow-purpose categorical grants to States and local districts into four broad areas reflecting national educational priorities. These will include compensatory education for the disadvantaged, education of children affected by handicapping conditions, assistance to schools in areas impacted by Federal activities, and vocational education. Flexible funds for the general support of education will also be provided.

This significant new proposal would become effect January 1, 1972, and would provide $3 billion during the first full year, an increase of

$192 million in budget authority over the amounts requested in the 1972 budget for existing programs. The programs and funds involved are summarized in table I–7.

Table I–7. **SPECIAL REVENUE SHARING FOR ELEMENTARY AND SECONDARY EDUCATION** (in millions of dollars)

Programs included in 1972 budget	1972 estimate	
	Budget authority	Outlays
Department of Agriculture:		
School lunch program	175	171
Related grants	18	17
Department of Health, Education, and Welfare:		
Office of Education:		
Aid to federally affected areas	440	487
Educationally deprived children	1,500	1,440
Library resources	80	73
Supplementary services	143	142
Equipment and minor remodeling	-------	39
Strengthening State agencies	33	27
Education for the handicapped	35	34
Vocational education	384	382
Subtotal	2,808	2,812
Additional amounts for special revenue sharing:		
First full-year basis	192	188
Fiscal year 1972 (50%)	(96)	(92)
Total, full-year basis	**3,000**	**3,000**
Total, fiscal year 1972	**2,904**	**2,904**

The special revenue-sharing proposal would retain the essential framework of national policy but give States and localities a wider degree of discretion as to how they would meet their own local problems. The proposal would also permit a large margin of flexibility to move funds from one broad purpose to another to enable States to respond to their own priorities.

A total of $1.5 billion is provided for the proposed Emergency School Assistance Act for 1971 and 1972. Project grants will be made to local school districts which are desegregating under court order or attempting to overcome the educational disadvantages of racial isolation. Funds made available in 1971 and 1972 will be spent in succeeding years to allow for the careful development of programs to achieve these objectives.

The administration's proposals for general Federal revenue sharing and welfare reform will have a significant impact on the financing of elementary and secondary education. The Federal revenues to be returned to the States each year in increasing amounts will be used by States and local governments as they see fit and without Federal strings. Education, which accounts for over two-fifths of State and local government spending, is certain to be a major beneficiary of this revenue-sharing measure. Also, the proposed welfare reform will lift from the States and local governments much of the pressure from rising welfare costs which have drained away funds from other purposes, such as education.

The President's Commission on School Finance is undertaking a review of the financial structure of elementary and secondary education and will recommend basic reforms to place the financing of our schools on a sound and stable basis.

Vocational education.—The Federal Government supports vocational education programs serving 6 million secondary school students through grants to States. These grants will be included in the special revenue-sharing proposal for elementary and secondary education in 1972. This will give the States greater flexibility and responsibility in meeting their particular vocational education needs, while preserving an area of high national emphasis. The 1972 budget also provides for a strengthened research and development program to help redirect vocational programs to focus more on the special needs of the disadvantaged and the handicapped, to build closer ties between schools and employers, and to develop new and improved course offerings.

The Department of Labor administers the Neighborhood Youth Corps in-school program which provides grants for work and study programs to help financially needy youth to remain in school. Grants also are made for construction of vocational schools by the Appalachian Regional Commission, a cooperative Federal-State economic development agency.

In addition to the $286 million in outlays for these vocational education programs in secondary schools in 1972, the Federal Government will spend $200 million for vocational and technical education programs in postsecondary technical schools and junior colleges and for programs for adults who wish to upgrade their vocational skills.

Other programs.—Outlays in this category are primarily for support of education research, development and demonstration projects, and education personnel training programs.

The Federal Government is a major source of funds for support of education research and development. In 1972, outlays for this purpose are estimated to increase by $53 million to $268 million. Initial start-up funds are provided under proposed legislation for a National Institute of Education. The Institute, an agency in the Department of Health, Education, and Welfare, will serve as a focal point for educational research and experimentation in the United States. Working with researchers, school officials, teachers, scientists, humanists, and others, it will help identify educational problems, develop programs to alleviate these problems, and assist school systems to put the results of educational research and development into practice.

Other initiatives of the Government include support for (a) experimental schools to develop and evaluate changes in curriculums, staffing, and organization as they affect student performance in actual school situations (Office of Education); and (b) a variety of research and experimental projects (Office of Child Development), including a planned variation experiment in the Head Start program. The 1972 budget also continues to emphasize the evaluation of existing Federal aid programs and supports an expansion of a national assessment of educational achievement being conducted by the Education Commission of the States.

Table I–8 summarizes the Federal education research and development outlays by program and agency.

Table I–8. **FEDERAL OUTLAYS FOR PRESCHOOL, ELEMENTARY, AND SECONDARY EDUCATION RESEARCH AND DEVELOPMENT**

(in millions of dollars)

Agency and program	1970 actual	1971 estimate	1972 estimate
Office of Education:			
National Institute of Education	--------	--------	3
Experimental schools	--------	*	10
Follow Through	38	55	50
Sesame Street	1	1	3
National assessment	1	3	5
Handicapped children	17	22	28
Vocational research	2	19	38
Other research and development	82	100	109
Office of Child Development:			
Head Start evaluation and research	7	11	11
Early education research and development	1	4	11
Total	**149**	**215**	**268**

*Less than $500 thousand.

Federal assistance to strengthen teaching resources is provided through several agencies. The 1972 budget places priority on demonstration projects to improve the selection, preparation, certification, and utilization of all educational personnel. "On-the-job" training for education personnel will be provided through the Teacher Corps and Career Opportunities program.

About 85% of project participants under the Education Professions Development Act are already in the educational system, and 45% are from minority groups. Four-fifths of the funds for these projects are directed to poverty area schools, half of the funds support demonstration projects for installing innovative practices in elementary and secondary schools, and one-fifth of the funds support training of personnel in critical shortage (early childhood, special education, bilingual education, and vocational education). The number of education personnel trained in these federally assisted programs is shown in table I–9.

Table I–9. **NUMBER OF TEACHERS AND OTHER EDUCATION PERSONNEL RECEIVING TRAINING**

Agency and program	1970 actual	1971 estimate	1972 estimate
Office of Education:			
Education Professional Development Act:			
Teacher Corps	3,653	4,647	5,291
Career Opportunities Program	8,000	10,000	12,000
Other personnel training and development	53,668	48,687	43,208
Teachers of the handicapped	4,822	4,400	4,400
Office of Child Development:			
Head Start: Short-term training	7,500	8,500	8,500
National Science Foundation	57,210	36,208	32,000
Total	**134,853**	**112,442**	**105,399**

HIGHER EDUCATION

Federal outlays for higher education will total $6 billion in 1972. This is 44% of total Federal outlays for education and about 25% of the estimated total expenditures of U.S. colleges and universities in 1972.

Table I–10. **FEDERAL OUTLAYS FOR HIGHER EDUCATION BY AGENCY AND PROGRAM** (in millions of dollars)

Agency and program	1970 actual	1971 estimate	1972 estimate
Defense:			
Academic research	219	206	209
Other	278	314	311
Subtotal, Department of Defense	497	520	520
Health, Education, and Welfare:			
Office of Education:			
Student assistance	610	708	800
Construction of facilities	437	374	201
Institutional and personnel development	220	287	308
Subtotal, Office of Education	1,267	1,369	1,309
Other Health, Education, and Welfare:			
Academic research-health services	586	619	677
Fellowships and traineeships-health professions	280	285	281
NIH facilities construction	139	137	147
Social and rehabilitation research and training	51	51	49
Social Security (student benefits)	502	563	594
Other	152	188	268
Subtotal, Other Health, Education, and Welfare	1,710	1,843	3,016
Housing and Urban Development:			
College housing	196	137	46
Other	1	3	10
Veterans Administration: Readjustment benefits	665	1,101	1,260
National Science Foundation	360	341	363
Other	447*	495	449
Total, higher education	**5,142**	**5,809**	**6,047**

Table I–10 indicates the major Federal agencies and programs contributing to higher education. The Department of Health, Education, and Welfare provides the largest amount of support with 54% of total Federal expenditures. Major Federal programs include: (a) grants and loans to college students by the Office of Education; (b) grants and loans for the construction of facilities by OE, NIH, and the Department of Housing and Urban Development; (c) fellowship and traineeship programs by several agencies; (d) project grants for academic research by several agencies; and (e) payments to college students from the Veterans Administration and the Social Security Administration.

Table I–11 indicates how Federal funds are distributed by type of institution. In 1972, 2-year institutions are estimated to receive 11% of Federal outlays, 4-year institutions, 42%, and graduate and professional schools, 17%.

Table I–11. **FEDERAL OUTLAYS FOR HIGHER EDUCATION BY TYPE OF INSTITUTION** (in millions of dollars)

Types of institution	1970 actual	1971 estimate	1972 estimate
2-year institutions	483	645	687
Other undergraduate	2,288	2,604	2,576
Graduate and professional	863	1,010	1,073
Other	1,508	1,551	1,711
Total	**5,142**	**5,809**	**6,047**

Table I–12 shows Federal expenditures for higher education by type of support. Approximately 50% of the Federal funds are used for student aid, 20% for institutional aid, and 30% are for research and training. The following paragraphs discuss current Federal activities by type of support.

Table I–12. **FEDERAL OUTLAYS FOR HIGHER EDUCATION BY TYPE OF SUPPORT** (in millions of dollars)

Type of support	1970 actual	1971 estimate	1972 estimate
Student support	2,128	2,769	3,033
Institutional support:			
Current operations	659	674	766
Facilities and equipment	800	715	472
Research and training:			
Academic research	1,508	1,549	1,710
Educational research	25	22	5
Teacher training	21	80	61
Total	**5,142**	**5,809**	**6,047**

Student aid.—Funds for student aid programs will total an estimated $3 billion in 1972. A basic revision of the existing student assistance programs of the Office of Education will be proposed to insure that no qualified student who wants to go to college will be barred by lack of funds. Under this proposal, grants, work-study payments, and subsidized loans will be provided to lower income undergraduate students with the amount of aid related to family income. Over 2.5 million students will receive benefits from this program. Legislation also will be proposed to establish a National Student Loan Association to provide loan capital to banks and colleges for loans to students at all income level. The improved access to federally guaranteed loans will help almost 1 million undergraduate and graduate students to finance their education.

Table I–13. **UNDERGRADUATE STUDENT SUPPORT**[1] **(outlays in millions of dollars; number of students in thousands)**

Agency	Total outlays			Number of students		
	1970 actual	1971 estimate	1972 estimate	1970 actual	1971 estimate	1972 estimate
Defense	83	86	86	62	53	49
Health, Education, and Welfare	1,049	1,240	1,350	2,133	2,407	3,979
Office of Education	615	751	843	1,703	1,945	3,500
Social Security Administration	401	451	475	402	432	455
Health agencies and other	33	38	32	28	30	24
Veterans Administration	539	894	1,028	506	679	746
National Science Foundation	4	5	2	3	4	2
Total	**1,675**	**2,225**	**2,466**	**2,704**	**3,143**	**4,776**

[1] Involves some duplication because students may be assisted under more than 1 program.

Tables I–13 and I–14 indicate the funds expended and the awards made to undergraduate and graduate students by major agency.

The Veterans Administration will provide grants to 900,000 returning veterans who are enrolled at institutions of higher education. Outlays of $594 million will be paid in 1972 under provisions of the Social Security Act to students under age 22 who are the children of retired, deceased, or disabled beneficiaries. Finally, several Federal agencies offer fellowships and traineeships to support graduate, professional, and postdoctoral students in a variety of fields. A total of 202,000 such students will be aided in 1972.

Table I–14. **GRADUATE STUDENT SUPPORT**[1] **(outlays in millions; number of students in thousands)**

	Total outlays			Number of students		
	1970 actual	1971 estimate	1972 estimate	1970 actual	1971 estimate	1972 estimate
Health, Education, and Welfare	257	262	262	100	104	104
Veterans Administration	126	208	232	101	135	145
National Science Foundation	34	33	27	8	5	3
Other	16	16	16	4	4	4
Total	**433**	**519**	**537**	**213**	**248**	**256**

[1] Involves some duplication because students may be assisted under more than 1 program.

Institutional support.—Federal outlays for institutional support will total $1.2 billion in 1972 with $766 million for current operations and $472 million for facilities and equipment.

The primary elements of aid under current operations in table I–12 are:

- Cost-of-education allowances paid to institutions of higher education as part of fellowship and traineeship grants, largely in the natural and health sciences, by the National Science Foundation and HEW;
- Grants to institutions made by HEW for the training of students in the health professions and rehabilitation services;
- Grants made by the Office of Education to developing colleges which are not yet quality academic institutions and to college libraries; and
- Department of Defense funds for college ROTC activities.

To spur reforms in higher education, a National Foundation for Higher Education, funded at $100 million in budget authority, will be recommended under new legislation. An independent Federal agency, the Foundation will provide funds to colleges and universities that wish to experiment with new educational forms and techniques and assist in the development of national policy in higher education.

Continuing efforts will be devoted in 1972 to meeting the special needs of predominantly black institutions. Budget authority is increased under several Federal programs to help these institutions improve their educational capability.

The Department of Housing and Urban Development and the Office of Education support the construction of college and university classrooms, laboratories, libraries, and dormitories. The method of support has been shifting from direct Federal grants and loans to Federal interest subsidy payments on loans made to institutions of higher education by private lenders. Approximately $520 million in loans for new construction will be supported by the Office of Education interest subsidy payments. About $300 million of new construction will be supported by the HUD college housing program.

Grants are also made by the National Institutes of Health for construction of health facilities at medical, dental, nursing, and other health professions schools.

Research and training.—Federal outlays of $1.7 billion for research and training in 1972 include $1,710 million for academic research, $5 million for educational research, and $61 million for teacher training.

Funds for educational research will support experimental projects to study and test means of changing traditional structures and curriculums in higher education. The National Science Foundation programs will upgrade science curriculums and facilitate the incorporation of computers in college instruction.

Several Federal agencies have programs for the training of college and university personnel. The National Science Foundation supports programs to improve the competence of college teachers. Under the Education Professions Development Act, the Office of Education will give special attention to personnel development in junior colleges, technical institutes, and liberal arts colleges. Office of Education programs will develop training models for new careers in higher education experiments with innovative training techniques and improvements in teacher education programs at the graduate level.

Federal outlays for academic research represent about two-thirds of the total expenditures for sponsored research performed by universities. The major agencies supporting research are HEW (medical, health, and welfare research), DOD (research related to military requirements), and the National Science Foundation (research in all fields of science). Federal programs for academic research are discussed also in the special analysis, "Federal Research, Development, and Related Programs."

ADULT EDUCATION AND OTHER ACTIVITIES

A significant portion of Federal outlays for education are devoted to adult and various community education programs. In 1972, the estimated Federal outlays for these programs will total $2 billion, or 14% of all Federal education expenditures. These outlays are summarized in table I–15.

Table I–15. **FEDERAL OUTLAYS FOR ADULT EDUCATION AND OTHER ACTIVITIES** (in millions of dollars)

Sublevel and program	1970 actual	1971 estimate	1972 estimate
Adult and continuing education:			
Adult basic	66	80	83
Extension	125	160	171
Continuing education	269	408	474
Public library services	51	49	34
Public broadcasting	19	28	42
National Foundation on the Arts and the Humanities	17	38	64
Subtotal	547	763	868
Training of public employees:			
Federal civilian	15	15	15
State and local	9	12	12
Federal military	381	396	393
Subtotal	406	422	419
Foreign educational activities	193	243	247
Other	324	438	456
Total	**1,470**	**1,868**	**1,990**

Adult and continuing education.—This category includes Federal programs which provide educational opportunities for adults who either have not participated fully in the formal educational process in their youth or wish to continue their acquisition of knowledge and skills through less formal means.

Adult basic education classes enrolling over 650,000 men and women who have had less than 8 years of formal schooling will be supported by outlays of $83 million in 1972, mostly by the Office of Education and the Office of Economic Opportunity. These programs, largely in low-income areas, will enable adults to overcome English language limitations and to prepare for occupational training leading to more profitable employment.

The Department of Agriculture will spend $171 million in 1972 to support instruction in agriculture, home economics, and related subjects through land-grant college extension activities. Increases will provide for nutrition education and professional assistance in community development. The Office of Education will support vocational education programs for 3 million adults who will upgrade or acquire new work skills. Almost 400,000 individuals will benefit in 1972 from the Veterans Administration readjustment benefits programs to widows and wives of deceased or seriously disabled veterans. The Defense Department will support off-duty education programs for 333,000 servicemen in 1972.

Other programs covered by this category totaling $108 million in 1972 include:

- Office of Education grants to States for public library services and educational broadcasting facilities.
- The Federal grant to the Corporation for Public Broadcasting, a publicly supported, private nonprofit institution, providing operating assistance and financing new public television and radio programs.
- The National Foundation on the Arts and the Humanities with a doubled budget authority in 1972 to aid various cultural activities, support State arts councils, and fund programs in colleges and universities to improve the quality of instruction in the humanities.

Training of public employees.—This analysis includes Federal programs designed to assist public employees in increasing their professional skills through graduate education and other courses at educational institutions. Inservice and on-the-job training are excluded since education institutions are not involved.

The military services account for the major part of this continuing education effort ($393 million or 94% in 1972), utilizing both institutions of higher education and their own educational facilities. Training of civilian employees of the Federal Government, as well as State and local employees, is supported by the various branches of the Armed Forces, the Foreign Service Institute in the Department of State, the law enforcement training program of the Department of Justice, and the public health and rehabilitation manpower activities of HEW.

Table I–16. **NUMBER OF INDIVIDUALS BENEFITING FROM FEDERAL PROGRAMS FOR ADULT EDUCATION AND OTHER ACTIVITIES** (in thousands)

Sublevel and program	1970 actual	1971 estimate	1972 estimate
Adult and continuing education:			
Adult basic	3,659	3,725	3,713
Vocational education	2,352	2,626	2,839
Other continuing education	2,092	2,350	2,500
Training of public employees:			
Federal civilian	21	21	21
State and local	392	412	412
Federal military	379	383	380

In 1972, an estimated 21,000 Federal civilian, 412,000 State and local, and 380,000 military personnel will receive graduate, professional, or other education.

Foreign education.—The Federal Government supports foreign students attending colleges and universities in the United States and provides assistance to educational institutions in foreign countries. The principal Federal agencies involved are the Agency for International Development, the Peace Corps, and the Department of State.

Other Federal support for education.—This category covers a number of Federal activities that do not fall conveniently into any other categories. This includes the Library of Congress and the National Agricultural Library, the educational activities of the Smithsonian Institution and the Small Business Administration, $364 million for Bureau of Indian Affairs welfare and training programs, and $35 million for research supported by the National Science Foundation outside academic institutions.

Part III—Coverage of the Education Special Analysis

This analysis includes all Federal programs which have the direct support of educational activities as a major purpose or which involve the use of educational resources to achieve other purposes. For this analysis, education is defined as (1) a student-teacher relationship primarily for the transmission of organized knowledge, as distinguished from occupational skill, or (2) the provision of services to the community at large aimed at expanding individuals' opportunities for professional or career advancement, for civic involvement, or for a more meaningful and satisfying leisure. Any Federal program with outlays of $500,000 or more which supports any educational activity meeting this definition is included in this analysis.

This analysis does not include scientific research conducted outside of academic institutions (other than that in laboratories and other science projects of the National Science Foundation and Smithsonian Institution). Also, it does not include scientific research conducted in university-managed centers under Federal contracts. Finally, it excludes university service contracts—for example, to operate mental health centers—and many inservice training programs for Federal civilian employees.

Relationship to other special budget analyses and budget functions.—All programs classified in the budget functional category for education (see part 5 of the Budget Document) are included in this special analysis. These include all the programs of the Office of Education and the National Science Foundation, as well as Office of Economic Opportunity education activities, college housing loans and education of American Indians. For 1972, outlays for programs classified under the budget functional category of education total $6.1 billion.

In addition this analysis includes outlays of $7.4 billion for 1972 for programs classified under such other budget functional categories as "national defense" and "health." These activities use education—most often graduate training or research at academic institutions—as a means of accomplishing their primary objectives.

The amounts tabulated in this analysis include some programs also covered in other special analyses. For example, outlays of about $1.5 billion in 1972 are included in both this analysis and Special Analysis K, "Federal Health Programs," for university and other postsecondary programs which help train medical personnel. In addition, approximately $1.7 billion in outlays for 1972 for research in academic institutions are reflected in both this special analysis and Special Analysis R, "Federal Research, Development, and Related Programs."

Table I–17 summarizes the outlays included in this analysis which are also included in other special analyses and by major budget functional categories.

Table I–17. **FEDERAL EDUCATION OUTLAYS BY MAJOR BUDGET FUNCTIONAL CATEGORIES AND RELATIONSHIP TO OTHER SPECIAL BUDGET ANALYSES** (in millions of dollars)

Major functional category and special budget analysis	1970 actual	1971 estimate	1972 estimate
Functional categories:			
Education	5,022	5,513	6,086
Other categories:			
National defense	1,158	1,195	1,199
International affairs and finance	180	237	241
Space research and technology	155	147	134
Agriculture	277	398	367
Natural resources	61	59	68
Commerce and transportation	52	86	96
Community development and housing	39	121	143
Manpower	4	58	77
Health	1,091	1,163	1,313
Income security	1,148	1,424	1,462
Veterans benefits and services	916	1,514	1,734
General government	61	68	79
Special analyses:			
Federal health programs	1,398	1,450	1,500
Federal manpower programs	-------	54	72
Federal income security programs	1,418	2,077	2,328
Federal research, development and related programs	1,508	1,550	1,710

FOR RELEASE AT 12 NOON, EST February 22, 1971

Office of the White House Press Secretary

FACT SHEET

STUDENT AID REFORM

The President's proposed changes in student financial aid programs would, for the first time in history, guarantee that every qualified student from a low-income family would have sufficient resources to attend college. Under the proposal, grants, work-study payments and subsidized loans will supplement what the families of low income students can afford to contribute to the post-secondary education of their sons and daughters.

The President's proposals will also increase the amount of unsubsidized loan funds available to students at all income levels. This improved access to federally-guaranteed loans will assist millions of undergraduate and graduate students to finance their educations.

Proposed Program: Concept and Structure

The Administration is recommending a coordinated student aid system with two parts: (a) a combination of grants, work-study payments and subsidized loans for full-time undergraduate students with low to middle incomes attending all public and non-profit post-secondary educational institutions; and (b) creation of a National Student Loan Association to raise money privately and make it available for all post-secondary students at all income levels.

A. Grants, work-study payments, subsidized loans

The basic concept is that all students whose families can be expected to make the same contribution should have the same help available for their education from Federal sources. The combination of family contributions plus Federal grants, work-study payments and subsidized loans would be enough to enable any students to meet minimum education expenses. The key determinant is family income (and, thus, family contribution). Students from lower income families would receive more Federal aid than students from higher income families. (Lower income students would also receive a larger proportion of their aid in the form of grants and work-study payments rather than in the form of subsidized loans.) But the total resources available (i.e., family contribution plus Federal aid) to students at different income levels would be made equivalent.

For example, under the Administration's fiscal 1972 budget proposals, students from families with adjusted family income of $10,000 or less, and with two children, one of whom is in college, would be eligible for Federal funds. The maximum total amount of subsidized aid (grant and work-study plus subsidized loan) available to any one student would be $1,400. The maximum grant available to any one student would be $1,000. In addition to these base amounts, students who (1) meet the eligibility criteria for subsidized aid, and (2) attend schools with annual average cost in excess of $1,400 would be eligible to apply for an additional subsidized "cost of education" loan of up to $1,500.

more (OVER)

B. National Student Loan Association

The purpose of the proposed National Student Loan Association (NSLA) is to increase the amount of resources available for loans (both subsidized and unsubsidized) to all students at all income levels.

NSLA would be a private corporation, chartered and established by the Federal Government. It would raise funds by issuing its own obligations for sale in private capital markets. These obligations would be guaranteed against default by the Government, allowing the NSLA to pay a lower rate of interest.

With the proceeds from its sales, NSLA would buy, sell, or warehouse (buy under the condition that the seller will repurchase, i.e., NSLA "stores" the loans) student loan paper from colleges, banks or other eligible lenders. Typically, a college without funds of its own to invest in student loans would make a loan to a student and then turn immediately to NSLA to sell the student's note. NSLA would pay enough for the note to restore the college's cash position.

NSLA would significantly increase the flow of funds into student loan markets. Both banks and colleges would be encouraged to do more student lending. It is estimated that NSLA may buy up to $2 billion worth of loans in its first-year of operation.

The Administration's proposals would assure that one of the President's deep convictions is fulfilled:

"Equal educational opportunity, which has long been a goal, must now become a reality for every young person in the United States, whatever his economic circumstances."

NATIONAL FOUNDATION FOR HIGHER EDUCATION

Reform is badly needed in higher education. New models of teaching and learning must be developed. Traditional practices do not merit support simply because they are traditional, but neither do new schemes simply because they are novel. At the same time, there must be a source of support for experimentation, for tentative probings into new areas of scholarship, and for radically different kinds of education.

To meet these needs, the President has proposed the creation of a National Foundation for Higher Education within the Department of Health, Education and Welfare.

The Foundation would help institutions of higher education to achieve change by:

-- encouraging excellence, innovation, and reform in postsecondary education;

-- providing assistance for the design and establishment of innovative structures and teaching methods in higher education;

-- expanding the methods and patterns of acquiring higher education and opening opportunities for such education to individuals of all ages and circumstances;

-- strengthening the autonomy, individuality, and sense of mission of postsecondary educational institutions, and by supporting programs which are distinctive or of special value to American society;

-- encouraging postsecondary educational institutions to develop policies, programs, and practices which are responsive to social needs; and

-- providing an organization in the Federal government which is concerned with the rationalization of public policy toward higher education.

President Nixon's budget for Fiscal Year 1972 includes a request for $100 million of new funds for the purposes of the Foundation.

# # # #

FOR RELEASE AT 12 NOON, EST February 22, 1971

Office of the White House Press Secretary

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THE WHITE HOUSE

TO THE CONGRESS OF THE UNITED STATES:

Nearly a year ago, in my first special message on higher education, I asked the Congress to join me in expanding higher education opportunities across the nation. First, I proposed to reform and increase aid to students. Second, I proposed a National Foundation for Higher Education designed to reform and strengthen post secondary education.

Neither house of Congress acted on these proposals. Now the time for action is growing short. Existing legislative authority for the basic Federal higher education programs expires at the end of the current fiscal year.

1971 can be a year of national debate on the goals and potentials of our system of higher education. It can be a time of opportunity to discover new concepts of mission and purpose, which are responsive to the diverse needs of the people of our country. I therefore again urge the Congress to join with me in expanding opportunities in two major ways:

To help equalize individual opportunities for higher education, I am proposing the Higher Education Opportunity Act of 1971.

To broaden opportunities through renewal, reform and innovation in higher education, I am proposing a separate act establishing the National Foundation for Higher Education.

Equalizing individual opportunities for higher education

At the present time, a young person whose family earns more than $15,000 a year is almost five times more likely to attend college than a young person whose family earns less than $3,000.

At the present time, Federal student assistance programs do not always reach those who need them most.

At the present time, there are just not enough funds to go around to all deserving students. Needy students often do not have access to grants. Higher-income students are frequently unable to borrow for their education, even when loans are guaranteed by the Federal Government.

I repeat the commitment which I made in my message of last year: that no qualified student who wants to go to college should be barred by lack of money. The program which I am again submitting this year would benefit approximately one million more students than are currently receiving aid. It would assure that Federal funds go first, and in the largest amounts, to the neediest students, in order to place them on an equal footing with students from higher-income families. Abundant resources for loans would also be available to students from higher-income families. The budget I submitted in January provides funds for these reforms and stands behind the commitments of this administration. Failure to pass this program would not only deny these benefits to many students, but also would limit their opportunity to make major choices about their lives.

more

A major element of my higher education proposal to the last Congress is the creation of a National Student Loan Association. For too long, the volume of funds available to students for federally insured loans has been arbitrarily restricted by the lack of a secondary market in which lenders could sell paper in order to replenish their supply of loan capital.

Establishment of the National Student Loan Association would relieve this squeeze on liquidity by making available an additional $1 billion for student loan funds. The Association would be authorized to buy student loans made by qualified lenders -- universities as well as commercial lending institutions. This secondary market would enable universities and commercial lenders to make loans to students in far greater quantity than they have in the past.

It is important to be clear on what this reform would mean. It would mean that higher education would be open to all the people of this country as never before. It would mean that students still in high school would know that their efforts to qualify for college need not be compromised by doubts about whether they can afford college. It would mean that their choice of a college would be based on their educational goals rather than upon their family's financial circumstances.

Renewal, reform and innovation

If we are to make higher education financially accessible to all who are qualified, then our colleges must be prepared both for the diversity of their goals and the seriousness of their intent. While colleges and universities have made exceptional efforts to serve unprecedented numbers of students over the last decade, they must find additional ways to respond to a new set of challenges:

-- All too often we have fallen prey to the myth that there is only one way to learn -- by sitting in class, reading books, and listening to teachers. Those who learn best in other ways are rejected by the system.

-- While the diversity of individuals seeking higher education has expanded in nearly every social dimension -- age, class, ethnic background -- higher education institutions have become increasingly uniform and less diverse.

-- Increasingly, many colleges, and particularly universities, have become large, complex institutions which have lost their way. The servants of many masters and the managers of many enterprises, they are less and less able to perform their essential tasks well.

-- At the present time, thousands of individuals of all ages and circumstances are excluded from higher education for no other reason than that the system is designed primarily for 18-22 year olds who can afford to go away to college.

-- At the present time, institutional and social barriers discourage students from having sustained experiences before or during their college years which would help them get more out of college and plan for their future lives.

The relationship between the Federal Government and the universities has contributed little to meeting these needs because it has not been a genuine partnership. In many cases the Federal Government has hired universities to do work which

has borne little natural relationship to the central functions of the institution. Too often, the Federal Government has been part of the problem rather than part of the solution.

Certain Federal agencies promote excellence, innovation, and reform in particular areas. The National Science Foundation has played a magnificent role in the public interest for science, and the National Institutes of Health have played a similar role for health.

The National Foundation for Higher Education would fulfill a new role in the Federal Government. It would have as its mandate a review of the overall needs of the American people for post-secondary education. It would have as its operating premises, the principles of selectivity and flexibility. Its constituency would include people as well as institutions -- and not only the usual secondary student entering college, but also others -- such as the person who wants to combine higher education with active work experience, or the one who has left school and wants to return.

The Foundation can do much to develop new approaches to higher education:

-- New ways of "going to college." I am impressed with the need for new and innovative means of providing higher education to individuals of all ages and circumstances (Britain and Japan, for example, have already taken significant steps in the use of television for this purpose).

-- New patterns of attending college. A theme of several recent reports is that students are isolated too long in school, and that breaking the educational "lockstep" would enable them to be better and more serious students (as were the GI's after World War II). If so, student bodies would reflect a greater mix of ages and experience, and colleges would be places for integrating rather than separating the generations.

-- New approaches to diversify institutional missions. Colleges and universities increasingly have aspired to become complex and "well rounded" institutions providing a wide spectrum of general and specialized education. The Foundation could help institutions to strengthen their individuality and to focus on particular missions by encouraging and supporting excellence in specific areas -- be it a field of research, professional training, minority education, or whatever.

Special Help for Black Institutions

Colleges and universities founded for black Americans are an indispensable national resource. Despite great handicaps they educate substantial numbers of black Americans, thereby helping to bring about a more rapid transition to an integrated society.

Black institutions are faced with an historic inadequacy of resources. To help these institutions compete for students and faculty with other colleges and universities, the combined help of government at all levels, other institutions of higher learning, and the private sector must be summoned.

This administration has taken a series of actions to assist these institutions:

-- The proposed reform of student aid programs, with its concentration of funds on the neediest students, would significantly aid students at black institutions.

-- The National Foundation for Higher Education will direct special efforts toward meeting the needs of black colleges.

-- Additional funds for black colleges have been requested for fiscal year 1972 in programs administered by the U.S. Office of Education, the National Science Foundation, and the Department of Agriculture.

Conclusion

These are but some of the new approaches to higher education which need to be pursued. A theme common to all of them is a new kind of engagement between all the citizens of our society and our system of higher education. All of us can make a contribution to bringing about such an engagement by taking part in a thoughtful national discussion about our priorities for higher education. Students and faculties can make a contribution by reexamining their goals and the means they choose to achieve them. The Federal Government can do its part by supporting access to higher education for all of our people and by providing the resources needed to help develop new forms of higher education which would be responsive to all of their needs.

RICHARD NIXON

THE WHITE HOUSE,

February 22, 1971.

# # # #

EDUCATION

SERVICE PACKAGE

POST SECONDARY AND CONTINUING EDUCATION

RATIONALE

- PROVIDE OPPORTUNITIES TO LARGER POPULATION (DOUBLE)
- REDUCE PER STUDENT COST (PRESENTLY $700/YR./STUDENT)
- PROVIDE MORE RELEVANCE THROUGH VARIED FORMS

GOALS

- CREATE ONE OR MORE "OPEN UNIVERSITIES"
- EXTEND REACH OF EXISTING INSTITUTIONS AT REDUCED PER CAPITA COST
- DEVELOP COMMUNICATION BASED INSTRUCTIONAL MATERIAL

CONSTITUENCY

PRESENT COLLEGE-AGE POPULATION 15 MILLION

ADULTS OVER 21

EMPHASIS ON STUDENTS OUTSIDE THE PRESENT SYSTEM - MINORITIES AND OLDER STUDENTS

SCHEDULE

PLANNING	FY 1972 - 1973
SOFTWARE DEVELOPMENT	FY 1973 - 1977
DELIVERY SYSTEM AVAILABILITY	FY 1973
FIRST STAGE EVALUATION	FY 1974
DECISIONS PHASE II FUNDING	MID 1974
IMPLEMENTATION	1975 - 1976
CONTINUING EVALUATION	

BUDGET ESTIMATES

PROGRAM/PROJECT COSTS

	FY-72	FY-73	FY-74	FY-75	FY-76	FY-7	ANNUAL OPS COST
PLANNING	$250,000	$1,000,000	$500,000				
SOFTWARE	$500,000	$10,000,000	$20,000,000	$40,000,000	$40,000,000	$40,000,000	
OPERATIONS		$ 5,000,000	$10,000,000	$10,000,000	$10,000,000		
EVALUATION			$ 2,000,000	$ 2,000,000			

TYPICAL BUDGET ELEMENTS:

PRODUCTION COSTS: $300-$1000/MINUTE

COURSE: 13 WEEKS X 2 LECTURES X 30 MINUTES = 780 MINUTES
= $230 - 780,000

corresponds closely with the proportion of R&D expenditures in these fields reported by doctorate-granting institutions for academic year 1970-71.[3]

Table 3 compares the changes in manpower resources which took place in the academic community among the six areas of science.

A more detailed analysis of traineeship applications will be made in a final report, *Graduate Student Support and Manpower Resources in Graduate Science Education, Fall 1971,* to be published later in 1972.

[3]See National Science Foundation, *Resources for Scientific Activities at Universities and Colleges, 1971,* to be published by the U. S. Government Printing Office later this year.

Table 3.—Percent change in graduate enrollment, graduate faculty, and postdoctoral appointees in doctorate departments, 1970-71

Area of science	Total graduate enrollment	Full-time graduate faculty	Postdoctoral appointees
Total	−2.9	0.7	5.3
Engineering	−5.7	.3	12.5
Physical sciences	−5.6	−.6	7.4
Mathematical sciences	−5.8	.2	−6.2
Life sciences	−1.1	3.2	2.1
Psychology	4.2	−.2	4.7
Social sciences	.4	.2	a

[a]No change.

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SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION • WASHINGTON, D.C. 20550 • MAY 25, 1972 • NSF 72-308

First-Year, Full-Time Graduate Science Enrollment Continues To Decline

■ In doctorate-granting institutions, first-year, full-time graduate science enrollment decreased 5 percent between 1970 and 1971, after decreasing 2 percent in the previous year.

■ The "top 20" graduate institutions experienced reductions in their first-year, full-time enrollment at the greatest rate—8 percent.

■ Virtually all areas of science experienced reductions in first-year full-time enrollment.

■ The number of full-time graduate students supported primarily by fellowships and traineeships declined nearly 10 percent from 1970 to 1971.

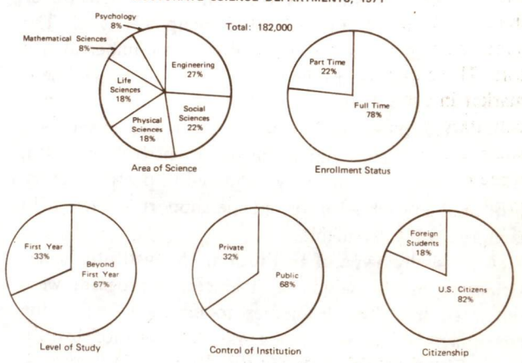
■ The proportion of full-time graduate students receiving their primary support from the Federal Government declined from 37 percent in 1969 to 32 percent in 1971.

The findings in this *Highlights* result from a recent study of departmental data derived from traineeship applications. These data were supplied to the National Science Foundation by 2,990 doctorate-granting departments and are considered highly representative of the national science enrollment picture. When fall 1970 traineeship applications were analyzed in an earlier study, it was found that they represented 80 percent of the total U. S. enrollment for advanced degrees in science and engineering reported to the Office of Education, and 98 percent of the doctorates awarded in all fields.[1]

Total Graduate Science Enrollment

The reporting doctorate departments enrolled a total of 182,000 graduate science students in 1971, of which 78 percent were attending full time (chart 1). To determine the enrollment trend over a 3-year period in basically similar departments, those reporting for 1971 were matched with identical departments reporting for both 1969 and 1970. In this matched set of 2,579 departments, graduate science enrollment declined 1 percent from 1969 to 1970, and 3 percent from 1970 to 1971, continuing the downward trend noted in the previous study.

CHART 1. SELECTED CHARACTERISTICS OF GRADUATE ENROLLMENT IN DOCTORATE SCIENCE DEPARTMENTS, 1971



Source: National Science Foundation

Publicly controlled institutions attracted 68 percent of the graduate science students in 1971 and private institutions, 32 percent. From 1970 to 1971, graduate enrollment declined 1 percent in public institutions but at a more rapid rate of 6 percent in those under private control. Engineering held first place in the total number of graduate students enrolled in 1971, as in the seven previous years of the collection period of these statistics. This field has traditionally been dominated by the largest percentage of part-time, foreign, and first-year students.

The general decline in graduate enrollment occurred in all areas of science except psychology and the social sciences. The substantial drop in part-time enrollment was heavily influenced by the 15-percent decline in the physical sciences (table 1).

[1]See National Science Foundation, *Graduate Student Support and Manpower Resources in Graduate Science Education, Fall 1970* (NSF 71-27) (Washington, D. C. 20402: Supt. of Documents, U. S. Government Printing Office), 1971.

Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies

Table 1.—Percent change in graduate enrollment in doctorate departments, by area of science and enrollment status, 1969-71[a]

Area of science	Total		Full time		Part time	
	1969-70	1970-71	1969-70	1970-71	1969-70	1970-71
Total ...	−0.7	−2.9	b	−1.5	−3.1	−7.9
Engineering .	−1.7	−5.7	2.6	−2.0	−8.0	−11.8
Physical sciences	−3.5	−5.6	−3.4	−4.3	−4.1	−14.7
Mathematical sciences ..	.3	−5.8	1.3	−4.3	−3.2	−10.9
Life sciences	1.2	−1.1	.4	.1	8.1	−10.0
Psychology .	1.5	4.2	1.2	4.8	3.8	−.2
Social sciences	.5	.4	−.6	−.9	4.0	4.5

[a]Data are based on 2,579 doctorate departments reporting in fall 1969, 1970, and 1971.

[b]Less than 0.05 percent change.

Full-time Graduate Enrollment

The pattern in full-time graduate enrollment, particularly of first-year students, is an important indicator of the size of the future scientific manpower pool. The continuing downward trend is due to a number of factors. These include influence of a shrinking employment market in some fields on prospective graduate students, voluntary cutbacks in enrollment by private universities, and more stringent controls in public institutions. Also, some college graduates may be forced to postpone entry into graduate school until outside support in their field is more readily attainable.

Analysis by Type of Institution. The institutions participating in the Graduate Traineeship Program were separated into four categories to examine further the enrollment dynamics among various types of institutions. The categories are: (1) the "top 20" institutions, chosen on the basis of the number of NSF fellows attending during the period 1968 through 1971 and the amount of Federal R&D funds obligated in fiscal year 1970; (2) the 65 "developing" graduate institutions that began granting science Ph.D.'s after 1960; (3) the 12 medical schools applying for traineeships; and (4) the 127 remaining institutions, called "intermediate."

A close look at the declining rate of first-year, full-time enrollment in the two periods studied indicates that prevailing conditions have changed within the public and private institutions within the "top 20." For instance, the 13 private institutions reduced enrollment radically in the earlier stages of funding restrictions, but this tendency has recently been modified. In contrast, the seven public schools reduced first-year entrants at a greater rate in the most recent period than earlier (table 2).

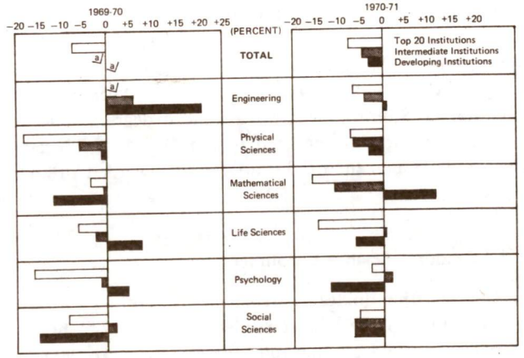
Table 2.—Percent change in first-year, full-time graduate enrollment in doctorate departments, 1969-71

Number of institutions	Type of institution	1969-70	1970-71
224	All institutions, total	−2.2	−5.0
20	Top 20 institutions ...	−7.4	−7.8
	7 Public	(-4.1)	(−12.6)
	13 Private	(-11.1)	(−2.1)
127	Intermediate institutions	−.2	−4.2
65	Developing institutions	.1	−3.0
12	Medical schools	−14.5	−9.2

Chart 2 illustrates the changes in first-year enrollment within each area of science as experienced by the three principal categories.[2] The "top 20" schools reduced first-year, full-time enrollment at a greater rate than did the developing or intermediate institutions in both 1970 and 1971. Although the developing institutions reported gains in engineering, life sciences, and psychology in 1970, these gains were not maintained in 1971. Likewise, the remaining, or intermediate, institutions increased first-year enrollment in engineering and social sciences, but this increase did not continue in 1971.

Types and Sources of Major Support. Fellowships and traineeships in 1971 accounted for 25 percent of the primary support of full-time students, as compared with 28 percent in 1970 and 30 percent in 1969. The number of students receiving this form of support declined 10 percent over 1970—the highest rate of decline of all

CHART 2. CHANGES IN FIRST-YEAR FULL-TIME ENROLLMENT IN DOCTORATE SCIENCE DEPARTMENTS



a/Less than 0.5 percent change

Source: NSF traineeship statistics from 2,579 doctorate departments

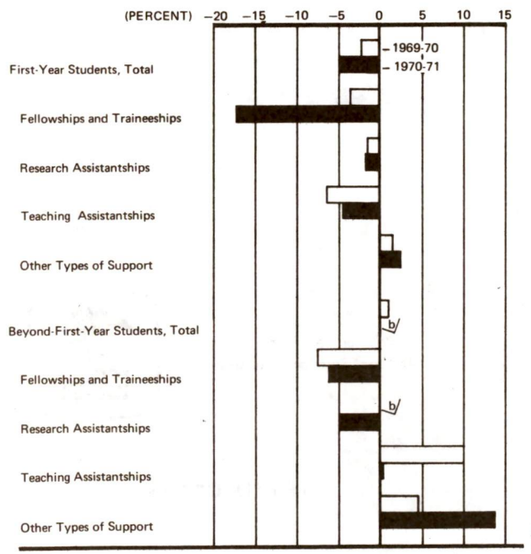
[2]Since the medical schools applying for traineeships accounted for only 129 first-year students in 1971, the 9-percent reduction in their enrollment does not have a significant impact on the overall results and was not considered illustrative.

types of outside support. Social science students had the smallest relative external support, while the physical science students had the smallest percentage of "other" support, primarily self-support. Fellowship or traineeship support was available to only 20 percent of the full-time students in publicly controlled institutions, but this same type of support was available to 38 percent in private institutions.

Fellowship-traineeship support to first-year students showed the highest rate of decrease of all the mechanisms of outside support available, as illustrated in chart 3. The number of students beyond their first year remained relatively stable, although fellows-trainees and research assistants declined. The increase in students depending upon "other" types of support, primarily self-support, indicates that the slack in outside support is being taken up gradually by the students and their families.

The 113,400 full-time students with U. S. citizenship constituted 80 percent of the full-time enrollment in 1971; foreign students, 20 percent, about the same proportions as in 1969 and 1970. The type of support available to the U.S. citizen differs from that of foreign students; e.g., fellowships and traineeships were held by 27 percent of the U.S. citizens but by only 18 percent of the foreign students. In contrast, research assistantships

CHART 3. CHANGE IN THE NUMBER OF FULL-TIME GRADUATE STUDENTS IN DOCTORATE DEPARTMENTS, BY LEVEL OF STUDY AND TYPE OF MAJOR SUPPORT, 1969-71 a/



a/Data are based on 2,579 doctorate departments reporting in fall 1969, 1970, and 1971.

b/Less than 0.5 percent change.

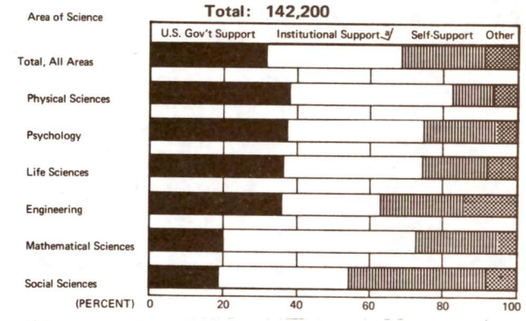
Source: National Science Foundation

were held by 19 percent of the U.S. citizens but by 29 percent of the foreign graduate students.

In 1971, the Federal Government reduced its share of support of full-time graduate students to 32 percent from 37 percent in 1969. There was a corresponding increase in self-supported students—from 19 percent in 1969 to 22 percent in 1971. From 1970 to 1971 federally supported fellowships and traineeships were reduced by 13 percent, and research assistantships by 5 percent. The full impact of recent major reductions in Federal traineeship awards will not be observable until academic year 1972.

Chart 4 illustrates the relative position in each field of science of the four sources of major support in 1971. The physical science students relied on self-support to the least extent; social science students the most. The Federal Government provided support to almost 40 percent of the full-time students in four areas of science—physical and life sciences, psychology, and engineering. Students receiving institutional support were concentrated in the physical and mathematical sciences.

CHART 4. DISTRIBUTION OF FULL-TIME GRADUATE STUDENTS IN DOCTORATE DEPARTMENTS, BY SOURCE OF MAJOR SUPPORT, 1971



a/Includes Institutions and State and local governments.

Source: National Science Foundation

Faculty and Postdoctorals

While total graduate enrollment declined, from 1970 to 1971 full-time graduate faculty (those teaching at least one graduate course or directing at least one graduate student) increased slightly, although less than 1 percent, and postdoctoral appointees increased by 5 percent. The doctorate departments included in the study reported a total of 57,400 full-time faculty in 1971, of which 85 percent were significantly involved in graduate teaching or research, as in 1970. Also, as in past years, over one-fourth of all graduate faculty were engaged in the life sciences.

In 1971, the number of postdoctoral appointments totaled 9,250, with 71 percent receiving their Ph. D.'s in 1967 or later. Over 80 percent of the appointees were engaged in the physical and life sciences; this percentage

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Chairman's Report

PSAC Panel on Educational Research and Development - May, 1968-Dec., 1970

F. H. Westheimer

Introduction

Early in 1968, PSAC established a Task Group on Educational Research and Development, and charged it with surveying the field, and with reporting to PSAC as to the areas where our efforts would have the greatest probability of benefiting the nation. The Task Group was constituted in May of that year and reported to PSAC in October at which time PSAC established it as a Panel; it has continued (with changes in personnel; see Appendix) until the present time. We believe that our activities have:

stimulated favorable changes in the Office of Education,

helped initiate essential programs in the Office of Child Development,

aided in the formulation of a reasonable program for Experimental Schools,

promoted a progressive program for the projected National Institute of Education

influenced NSF to strengthen its research program in Computer Assisted Instruction

During the two and a half years the Task Group and Panel have been operative we have established excellent working relations with the Office of Management and Budget, the Office of the HEW Assistant Secretary for Planning and Evaluation, and the HEW Office of Child Development, and had cordial relations with two

Commissioners of Education. We have presented several written reports and memoranda to PSAC and to other governmental agencies, but none of these reports has been formally issued.

This report is intended as a summary of the activities of the Panel, and as an outline of the future possibilities that constitute the Panel's unfinished business. But it can also be regarded as a guide to our earlier reports and memoranda, where much more detail and documentation are presented.

I. Draft Report to PSAC on "Educational Research and Development in the U.S. Office of Education" (September 1968).

The Panel prepared a draft report with this title for the PSAC, based on briefings from the Bureau of Research of the Office of Education and others, and on visits to educational laboratories, including a number that OE sponsored. The report was circulated to the Office of Education and elsewhere in HEW, but was never made public.

The Panel found that the Bureau of Research was hampered by an inadequate assignment of super-grades in the Civil Service. We were nevertheless critical of the Bureau's management, and of much of the research that they sponsored; particular, a large curriculum project, called ES 70, was considered "too nebulous to judge". Further, we noted that the Bureau relied on "field readers" to advise it on research projects, although their Field Reader Catalog contained

few outstanding scholars, and not one member of the National Academy of Education. In addition, we considered the research conducted at those OE-supported Regional Laboratories that we visited to be of uneven but generally mediocre quality, and that several of these laboratories lacked effective leadership or direction.

As a result of our investigations, we recommended that:

HEW establish a high-level advisory committee to review R and D related to education

OE establish a special committee for Basic Research in Education, and increase its support of unsolicited basic research

OE abandon the Field Reader system, and adopt a system of review panels similar to those of NICHD and NIMH

OE upgrade the personnel in the R and D Centers supported by the Bureau and improve the Regional Laboratories by cooperatively establishing a specific mission for each

The report drew a sharp written rebuttal from the Bureau of Research*.

*The Bureau's management had not changed much by late 1969. On July 27-29, 1970, the writer visited the Philadelphia Regional Laboratory, which advocates and develops Individually Prescribed Instruction. Standard tests gave no indication that their program, although 50% more expensive than the standard one, produced an improvement in learning. My report (August 1969), suggested (among other things) control experiments to see whether other methods could do better with equal additional funds. OE did not acknowledge or respond to my report; they continue to support the laboratory strongly.

At the same time, however, OE withdrew support from 5 of their 20 Regional Laboratories, and are now withdrawing support from four more (although perhaps not from the weakest). The Bureau of Research (now renamed National Center for Educational R&D — NCERD) allowed ES 70 to disappear, and has established a panel system to replace the Field Readers for basic research. It has also created a targeted research and development plan which in its present form is an inadequate response to suggestions, by the Panel and others, of the need for greater focus.

The present Federal Administration has elected to try to create a new organization, the National Institute of Education, that can get a fresh start with new ideas and new, higher grade personnel (see Section V). Although this move is not without danger, our panel regards the NIE as hopeful, and recognizes the great difficulties that would be involved in upgrading research in NCERD.

II. Report on "Opportunities in Educational Research and Development" (October 21, 1968)

A documented report on "Opportunities in Educational Research and Development" was presented to PSAC, and subsequently revised as a "Working Paper" that circulated in January, 1969 in BoB and HEW. We advocated to PSAC that the Task Group be constituted as a Panel and concentrate its activities on three areas of investigation, in this order:

1. Early childhood education
2. Experimental Schools
3. Improved methods of evaluation

In our report, we stressed intellectual opportunities rather than technological aids.* The opportunities for significant advances in all three of these fields are documented in this report, with numerous specific examples of potentially important research projects. In particular, we noted that ". . . learning to talk [rather than learning to read] may be the most important educational experience in life," we stressed the importance of the first few years (and even months) of life for learning, and discussed the chaotic way in which Head Start had been initiated and operated.

III. Early Childhood Education

PSAC approved these fields of investigation, and the Panel proceeded with briefings, site visits and discussions. Dr. DuBridge arranged a meeting with Dr. Moynihan so that members of the panel could acquaint him with our views on early childhood education. These views were timely in that they were directly related to the day-care provisions of the President's Message to the Congress on Family Assistance. Subsequent to our meeting with Moynihan, we prepared and submitted to him a memorandum (October 15, 1969) in which we recommended:

*We did note, however, that ". . . perhaps our greatest teaching opportunity comes from the possibility of reaching children, through TV, in their homes."

. . . a Summer Workshop to prepare materials making easily available to day care centers current scientific knowledge and curricula and other model procedures in child development, health and nutrition

. . . evaluation and continuing development of the curricula in some day care centers

. . . development of a course in child growth and education for adolescents

Planning for day-care centers was also considered by OEO, and we exchanged reports with them on this subject. The President nominated one of our candidates, Dr. Edward Zigler, of the Dept. of Psychology and Child Study Center at Yale, as Director of the Office of Child Development. We were in touch with Dr. Zigler at an early date and adopted our proposals so that, when he was confirmed by the Senate, he was ready to move ahead. As a result, this past summer a Workshop, sponsored by OCD, OEO and OST, produced a number of pamphlets on day-care for infants and preschool children, and for after-school care for young school-age children. Although the President's Family Assistance Plan has not yet been passed by the Congress, the use of day-care centers has been growing throughout the U.S. and the curricula prepared by the Summer Workshop cannot fail to prove of great use. If and when a Federally sponsored program for day-care is instituted, it can be begun in a business-like manner, rather than in the hasty and improvised manner with which Head Start began.

Provisions may not yet have been made for evaluation and for continued curriculum development in experimental day-care centers. However, we are confident that Dr. Zigler will move in this direction when he can.

OCD has also started toward the development of a course for adolescents on child development and education. This course is intended to convey to young people, who will soon be parents, some of what is now known concerning the ways in which children learn. For example, the importance for communication of the concepts contained in simple prepositions (over, after, between, etc.) has now been fairly well established, and the need to use these words early, often and carefully can be emphasized. The objective is to help all new parents to educate their children during the critical first three years of life, and in particular help parents from poverty backgrounds to close the gap that now obtains on entry into school between their children and those from middle-class homes. Only limitations of funds for research (a limitation imposed by the House of Representatives) has prevented OCD from full implementation of this project.

IV. Experimental Schools

The PSAC Panel on Educational R and D sponsored two meetings on experimental schools designed to bring together representatives

of various governmental agencies concerned with such schools, for an exchange of views. A number of different types of experimental schools, and of experiments on changes in curricula in schools were suggested, and in the fall of 1969 HEW proposed to BoB an experimental school program. Planning for this program has gone ahead, and a Federally financed experimental schools program is now near implementation. Such a program is discussed in more detail in our two memoranda of July 26, 1969, and in the attached memorandum on a program for the National Institute of Education. Here we note merely some of the possibilities listed in the earlier memoranda:

> schools modeled on the "infant" schools in Leicestershire, (England), and elsewhere where children are allowed considerable individual choice of what they study within an environment rich in educational artifacts
>
> schools where emphasis is placed on tutoring of young children by older ones
>
> schools with emphasis on individually prescribed instruction
>
> work-study schools, where students go to school part-time and have part-time jobs
>
> schools with greater emphasis on learning outside the schoolroom . . . (and) much greater use . . . of instruction by TV . . .

In our papers on the subject, we warned that, because the effects of early childhood education and of home environment are so large, the effects of changes in schooling may be hard to discern. Today, however, the success of "Sesame Street" seems sufficiently well-documented to suggest that radical departures in educational methods can make significant differences in learning.

V. The National Institute of Education

In his Message on Education Reform, the President called for a National Institute of Education. This Institute, if approved by Congress, will provide a new and needed mechanism to further research and development in education. It could easily command the high-level personnel that OE has lacked, and if given a strong director and reasonable distance from NCERD, might provide the leadership and focus for advances in education. The establishment of the Institute is however faced with several difficulties. The greatest risk is that the Institute will consitute simply another renaming of the Bureau of Research or NCERD, or will waste its political assets by defending the past performance of those agencies. The Panel is eager that the Institute be successful, and immediately after the President's message, held intragovernmental meetings on the opportunities and dangers associated with the proposed venture.

In order to put some meat on the bones of the idea, HEW let a contract to the Rand Corporation for a study, headed by Dr. Roger Levien, of possible ways of setting up the Institute. Dr. Levien has proceeded with meetings of his own, but has also met with us and has consulted extensively with John Mays. He has now written a draft of a report where he advances a fine plan for the Institute; a revised version of his report will soon issue. Our panel has written a more modest memorandum (herewith attached) intended for Secretary Richardson and Dr. Levien; it is concerned only with a possible research and development program for the NIE and does not treat other important aspects of an Institute, such as its organization.

VI. Technology.

The PSAC Panel investigated, among other matters, the possible application of technology, and especially of computers, to education. Although our intial reaction to computer-assisted instruction (CAI) was cautious, we became convinced in the fall of 1969 that incipient advances in hardware, such as those of Dr. Donald Bitzer at the University of Illinois, would soon make CAI cheap enough and flexible enough to be useful. We are not impressed, generally, by attempts (such as those at the Naval Academy) to program conventional courses for the computer, or by drill and practice routines. We are however attracted to the possibilities of quite new types

of education, such as computer-simulation in training medical students in diagnosis. In this application, a computer offers a medical student a patient's history, and then supplies only such further information (e.g., the results of X-rays or lab tests) as the student calls for; the student is asked to come up with a diagnosis and prescribe treatment. We are also stimulated by the possibilities of computer-assisted problem-solving and computer assisted college-board examinations. In any event, the time is here if not already past when extensive experimentation and hard evaluation are needed for various types of CAI. We must be firm in seeing that whatever is tried is rigorously and empirically tested for its results (including effects on attitudes) with students.

In November, 1969, we wrote Dr. McElroy to suggest an expanded program in CAI at the NSF. Although McElroy's reply at the time was non-committal or negative, we are happy to find that NSF is now proposing an expanded CAI program. CAI seems especially appropriate to the NSF, under which educational programs of high quality can thrive.

VII. Unfinished business

1. The National Institute of Education. The NIE is now in its formative stages. If PSAC maintains a panel on educational R and D, that Panel may wish to follow developments, with the intention of helping to maintain the NIE's inde-

pendence from NCERD, and of helping the new director, when appointed, to get the best possible program started.

2. Evaluation. The third topic that the PSAC Panel originally selected for emphasis is evaluation. The importance of evaluation becomes more apparent each day, as the answers to important questions are seen to depend on our appraisal of what has been done in various programs. For example, the future of the Regional Laboratories depends on establishing whether their programs do or do not help students to learn, and on comparison of their programs with others of equal cost; the particular places where CAI should (and should not) be applied depend on finding out what particular programs will and won't accomplish. Our conception of evaluation implies something broader than simple testing, for we wish to find out something about the attitudes of students, of their retention of materials over time, of the effects of various programs on their abilities in problem-solving and problem-setting, as well as on their abilities to remember. Several of the leading practitioners of evaluation and testing in the U.S. are eager to encourage research in this area. They generally realize that the simple tests -- and particularly routine tests adapted for machine-grading -- are insufficient, and they want to develop better methodology. They are also interested in participating in the planning

of new ventures (such as day-care centers) so that adequate "control" groups can be established from the beginning. Furthermore, they believe they should participate in "formative evaluation", i.e., evaluation that will guide further research and development. This field of mensuration seems well adapted to scrutiny by the scientists on PSAC.

3. Technology. The past PSAC Panel did little to evaluate the potential impact of technology on education. During the past year, however, technology (as TV) contributed enormously to education through Sesame Street, and the further possibilities both for TV and for computer assisted instruction are large.

Other areas (e.g., teacher education) also need study, and the President may need counsel with respect to them. The areas of the NIE, evaluation and the application of technology, however, appear to be the most urgent, and most appropriate for future action by a PSAC panel.

APPENDIX

Membership on the PSAC Panel on Educational Research and Development, May, 1968 - December 1970

The membership of the Panel on Educational Research and Development was as follows:*

Robert Cross (President, Swarthmore College) 1968-70

James Comer (Psychiatry, Yale Medical School) 1969-70

James Coleman (Sociology, PSAC, Johns Hopkins) 1969-70

John Davis (Superintendent of Schools, Minneapolis) 1968-70

Jacob Getzels (Department of Education, University of Chicago) 1968-70

William Hewlett (PSAC, Hewlett-Packard) 1968-69

Jerome Kagan (Psychology, Harvard) 1969-70

William Kessen (Psychology, Yale) 1968-70

Colin MacLeod(Department of Pathology, New York University Medical Center) 1968-70

George Miller (Psychology, Rockefeller University) 1968-69

Herbert Simon (PSAC, Carnegie-Mellon) 1968-70

Neil Smelser (Sociology, Berkeley) 1968-69

F. H. Westheimer (Chemistry, Harvard) 1968-70, Chairman

John Mays (OST Staff) 1968-70

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*Kenneth Clark (Metropolitan Applied Research Center) accepted membership on the panel, but did not serve.

FOR IMMEDIATE RELEASE FEBRUARY 22, 1971

OFFICE OF THE WHITE HOUSE PRESS SECRETARY

THE WHITE HOUSE

PRESS CONFERENCE

OF

DR. SIDNEY P. MARLAND, JR.,
COMMISSIONER OF EDUCATION,
AND DR. PETER H. MUIRHEAD,
OFFICE OF EDUCATION

10:04 A.M. EST

MR. WARREN: I think you have all had a chance to read the President's message to the Congress on higher education, the fact sheet and the charts. If you all did not get the charts, we have more available in the press office.

Dr. Sidney Marland, Commissioner of Education, and Dr. Peter Muirhead, of the Office of Education, are here to discuss the message and take your questions.

I would like to remind you that there will be a more detailed briefing at the Office of Education this morning at 11 o'clock following this. So we can move along here rather rapidly.

Now I will turn it over to Dr. Marland.

DR. MARLAND: Thank you, Jerry.

I am pleased to be here with you. This is the anniversary of my second month in office and, therefore, if I lean somewhat heavily on Mr. Muirhead, Executive Deputy Commissioner of Education and also former Associate Commissioner for Higher Education, I hope you will understand.

The topic is higher education and the legislation now going forward. I would like to offer at the very start an observation that I made before I came to Washington. The Presidential proposition implicit in this legislation, which we will attempt to elucidate this morning, is, in my judgment, a proposition of landmark skill that has not yet been wholly comprehended by our people.

We are speaking of the President's mandate that no child who wants to go to college and has the equipment for it shall be denied that opportunity for higher education. This has far-reaching and very, very substantial consequences to this country. And I, as a school teacher, am very proud to applaud them.

The proposition consists of two major parts: One, again recalling the President's mandate, to remove once and for all the financial barriers now preventing able but needy students from getting a college education; and, two, to encourage, assist and induce higher education institutions to continue their pursuit of excellence and to accelerate their efforts to make changes and reforms in the higher

MORE OVER

education structure, so that they may more completely and efficiently adapt to the needs of America in these vastly different and varied institutions throughout our land. Therefore, these two parts: assistance to the young poor and reform in higher education.

One, the student aid proposal, which we call the Higher Education Act of 1971, will do the following things: It would guarantee that every qualified student from a low-income family would have sufficient support to attend college.

Number two, it would increase from 1.6 million to about 2.5 million the number of students receiving support; almost a million new young people would come under the influence of this assistance than are now being assisted in the universe of higher education.

3, it would increase by more than 70 percent the funds for student grants, direct gifts to these young people qualifying grom the level of $333 million this year to $575 million in 1972. It would increase by more than four-fold the subsidized loans for needy students through the National Student Loan Association from the level of $243 million this year to a level of $1.2 billion available under this proposed program.

Next, it will target the grant funds on students from the lowest income families -- for example, students from the lowest incomes, the most humble circumstance of environment, would be eligible for $1,000 in direct grants and $400 in subsidized loans for an immediate access vehicle of $1400 with loans beyond that available up to an additional $1500. I will come back to that.

The program insures that needy students would know while in high school that they could count on and get a college education. Here is where I can bring some of my credentials as an elementary and secondary school man as distinct from an expert in higher education, which I do not profess to be. But think what this means today to the high school counsellor who can say to little Joe and little Alice, "Now, it is there; it is assured." And think what this does to the attitudes, the aspirations and the hopes of young people that up until now have had that door closed. I say it goes to the 4th grade, the 5th or 6th grade or the teacher who can now say that the schools are ready to move this youngster up and there is no gate beyond that high school diploma.

MORE

This is where the world changes. This is laid out not for 1971 and 1972, but for generations to come. This is why I speak of the immensity of the impact of this legislation that has not yet been perceived.

Finally, under the student loan theme, it extends the opportunities for all students, the middle class and the favored, to obtain long-term loans at reasonable interest rates under the conventional market, but guaranteed and, therefore, presumably given a more attractive borrowing circumstance.

Let us now turn to the foundation for a moment and what we would call the reform proposal. We would create a national foundation for higher education within the Department of HEW. We will provide assistance for post-secondary educational institutions seeking to develop new programs of national importance and to become models for reform to be demonstrations of restructuring higher education.

Some of you have heard about the things that Mr. Muirhead has already helped to stimulate in what we call the university without walls. You have probably heard of what is happening in England in the open university this year. We will be sending people over there very soon to observe that from the Office of Education.

But here you have an instrumentality that is a foundation and it behaves like a foundation and it has a governing Board and is made up of competent people who will deploy those funds budgeted this year at $100 million into institutions to be reform models for higher education and, hopefully, to increase the efficiency and effectiveness and the variability and the departure from the locked step in higher education which this bill encourages.

It will establish a higher education board representative of the higher education community and of the general public. And, you see, this will be a creature of higher education itself because these resources of foundation dollars will go to those institutions that want to change and be models for others to change. That is how they will get their grants as one would with any other kind of a responsible foundation. As I mentioned, it is funded at $100 million for fiscal '72.

Finally, let me emphasize that in addition to serving these two important priorities, the proposed legislation would continue the following worthwhile programs now established in the law. I will come back to that.

One, these things that are continuing, the community service and continuing education component under Title I of the existing Higher Education Act; two, college library support services under Title II will continue; developing institutions will continue. And this is where we will have a high priority potential on the black colleges in terms of their needs as developing institutions.

Four, Education Professions Development Act will continue and will, we hope, flourish to include such things as the Teacher Corps and the selectivity of certain kinds of needed teachers even at a time when there is a surplus in overall teachers. There are great shortages still in a number of categories.

It will continue the Higher Education Facilities Act. It will continue the language and area centers for the development of scholars in the exotic and somewhat remote fields of language and culture in countries not customarily studied in depth.

I would add that this budget that we are now presenting in support of the propositions I have just put before you more than doubles the resources for higher education in this country in 1972. In a time when it is clear that many, many things outreach our grasp economically in the education budget, we are indeed doubling the resources for higher education from $970 million to a requested $1.9 billion.

Finally, I would add that under Peter Muirhead's exceptional leadership, the past many months have seen us bring together the leaders of the higher education community to help sharpen, shape, refine and evaluate this legislation that has now been described to you and which will be going forward directly to the Hill. It does have the influence, the persuasion and the counsel of the representatives of the higher education community, both individually and through their separate organizations and parts.

And now with that, having been the general description of this legislation, I would invite you to hear Peter Muirhead, Executive Deputy Commissioner, to proceed with additional detailed information on this subject.

Thank you.

DR. MUIRHEAD: It seems to me that your principal interest at this juncture would be on some more detail on the student aid provisions of the bill which, of course, are the major thrust in the legislation, the student aid provisions of the bill seeking to carry out the President's mandate that every young person will have an opportunity to go on with his higher education irrespective of family income.

We have a few charts here. I think it might be helpful in explaining the concept that is in the bill. It is based upon a rather unfortunate situation in our nation today, and that is that the young person who comes from the family of very low-income background, as illustrated here, his chances of going to college are about 18 percent.

If, on the other hand, by the virtue of genetics he comes from a family earning $15,000 or over, his chances of going to college are 86 percent. By and large, the chances of going to college for a young person coming from a middle or upper-middle income family are about five times greater than that of a youngster coming from a low-income family.

I think this chart is intended just to illustrate and point that out as dramatically as we can.

The bill that will go to the Congress, and that is described in the President's message, will see to it that the number of young people that are assisted with sort of a foundation program will increase from the present level of 1.9 million. And I should call it to your attention that the1.9 million now includes about 300,000 students who are not classified as needy. So that we are now helping about 1.6 million needy students. The proposed legislation would move that level of support up to 2.5 million needy students.

The bill also makes it abundantly clear that the costs of education are a burden on middle income families and that we must recognize that and that we should provide opportunity for credit and make it readily available and have a federal guarantee behind it. We did do that in some measure in previous years. About $25 million were available on what we call unsubsidized guaranteed loans.

This bill would increase that so that 1 million students coming from families who cannot meet the financial needs test would have available to them ample credit up to $2500 a year and 20 years to repay it with a federal guarantee to help with their higher education costs.

A very important part of the legislation is that of increasing the level of subsidized loan support. I mean by subsidized loan support, loans that are made available to young people where they do not pay interest while they are in school and they have an extended period to repay it after they leave school and they repay it at a very low interest rate of three percent. And the Government subsidizes the interest rate above that.

At the present time, as many of you know, there is a program called the NDEA Student Loan Program which provides loans under those terms at this level of support. The NDEA loan program has been in operation long enough so that there has been built up in the schools a revolving fund amounting to $105 million. The NDEA Student Loan Program requires the institutions to put in 10 percent of their own money so that there is a total level of support at the present time on subsidized loans for needy students of $369 million.

This bill would provide that type of loan with that type of subsidy at the level of $1.2 billion.

Q What does NDEA stand for?

DR. MUIRHEAD: NDEA stands for National Defense Education Act. It was enacted in 1958 and has been renewed several times by the Congress and one important provision of the National Defense Education Act is the student loan program.

Under the bill that is going before the Congress with the President's advocacy is a measure to increase subsidized loans from this level of $369 million to a level of $1.2 billion as indicated here. That consists of $800 million which would be obtained through the purchase of private capital with the Government paying the interest, the continuation of the revolving fund in the schools, and a new program called cost of education loans which is much the same as the present National Defense Education Loan Program. Totalling then a total of $1.2 billion and having an on-the-budget cost of $85 million because in effect this program purchases the capital in the private marketplace and pays the interest.

Q By what year, sir, $1.2 billion?

DR. MUIRHEAD: If the legislation is enacted, by the college year beginning September 1971.

DR. MARLAND: I want to add a point to what Peter has just said, if I may. We have urged in our conversations with Congressmen and Senators that this bill move forward very, very promptly. It has been stated that the bill runs out of time at the end of this fiscal year. We have urged that it be acted upon forthwith so that the money may be established and the program established and the arrangements established for young people, in response to your question, who will be going to college this fall.

And until that money gets out there, until the plans get out there, the student loan officers and administration officers and indeed university presidents aren't going to know what the system is.

Therefore, we are asking for very early attention to this bill, hopefully so that we can declare our position and have the papers in motion certainly by the first of May so that young people entering college this coming September will have the benefit of this action without any doubt and that school counsellors and principals will be able to provide this kind of information for them now.

DR. MUIRHEAD: It has been suggested that we get to our back and forth rather quickly.

Let me just share with you one other chart which might stimulate some of your questions. The proposal would target the funds, as the Commissioner has said, on low-income students and would be graduated according to the family income. I thought perhaps the best way to explain that was to select several examples of families from different financial backgrounds and indicate how they might make out under this program.

Here we have some examples. A student coming from a low-income family whose family is not able to support them at all, with two children and one in college, that student in college would receive a $1,000 grant and a $400 subsidized loan. He would also have available to him additional subsidized loans up to the level of $2900.

A family that is a little better off but has more children would be treated much the same way.

DR. MARLAND: That is $3500 family income. This is $5,000 family income.

DR. MUIRHEAD: A third example of a family that is approaching the middle income level earning $7500 with five children, they, too, would benefit from this program with this level of support, about $800 in grants and $400 in loans.

Finally, a family that is clearly in the middle income group but with a large number of children would continue to get support, so that a family earning as much as $12,500 and having five children would still get a grant of $420 and the subsidized loan of $400 and have available to them up to $1500 in subsidized loans to meet the costs of education.

The Commissioner and I would be pleased to respond to your questions.

Let's show you the other chart. This last chart sort of takes you through the process of how a student gets this aid and is illustrated on this chart.

Q Could you tell us what is new with this program that wasn't in the program that you proposed a year ago?

DR. MUIRHEAD: Yes, there are a number of significant things. But the most important change in this program is that it retains what is known as the NDEA Student Loan Program and provides $250 million of support. It provides it in such a way that the colleges will have the money available and then when there is put in place a secondary market, which this bill would provide for, then that student loan paper would be turned over to the secondary market and would thereby become a non-expenditure item on the budget.

Q Is that the only new thing? Are there other new things? Is it an increased program? What else is new?

DR. MUIRHEAD: The thing that is markedly different about the program over the programs we have at present is that it sharply increases by 75 percent the grant support for students and increases, as the Commissioner said, by four-fold the amount of money in subsidized loans and does provide a secondary market to make that capital available for loans to students.

Q That wasn't in the last year's program or it has increased from what it was last year?

DR. MUIRHEAD: It has increased from last year and the important increase is the continuation of subsidized loans to enable young people to have freedom of choice in the selection of their institutions.

Let me illustrate. The basic foundation level of support is $1400. That will meet the costs at many public institutions and at almost all community colleges.

But for many of these young people, they want to select another institution of higher cost, the important change here is that they can now draw upon $1500 more of subsidized interest support taking them to the level of $2900.

Q Dr. Marland, the fact sheet says you are asking for $100 million in new funds. Are you going to do all of this with $100 million or is there more money involved?

DR. MARLAND: I think probably that fact sheet refers to the sum for the foundation.

Q What is the overall cost?

DR. MARLAND: There is a total cost, as I mentioned earlier, which goes to a budget of $1.9 billion as against the current year of $970 million, more than doubling. The $100 million that you speak of is new money attaching to the foundation.

Q Dr. Marland, last year the proposal for the foundation called for spending $200 million. This year it is $100 million. What has happened there?

DR. MARLAND: We have eliminated a number of features that were originally perceived in the foundation, such as continuation of graduate fellowship programs, the area and language studies, et cetera, which were first considered in the design of the foundation.

We don't now see the foundation as being an operating agency. And those costs have been removed from it and restored in the budget in the main body of the Higher Education Act.

Q Dr. Marland, many higher education organizations are still saying that they need institutional aid to go along with the increased students that your proposals are going to put on their campuses. Does this legislation offer any hope?

DR. MARLAND: There is no increased institutional aid in this legislation. I believe that I could assure you that this is one of the highest priorities of the Office of Education to establish the best method for creating a new mode of effective institutional aid.

It is a critical need. Our universities and colleges in many, many cases are in dnagerous conditions. I believe that this Administration will want to press very hard and very early for a solution to this problem.

You will note in your fact sheet that among the first

things that we would expect the foundation to attack would be to create a model that would make sense for the distribution of Federal treasure to higher education, recognizing the vast array of differences that exist between a modest school for people with very low costs, a community college for example, as distinct from a very high-cost institution with our values relating very earnestly to sustaining both.

How do you distribute Federal money to those two widely different kinds of institutions, your Princetons here and your local community college there?

The great needs of the black colleges, the great needs of our State universities and Land Grant colleges? We have got to design a formula for distributing that money before we come before the Congress and ask for it. I hope that will be within the next year.

Q Yet, if I understand you correctly, you say there is no increased institutional aid in this legislation. But the aid to the schools are expected to come through the tuition that these students will be able to pay the institutions. The private colleges are screaming that they are going under right today, that they can't meet their expenses out of tuition, and that the need is now and that it can't come from tuition.

How does the Administration propose to meet this problem?

DR. MARLAND: By designing a plan within the context of the $100 million set up for the foundation so it will have a rational plan and move swiftly to find the funds to assist those colleges.

But until we have a plan and a design and a model for distributing it, I am not prepared to recommend how we go about it. And I admit that it is a very desperate need and I know that it is.

Q Are you saying that if the foundation is established this year and the $100 million is spent, among other things, to develop this type of plan and design for distributing institutional aid, that you are hopeful that as early as next year Congress will be given a general institutional ---

DR. MARLAND: I will recommend, assuming we have a rational plan that makes sense, and I will be urging vigorous aid to higher education.

Q What was wrong with the previous plans for massive aid? You were talking about a rational plan. What is wrong with the previous methods of distributing aid to higher educational institutions?

DR. MARLAND: It is a matter of priorities at this time. The Administration is saying we must put the money where the poorest people are, where the greatest needs are in terms of national priorities,to uplift these young people, and to know that we have only so much money with which to deal and to place it where the need is the greatest.

DR. MUIRHEAD: May I just inject a point of additional fact that you would like to know? The present budget does in some measure recognize the need for institutional assistance in that it does provide an increase in the developing institutions program of $5 million, which is targeted on poor colleges and in addition to that it provides rather a massive program of interest subsidy for construction and a very important amendment will appear in the legislation in that that interest subsidy for construction will also carry with it a Federal guarantee, thus, making it more readily available for institutions to use.

DR. MARLAND: If I had not made it clear earlier, we are not wiping out institutional aid. We are just not moving in the massive direction that we would hope to. My notes earlier said that we were providing aid for developing colleges and in support for borrowing.

Q Dr. Marland, could I ask you two questions? Can you estimate how many eligible students are not going to college at the moment? How many people are we talking about who will be going to college as a result of this legislation? Secondly, the President talks about $1 billion,which appears to be the total of the increase in aid to higher education. I don't understand why the total is only $1 billion, if $1 billion is to go in the loans alone.

DR. MUIRHEAD: Let me respond to the first question. If we use, as the measure of unequal education opportunity, the difference between what the college entrants rates are of low income students as compared with middle-income students, we are presently suffering in this nation a talent loss each year of about 500,000 highschool graduates.

The bill that is before the Congress will move in the direction of correcting that talent loss. It is quite evident that it will not, of course, spring from the ground full-blown and they will not all be rescued the first year. It is our best judgment that probably as much as 20 percent of students who would not have gone on to college will be able to go on to college as a result of this bill. And in addition many thousands of students who did not get aid for school and who are eligible will get it under this bill.

The second part of your question: The $1 billion increase in the higher education support, most of that, as you must have gathered by this time, is directed at the over-riding priority of unequal education opportunity and is directed at helping low-income students get a chance to go to college.

Q Dr. Marland, a wide-spread complaint from middle-class parents has been that while they have paid up on their mortgages and are paid up on their car and they are relatively debt-free, they find that they cannot finance higher education for their children or get bank loans because they are in a relatively good financial position.

At the same time, people who are heavily mortgaged for homes, second homes, boats, second cars and that kind of thing have less difficulty doing this because they are in debt. Therefore, they need aid.

It goes to the whole question of the American Puritan

ethic aside from the very real question of how do you help these people who have scrimped and saved and whatever you like to call it.

DR. MARLAND: I will ask Peter to amplify. But I would say those people with the two cars and boats in terms of the eligibility data we gather on their sons and daughters would not be found eligible and would not, therefore, preempt money from the Puritan ethic family that is paying its bills.

The difference is that the middle-class family will be able, regardless of the condition of its boats or automobiles, to borrow money for this purpose under a guaranteed loan at what we believe because of the guarantee will be a more reasonable interest rate for that youngster.

And while he will not have free money, grants, work study and subsidized loans, he will have the benefit of the government behind his borrowing and there should be no problem in his being able to get money.

Q Sir, Congress didn't like the student aid proposals last year. What is in them new that is going to make them more palatable?

DR. MARLAND: Mr. Muirhead has cited the restoration of the NDEA type action and that is, I think, the principal interest of the popular program -- and it is a very good and popular program -- the vested interests that comes with history, it is familiar, it is known, it is dependable, it is there.

And to the extent that that has been an issue in our presentations before Congress, that is now corrected.

THE PRESS: Thank you, gentlemen.

END (AT 10:35 A.M. EST)

John Mays
10 February 1971

Panel on Educational R&D

Membership

James Coleman, Sociology, Johns Hopkins University
James Comer, M.D., Psychiatry, Yale University
Robert Cross, President, Swarthmore College
John Davis, Superintendent of Schools, Minneapolis
Jacob Getzels, Education, University of Chicago
Jerome Kagan, Psychology, Harvard University
Colin MacLeod, President, Oklahoma Medical Research Foundation
Herbert Simon, Psychology, Carnegie-Mellon University
F. H. Westheimer, Chemistry, Harvard University

Terms of Reference

General monitoring of Federal educational R&D program with particular emphasis on early childhood education, experimental schools, and evaluation. During last year has paid particular attention to plans for the National Institute of Education, a matter of particular interest to the President.

Status of Work

Recommendations on early childhood education have been accepted enthusiastically by Dr. Edward Zigler, Director of the HEW Office of Child Development.

A program of Experimental Schools proposed by the Panel (and others) has come into being at OE. It is being closely monitored by OST staff but help by a PSAC panel would be useful.

A plan for the program of the National Institute of Education alternative to that prepared for HEW by Dr. Roger Levien, was sent to HEW Sec. Richardson after PSAC review. More detailed planning of NIE is going forward at HEW with involvement of OST staff but help from a PSAC panel would be useful.

Accomplishments

a. Working in close relationship with OMB and Office of Secretary of HEW, and with Commissioners of Education have stimulated fundamental changes in HEW educational R&D programs, which have culminated in the President's proposal for a National Institute of Education and a program of experimental schools (now in operation).

b. Helped establish an R&D program in the HEW Office of Child Development.

c. Strongly influenced planning for the National Institute of Education.

d. Influenced NSF to strengthen its R&D in computer assisted instruction.

Remarks

This panel has been kept in being on a standby basis, despite the retirement of Dr. Westheimer from PSAC, pending the arrival of Dr. Truxal who it was thought might be interested in taking on the chairmanship of a panel in this area with initial strong emphasis on use of technology in education as discussed at the December 1970 PSAC meeting. Dr. Truxal has indicated his interest in this assignment. Among the things not decided at this date are which if any of the members of the present panel would be asked to join the new one. The length of time necessary to appoint panel members and the diversity of the field of educational R&D suggest retaining the present practice of keeping a larger panel roster than would be expected to work on any particular problem. An important activity will be monitoring of the planning of NIE (which, as has been said above, is of particular interest to the President), there being many a slip between cup and lip in the area of educational R&D. Another possible activity discussed by PSAC is evaluation of educational programs, perhaps in collaboration with another panel on evaluation of social programs.

John Mays
10 February 1971

Panel on Youth*

Membership

The Panel will be chaired by James Coleman. Following are possible candidates for membership:

Bernard Bailyn, Dept. of History, Harvard
Robert H. Bremner, Dept. of History, Ohio State
Burton R. Clark, Dept. of Sociology, Yale
John B. Davis, Supt. of Schools, Minneapolis
Zvi Griliches, Dept. of Economics, Harvard
Martin L. Hoffman, Dept. of Psychology, Michigan
Martin A. Trow, Grad. School of Public Affairs, Berkeley
(James S. Coleman (Chairman), Dept. of Sociology, Johns Hopkins)

Terms of Reference

This panel will reexamine, in the light of an historical and cross-cultural frame of reference, the institutional framework which has, without serious questioning, evolved as a means of bringing children into adulthood. This institutional framework is that of formal education, generally coming to encompass most of a young person's activities for a long period. The panel will examine this system of socialization on many counts, attempted to locate its potential defects (particularly as the family deteriorates further) and investigate possible institutional alternatives and supplements. After a year or so of work the panel will submit to PSAC, with a recommendation that it be published, a report based on the panel's review of historical and cross-cultural materials, and the potentials inherent in the current structure of modern society.

Status of Work

Panel is in the process of being formed.

Remarks

This panel is separate from the Panel on Educational R&D and is thought of, at this time, as an ad hoc one that will be disbanded at the conclusion of the work described above.

Dr. Coleman, who will not be at the February PSAC meeting, has indicated that he would be pleased if any members of PSAC wished to join the panel.

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*tentative name.

Subpanel on Education and Research, Science and Technology Policy Panel.

Members:

Dr. Arthur Bueche - Chairman
Dr. Edward F. Denison
Mr. Michael Boretsky
Dr. Michael Ference
Dr. John Kendrick
Dr. Richard R. Nelson
Dr. Chauncey G. Starr
Dr. Edward Teller
Mr. Carl H. Savit - OST Staff Representative

Last summer the President established the National Commission on Productivity. One of the Committees of the National Commission has the responsibility to study education and research as related to productivity. In connection with his work on that Committee Dr. David has asked the Science and Technology Policy Panel to make its own analysis of the relationship between productivity and education and research. It was Dr. David's intention that we could bring our special viewpoint to bear on the problem and thus complement the work of the broadly-based Commission.

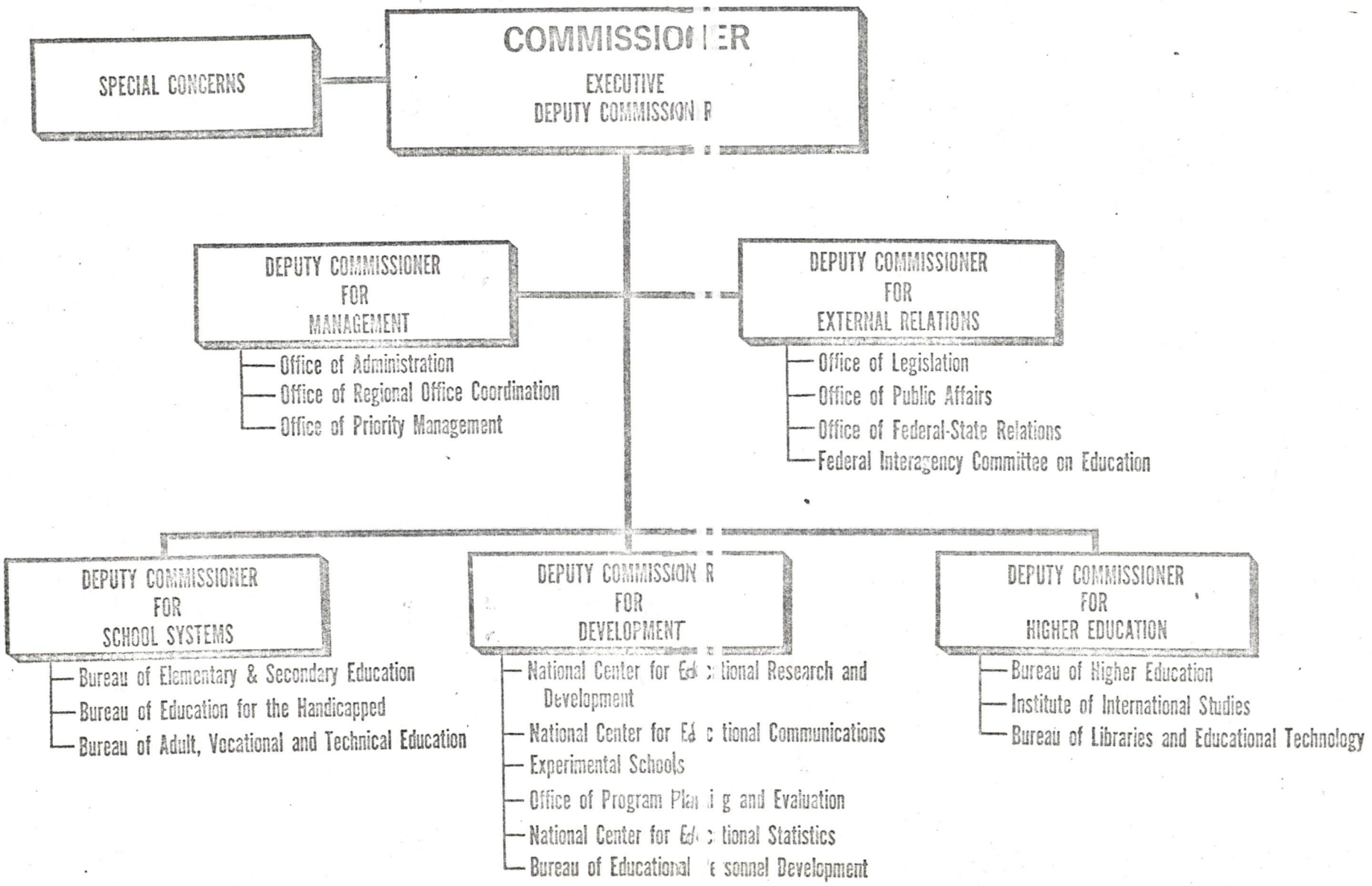
The first meeting of the Subpanel was held in Room 285, EOB on January 19th. At this meeting the state of measurement of productivity was reviewed intensively, primarily by Dr. Denison and Mr. Boretsky. Tentative substantive recommendations were worked out on the subject of education and educational policy, recommended research and development programs, programs for the dissemination and utilization of technology, and the removal or reduction of institutional impediments to the effectiveness of technology in improving productivity.

A draft working paper incorporating the recommendations and conclusions at this stage was prepared and is being circulated among the members.

The second meeting will be held February 18 in Washington, D. C. Dr. Howard Matthews, Director of the Division of Manpower and Training of the Office of Education will attend this meeting and will discuss vocational education and retraining.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

U.S. OFFICE OF EDUCATION



FOR PSAC USE ONLY

John Mays
10 February 1971
Revised 5 March 1971

Panel on Educational R&D

Membership

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James Comer, M.D., Psychiatry, Yale University
Robert Cross, President, Swarthmore College
John Davis, Superintendent of Schools, Minneapolis
Jacob Getzels, Education, University of Chicago
Jerome Kagan, Psychology, Harvard University
Colin MacLeod, President, Oklahoma Medical Research Foundation
Herbert Simon, Psychology, Carnegie-Mellon University
F. H. Westheimer (Chairman 1967-70), Chemistry, Harvard University

John Truxal (Chairman 1971-), Engineering, Brooklyn Polytechnic Institute

Terms of Reference

General monitoring of Federal educational R&D program with particular emphasis on early childhood education, experimental schools, and evaluation. During last year has paid particular attention to plans for the National Institute of Education, a matter of particular interest to the President.

New assignment: technology in education.

Status of Work

Recommendations on early childhood education have been accepted enthusiastically by Dr. Edward Zigler, Director of the HEW Office of Child Development.

A program of Experimental Schools proposed by the Panel (and others) has come into being at OE. It is being closely monitored by OST staff but help by a PSAC panel would be useful.

A plan for the program of the National Institute of Education alternative to that prepared for HEW by Dr. Roger Levien, was sent to HEW Sec. Richardson after PSAC review. More detailed planning of NIE is going forward at HEW with involvement of OST staff but help from a PSAC panel would be useful.

Status of work on new activities under Dr. Truxal is described on page 2 under Remarks.

Accomplishments

a. Working in close relationship with OMB and Office of Secretary of HEW, and with Commissioners of Education have stimulated fundamental changes in HEW educational R&D programs, which have culminated in the President's proposal for a National Institute of Education and a program of experimental schools (now in operation).

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The length of time necessary to appoint panel members and the diversity of the field of educational R&D suggested retaining the present practice of keeping a larger panel roster than would be expected to work on any particular problem. Dr. David is writing to present Panel members asking them to continue, and Dr. Truxal is making plans for addition of new members with special expertise relative to educational technology. Dr. Truxal will welcome any PSAC members who would be interested in joining the Panel.

An important activity will be monitoring of the planning of NIE (which, as has been said above, is of particular interest to the President), there being many a slip between cup and lip in the area of educational R&D. Another possible activity discussed by PSAC is evaluation of educational programs, perhaps in collaboration with another panel on evaluation of social programs.

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John Mays
10 February 1971
Revised 5 March 1971

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Status of Work

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Remarks

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Dr. Coleman has indicated that he would be pleased if any members of PSAC wished to join the panel.

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*tentative name.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20506

MAR 8 1971

March 5, 1971

MEMORANDUM FOR

Drs. Friedman, Moynihan, Olsen, Truxal

In connection with the discussion of educational R&D with Commissioner of Education Sidney Marland at the forthcoming PSAC meeting I am sending you the following earlier PSAC documents which have also been sent to Dr. Marland:

A Program for the National Institute of Education
(A Report of the PSAC Panel on Educational R&D),
December 30, 1970

Experimental Schools (PSAC Panel paper), July 26, 1969

Working Paper on Opportunities in Educational Research and Development (excerpted from a PSAC Task Group report to the full Committee), January 8, 1969.

Draft Report to PSAC on Educational Research and Development in the U. S. Office of Education by a PSAC Task Group on Educational R&D, December 1968

John M. Mays

FOR PSAC USE ONLY

A Program for the National Institute of Education

(A Report of the PSAC Panel on Educational R & D)

Introduction

In his message on Educational Reform last March, President Nixon proposed that the nation establish a National Institute of Education to "conduct basic and applied educational research" both within the Institute and by contract with universities and other organizations. The PSAC Panel on Educational R and D is enthusiastic about the potential of such an Institute and has sponsored and participated in intragovernmental discussions of its possible modes of organization and functioning. This paper reports our suggestions concerning one of the ways of organizing its program.

A National Institute of Education could easily affect a major strengthening of research and development related to education and thereby substantially improve learning throughout the U.S. Much productive thought has already gone into designs for the Institute. In particular, Dr. Roger Levien, who directs a Rand study under contract with the Department of HEW, is developing a plan for the NIE. We have had the privilege of reading his preliminary draft of October 30, and believe that his report when issued will constitute a major contribution to the Institute's future success. We are very favorably impressed by the wide range of persons, from many disciplines and from the schools themselves, who were involved in the preparation of this report and trust that this wide

December 30, 1970

participation will carry over into later phases of planning and most important, into the actual programs of the NIE. Nevertheless, we hope that it will prove useful to have our Panel present its views; where they are concordant with Dr. Levien's, they may serve to strengthen his, and where they diverge, they may provide worthwhile alternatives.

Dr. Levien's report is properly concerned not only with program but with the organization, staffing and financing of the Institute, and with the best ways of recruiting "the permanent staff of outstanding scholars" that the President called for. These are important questions. The PSAC Panel has, however, restricted its present report to a narrower field: the organization of the research and development program itself. Although we are in agreement with much of what Dr. Levien offers, our research program differs significantly from his; a brief analysis of the similarities and differences in the research programs is offered in Appendix II to this report. Since we are deeply concerned that the National Institute of Education be a success, we hope that the Panel's views will prove useful; we would like to avoid the possibility, however remote, that the NIE could become, or be criticized as merely a dressed up version of the Office of Education Bureau of Research or NCERD, with more money but without greater effectiveness. Decisions as to program will finally have to be made by the Commissioner of Education, by the Secretary of HEW, by the first Director when he is chosen, and of course by the Congress when it acts upon the President's suggestions for legislation. We hope that our suggestions for a research program will help those planning the NIE to create an organization whose effective output will be

commensurate with the large resources it will command.

Our suggestions are organized in three (somewhat overlapping) divisions:

A. Improving educational opportunity for the individual student,

B. Improving the social organization of learning

C. Educational goals, standards and evaluation.

Little attention is given in this paper to the question of the division of effort, as between in-house and extramural activities. As a general proposition, however, we feel that a research and development group devoted to Goals, Standards and Evaluation should be part of the NIE itself. In order to investigate new methods of evaluation, the NIE will need to establish a close relationship with several school systems that are interested in cooperating in various experiments. In addition to providing a testing ground for the methods of evaluation, these cooperating school systems would serve an additional purpose. One of the attractive features of the NIE to leading scholars could be its close connections with schools where experiments can be carried out; further the results of previous experiments would be available at NIE for analysis. By contrast, the majority of the program devoted to improving individual learning would presumably be handled by contract with universities and other organizations. The NIE would nevertheless need to house some first-class investigators in these fields, in order to maintain the competence required to administer a quality program elsewhere.

A. Improving educational quality for the student

1. Use of language

a. Oral communication. Recent studies have shown that the disadvantaged frequently begin school seriously handicapped with respect to their

ability to use standard English, and to grasp the concepts behind important words, such as the prepositions (over, under, after, before, on, behind, etc.). Programs such as "Sesame Street" and those in several effective preschools are aimed at improving oral communication; much research and development are needed in this area, both at the preschool level and later. Such research could be sponsored by the NIE extra-mural program, in cooperation with the program of the Office of Child Development and the NICHD.

b. Relationship between command of spoken language and reading. Reading may be regarded as a decoding process. Thus children with an inadequate vocabulary may be severely handicapped, since a word may be pronounced correctly but unrecognized. A variation now occasionally practiced is to record stories told by children, type them, and allow each child to learn his own words, where the vocabulary, even if not in standard English, is familiar to him. Investigation may show that, for some retarded readers, the quickest and best path to reading skill will come with postponing reading, and teaching standard spoken English first.

c. Reading. Although much attention has been devoted to reading, only recently have scientific studies of perception been related to reading; much fundamental research in this vitally important field could profitably be sponsored by the NIE.

computer?

d. Writing. How should children be taught to write? Should one encourage composition, with someone else (teacher, teacher's aid, older students) doing the actual mechanical writing, perhaps with a typewriter, both to encourage composition and to supply texts for reading. Relatively little investigation has been centered on this vital area.

2. Learning and Curriculum Development

a. Fundamental investigations of perception and memory. When, someday we discover the biochemical processes of memory and thought, we may be able to revolutionize teaching and learning. The current tentative conclusion is that we have at least two sorts of memory, a short term memory (half-hour or less); a permanent one; if this tantalizing concept is correct, we need to find what triggers the transposition from short to long-term memory, and what interferes. Few areas can offer such enormous potential pay-off. The NIE should cooperate with the National Institute of Mental Health in this area.

b. New methodology. A number of new methods of teaching and learning are today under investigation; one example is individually prescribed instruction. Methods similar to this have been in and out of the schools for a generation or more; we need to find whether it is effective, or more probably where and for whom it is effective, what are its limitations.

c. Use of teaching aids. Modern technology offers many teaching aids. TV has been used effectively in "Sesame Street" and in the school system of Samoa. Computer-assisted instruction is under investigation in several laboratories; it may prove a magnificent aid for problem-solving, and problem-solving

examinations, and affect the quality of education by encouraging emphasis on problem solving in schools. Its revolutionary potential cannot be achieved without both improvements in hardware, to reduce costs drastically, and experiments with soft-ware, to find where CAI is and where it is not effective.

d. Classroom materials and artifacts. The use of many artifacts to interest children in learning constitutes a major feature of some of the British infant schools in Leicestershire and elsewhere; for convenience, the method will be called the "Leicestershire" system. The fish and birds, typewriters and adding machines, puzzles, toys, pictures and books, tools, relief maps, paints and clay make the school rooms vital and interesting. We need investigations of the value of such artifacts in teaching. At the present time, only a minute fraction (e.g. 3%) of school budgets are devoted to such artifacts. A small increase in the student/teacher ratio would supply the money for a major increase in artifacts, might simultaneously make teaching easier (despite more students per teacher) and improve education. An investigation of the optimum balance between personnel and instruments is needed.

e. Curriculum development. Finally, the content of teaching is vitally important. Love and attention by devoted teachers, and mechanical devices such as films and TV, are primarily means to communicate content; the content must be well chosen. The curriculum revision in the sciences (PSSC Physics, Project Physics, the Chemical Bond Approach, and Chem Study in chemistry, three new biology texts) points the way, but are themselves simply the early models of interesting curricula. Much remains to be done to improve these

first attempts, and of course much needs to be done to initiate curriculum reform in English, social studies, history, art and music, etc. The NIE could contract for these curricula, in collaboration with the National Science Foundation and the National Foundation on the Arts and the Humanities.

3. Social Interactions, as they Relate to the Individual Student.

The study of social interactions takes place at two levels. On one level, it is concerned with social organization (see Part B); at another level, social interactions affect learning by the individual student.

a. Study of human awareness. We as a nation are concerned not only that students gain factual knowledge of the world, and acquire problem-solving abilities with respect to such knowledge, but that they become aware of others, and able to interact successfully with their peers and with adults. Much research and development needs to be done in the area of human interactions.

b. Effect of peers on learning. The extent to which children learn from their peers is substantial; the attitudes of peers has been shown to provide important motivation to learning. As an example, consider the effect of peers on language development; a young child in a foreign country (or a different region of his own country) quickly acquires a "perfect" accent. This influence needs to be analyzed and used constructively.

c. Effect of home environment on learning. Studies suggest that the influence of home environment on learning is more important than that of the school. Yet most attention is directed toward schools. We need to know more

about the crucial elements of the home environment.

4. Aid to Deprived Children

a. Physical handicaps. The nation needs to diagnose promptly the handicaps of children (poor vision, hearing, malnutrition), and arrange for remedial action.

b. Environmental handicaps. The nation similarly needs to diagnose environmental handicaps of children promptly, and arrange for remedial action (see below). Such environmental handicaps can, for example, include inadequate preschool education. We need to invent and test new and imaginative programs to prevent such preschool handicaps. One such program, suggested by this panel, is being implemented now by the Office of Child Development. Curriculum materials in child development and learning are being developed for adolescents. When they become parents a few years hence, they will know something about teaching their children to talk, and will know how important to child development early teaching and learning can be.

c. Remedial programs. We need research and development on remedial programs designed to help disadvantaged children catch up to their more fortunate contemporaries, and investigation of the needed motivation so that they will wish to do so.

5. Opportunities for the Gifted

The nation must care not only for its disadvantaged and handicapped, but also for its specially gifted children. As Terman said, "It should go without saying that a nation's resources of intellectual talent are among the most precious it will ever have . . ." The nation will depend, for its economic, technological,

artistic and political future both on the general vigor of its population and on the special contribution of genius. The welfare, safety and happiness of all of us depend on the inventions, discoveries and accomplishments of our future Langmuirs and Edisons, Mark Twains and Fords. A program that stimulates our most talented children constitutes a small but vital part of a balanced educational program.

6. Education of School Staff

a. Teacher education is central to development of better schools. Much can be done to improve it, including curriculum development for new, modern courses in psychology and other subjects.

Furthermore, teachers need acquaintance with some examples of successful educational R&D, so that they will be more receptive to new programs, and will realize that new programs must generally be adapted as well as adopted in the schools.

b. Administrators and specialists need training for their jobs; coming up through the ranks is helpful but insufficient. In particular, school administrators need to discuss and become acquainted with the possibilities for improving schools that are offered by community participation. They must see the community as a source of ideas, help and support, of cooperation and benefit. For surely community participation in schools will grow rapidly, and the attitudes of administrators must be tuned to take advantage of, and not fight against, this development.

Another major new question for school administration, concerns the rights and responsibilities of students and parents. (This, of course, is closely related to questions of community participation.) We have in the past given little consideration to these rights, but have regarded children as individuals to be educated and molded by the school system more or less as the teachers and administrators thought best. The NIE could profitably take the lead in consideration of these problems.

B. Improving the Social Organization of Learning

The present school system assigns one school to a given district, and allows the parent or student no effective choice, except for a rare few students who can afford private schools. Despite local control of schools, public schools throughout the nation are remarkably similar. Perhaps the College Board and similar examinations are in part responsible for this uniformity. In any event, some variation in school experience may be essential to improving the organization of education in the U.S. Such variation may take two forms: experimental schools (which can serve as models if successful) where new ways of organizing learning can be tried, and provision within a school system for choice among styles of education by students and parents. The latter idea is based on two premises. First, that children differ, so that no one style can possibly be best for all, and second that every school may be improved by competition with others.

1. Competitive Schools

a. Voucher system. The Office of Economic Opportunity plans to try an experiment with educational vouchers in a major city. This system grants vouchers to parents for their children, vouchers that are valid for a specified

payment for schooling. This allows schools to be established by any responsible group, and these schools then compete for students. The system has obvious advantages, and obvious dangers. If supplementary payments may be made by parents then the best financed schools will be those where the children of the prosperous go, and schools might tend to become more segregated on income lines than at present. Nevertheless, the system can probably be arranged so as to avoid this pitfall, and provide competition and variety among schools, to the benefit of the students.

b. Choice of school type within the system. In populous school districts, where two or more schools are within reasonable walking or busing distance of homes in the community, schools could be established that deliberately used different systems. For example, one school might be traditional, and another much more open (see the "Leicestershire" model, below). This should benefit the children in the district, since different children will benefit from different types of schooling, or the same child may benefit from different systems in different years. Further, the system could generate competition for excellence.

c. Choice of school for a particular activity. Another possible method of improving schools, related to choice of school type, is choice of school for a particular activity. Certain schools could specialize in specific activities (shop work, sculpture, swimming, calculus) and students might have the right to attend the appropriate school for an activity of his choice.

d. Accountability Schools. Schools that are accountable for their results to the community they serve would provide incentive to the staff for improved performance. If the salaries of the teachers and administrators were linked to the performance of the students, the motivation of the staff would be assured; teachers could not excuse poor performance of their pupils by saying the students are stupid, since unless the students learned well, the teachers would not be paid well. Of course, the community would have to insist on testing more than simple performance in school subjects, or teachers might become martinets; attitudes of the students toward school would also be important. But an attempt to develop a system for accountability in schools that incorporates the potential advantages and avoid the potential dangers is well worth the attention of the NIE.

2. New Educational Organization (Experimental "schools").

a. "Leicestershire" model. This style of education, developed over the past two decades in British infant schools (and sometimes called the Leicestershire system) features considerable freedom on the part of the school staff to arrange the curriculum, considerable freedom on the part of each individual student to carry out activities of his choice on his own time schedule, and considerable reliance on a wealth of toys, books, machines, puzzles, live animals, etc., to stimulate interest on the part of the students. The teacher/student ratio is often an astounding 40-45, despite individualization of instruction. It isn't clear how easily this model can be imported; freedom for the child without chaos is probably linked to the self-discipline British children learn in the home. The model is nevertheless an important one for investigation.

b. Tutoring by older children. An experiment in U.S. schools has shown that tutoring of younger children by older ones resulted in slightly improved learning for the younger children, and dramatic intellectual gains for the older children who were tutoring. A school based on this principle is well worth examining, and might link much improved learning with social gains, as older children find an important role for themselves in society. Such schools might also operate at lower cost, especially if the expected improvement in spirit on the part of the older children diminishes the problem of the "breakdown of the social fabric" in schools.

c. Individually Prescribed Instruction. One of the important innovations under investigation with support from the Office of Education is Individually Prescribed (IPI). The present research and development are largely devoted to teaching mathematics. That field is broken down into a matrix, and students tested to see what parts of the matrix they know, and what lacunae in their knowledge exist. Then each student works by himself at his own pace on the lessons appropriate to him. This form of instruction has obvious advantages, and some less obvious disadvantages, such as the loss of group interaction and peer influence on learning. The system warrants intensive R&D, and since the work was started by OE, should be continued by the NIE.

d. Work-Study Schools. Why should children remain in school until they graduate at the age of 18 (or from college at 22), and only then go to work?

Why not work and school interspersed, as at Antioch College, or work and school side by side, as with many part-time and night-school students? Work can improve schooling, by showing the relevance of much school material, especially in English, mathematics and science. (Although one would not wish to restrict learning to just the immediately relevant, motivation to learn is vitally important.) Furthermore, a work-study program may inculcate the habit of lifelong learning. Some work-study schools have been started; they merit support, evaluation, and further development.

e. Schools based on community participation. Community participation in the schools, until recently, was generally minimal. Today intense community participation ranges from parent advice on appointments and curriculum through direct parental participation in every school activity. Community involvement in the schools should result in better education, but in time some patterns will almost certainly emerge as superior to others. Experiment with and evaluation of community participation should be enormously valuable, and precisely suitable for the NIE.

f. Learning Outside of the Classroom. Most of what most of us learn is acquired outside of the classroom. In particular, the vitally important learning in early childhood is done at home. Young students have much to learn from factories, farms, construction work, from art and science museums, from libraries, from law courts, from movies, theaters, airports, etc. Much learning comes from participation in organized sports and from work experience (as suggested in the idea of Work-Study schools, above). Learning today may

come in large measure from TV, and large programs could be mounted for TV at home. Why should school be five days a week, or for the hours now prescribed? We might need fewer buildings and perhaps fewer teachers if part of the program were for learning at home, and in the educational opportunities inherent in the surroundings in cities and in the countryside. Experiments based on these possibilities ought to be more widespread.

Another supplement to school should be travel. It's difficult to evaluate the intellectual benefits of travel, but we know they are enormous; families who can afford it have given their children these benefits for generations. We are foolish to ignore an important education method because we don't yet know how to test or measure its results. Americans are great travellers; more effort is needed in finding out how to maximize the educational value of this travel, and how to evaluate it.

g. Other educational opportunities. The present legal requirements for school attendance to a given age (rather than to a given criterion of accomplishment) makes little educational sense. The requirement is probably in part an attempt to use the schools for custodial care of children while they are carefully kept off the job market. A more vigorous economy, where job opportunities exceed the labor supply, would presumably lead to a different pattern. So far as education is concerned, one might well remove the legal requirement for school for students over fourteen who pass specified series of tests. Such students would be free to seek work, or of course to remain in school. The benefits to the individual and the school system of substituting examinations for

age as a criterion to leave school might be great. Many who now regard school as a form of jail sentence, to be served for a specific length of time, might have an incentive to learn so as to leave; many disruptive students who hate school would be out of it, and might enjoy facing the real challenges of industry; many who passed the test would voluntarily remain, but with improved motivation. Such an experimental school is worth trying.

Closely linked to this idea is that of the "free school", where students come and go as and when they wish. Such schools are now operated for drop-outs; they might be extended to others, and must certainly be evaluated.

C. Educational Goals, Standards, and Evaluation.

1. Evaluation of "Natural" Experiments

A number of important "natural" experiments are conducted from time to time in education. The National Institute of Education should take the lead in seeing that these experiments are properly evaluated. An example of an opportunity missed involves the Head Start program. Here was a major experiment, yet no criteria of success were determined prior to setting up the schools, no control group was set aside for later comparison, and when the Westinghouse Learning Corp. began its evaluation, most of the needed data and controls were not only missing but forever unavailable. Another opportunity is now at hand with respect to school desegregation. Despite the years that have elapsed since the Supreme Court decision on desegregation, little had been accomplished in the deep South until this year. Now many schools are desegregating, and the effect of this major social change on learning, on community

attitudes, and on school structure should be evaluated. When and if government supported child-care centers are activated, under the President's Family Assistance plan or otherwise, the nation ought to evaluate the results.

Another "natural" experiment is provided by the phenomenal apparent success of "Sesame Street". Millions of children watched this program. We shall wish to know whether the children who watched are more successful in school than similar children who did not watch, and in particular whether the level of performance of disadvantaged children (who might otherwise not get the information transmitted by the program) is substantially improved. And this evaluation would best be made by an independent and unprejudiced organization such as the NIE.

Over the years, many opportunities will arise to evaluate "natural" experiments in education. No planned experiments can ever have the scope of these natural ones: some governmental agency, and presumably the NIE, ought to have responsibility for this evaluation.

2. Examination of the Long-Term Objectives of Schools

Very little attention has been given to an examination of the objectives of education. Various parents and students will have differing objectives, and no single educational system can hope to satisfy all objectives, or satisfy all parents equally. In particular, different communities will offer differing value judgements concerning the objectives of education, and these various and varying ideas should be brought into the open for discussion. The present objectives of

schools include education for choosing and performing jobs, education for general cultural pleasure, education for citizenship, education to aid each individual to adapt to changing times, and, undoubtedly, custodial care of children to keep them off the streets and out of the job market. The NIE could evaluate school programs in terms of the long-term objectives of the schools.

3. Evolution of Broad Standards of Student Development

In connection with the development of long-term objectives, new methods of evaluation are urgently needed. At the present time, most evaluation in schools is devoted to those things that can readily be quantified, such as mathematics and spelling scores, and the recitation of facts in history. Modern tests can be conducted to measure attitudes, and are of increasing validity as the community of testers gets more and more experience. But very little testing is devoted to questions of citizenship or honesty or friendliness, or even of enjoyment at school; as earlier noted, no-one has devised a way to evaluate the educational value of travel. Within traditional school subjects, testing tends to emphasize memory over understanding (for a possible cure, see below under computer-assisted examinations). The National Institute of Education is the natural locus for an advanced group who can devote more sophisticated means of evaluation.

4. Investigation of the Effects of Tests on Education

Certain tests may have an important influence on education. Teachers, who are judged in part by how well their students perform on standard tests, may well teach to those tests. The Iowa, the N. Y. Regents, and College Board tests may all do much more than measure; they may, in effect, decide what is taught, and how. Perhaps it is the Educational Testing Service, and not the State of local school boards, that in reality fixes school curricula. A group concerned with evaluation will want to know, first of all, the extent to which tests control education.

An attempt could be made to devise tests that accord with the educational objectives of a community. In particular, if problem-solving is considered an important activity for students, then an experiment might be tried with problem-solving examinations. Teachers might prepare their students for such examinations by increasing emphasis on problem-solving in school. Another important and understressed student activity is that of finding, or setting problems.

One way to introduce problem-solving would utilize computer aided examinations. Computer-aided instruction may be too expensive for immediate use, but we could undoubtedly afford at least computer-assisted college board examinations. These examinations would permit "chain" problems, where the answer to the first part is used in the second, and so on. At present, such problems are rarely tried, for if a student misses the first part, he cannot solve any of the problem, even if he understands all the rest. As a result, even

when problems are introduced on examinations (and perhaps in school), they tend to be extremely simple ones, quite unlike the real problems that face scientists and citizens. A computer, however, could record that the student had missed the first section of a multistep problem, supply him with the answer to it, and let him move forward. A computer-assisted examination can rival an oral one, but at relatively minor cost, and with complete reproducibility from one student to the next. The NIE could cooperate with the NSF to devise and evaluate such experimental examinations.

5. The National Assessment

The National Assessment, which should be completed for the first time this year, will presumably provide, like the census, a decennial indication of our nation's educational position, and provide the information needed by educators and local boards in deciding policy. The Assessment has been and should remain a function of the Education Commission of the States, but might well obtain support from the National Institute of Education.

6. Dissemination

The dissemination of the results of educational research and development is a major responsibility of the Office of Education, and will presumably be carried out through the NIE. Considerable controversy surrounds problems of dissemination. Some advocates feel that sufficient knowledge of educational methods is now available so that, if these methods were properly disseminated, considerable progress could be made immediately in reforming the schools.

Others believe that the difficulty really lies with evaluation. They maintain that we have seldom if ever been able to prove that any given innovation is really much better than the practices it replaces, but when and if any method is firmly proven, dissemination will prove no problem; the method will sweep the schools, just as penicillin swept through the medical profession once its efficacy was established. Since sincere and informed men hold both these views, probably both are partly correct.

The National Institute of Education can aid in the problem by careful evaluation, by pointing out, with respect to each evaluation just what was tested, what question was asked and how firm the answer is, or is not. Until the results of experiments in education are as firm as the results of experiments in physics or chemistry, the problems of dissemination will be difficult, and inextrically linked to those of evaluation. Honesty and care in reporting, and imaginative and thorough evaluation by the NIE can be an important boost to dissemination.

APPENDIX I

Members of the Panel on Educational Research and Development

Concerned with this Report

Robert Cross, President, Swarthmore College

James Coleman, Sociology, the Johns Hopkins University

James Comer, M.D., Psychiatry, Yale University

John Davis, Superintendent of Schools, Minneapolis

Jacob Getzels, Education, University of Chicago

Jerome Kagan, Psychology, Harvard University

George Miller,* Psychology, Rockefeller University

Colin MacLeod, M.D., Pathology, New York University

Herbert Simon, Psychology, Carnegie-Mellon University

F.H.Westheimer, Chemistry, Harvard University, Chairman

John Mays, OST Staff

*For part of the time

APPENDIX II

Since the Panel's report on "A Program for the National Institute of Education" was written, we have had an opportunity to see the Draft of October 30, by Roger E. Levien, entitled "National Institute of Education- Preliminary Plan for the Proposed Institute". As Panel Chairman, I have here summarized the similarities and differences, as I see them, between Dr. Levien's proposal for a R & D program, and ours.

Similarities.

Despite the differences between the way in which we organized our program and the way in which Dr. Levien organized his, the actual content of the programs overlap to a considerable extent; we agree on many of the things that must be done, and where many of the opportunities lie, although obviously we differ on emphasis. For example, both programs make provision for curriculum development, for the use of more technology in education, for special programs directed to the disadvantaged, for experimental schools, and for better evaluation.

Differences.

1. Organization of the programs. The major areas for the organization of the two programs are shown below.

Dr. Levien's Program	PSAC Panel Program
I. Solution of Major Educational Problems	A. Improving Educational Quality for the Individual Student
II. Advancing Educational Practice	B. Improving the Social Organization of Learning

III. Strengthening Education's Foundations

C. Educational Goals, Standards and Evaluation

IV. Strengthening the R & D System

No method of dividing educational R & D can be best for all purposes. The differences in organization implied by the areas shown above are considered below.

2. Duplication. No method of organization of a program for the National Institute of Education is likely to avoid duplication completely, and ours does not do so. Nevertheless, we find that Dr. Levien's program contains major duplications that may increase the difficulty of carrying out the work of the Institute. For example, Experimental Schools are introduced in the context of "Improving education of the disadvantaged" and of "Improving the quality of education", of "Improving the Instructional Process" and of "Improving the Educational System". (Subdivisions of areas I and II.) Technology is likely to be useful in many phases of education; it is designated for study in "Improving education of the disadvantaged", "Improving the quality of education", "Improving the instructional process", "Improving educational assessment" and in a section on "Increase ability to use technology and media effectively in education".

Dr. Levien has suggested a "matrix" organization for the Institute, where individuals will be hired by discipline, rather than as members of a team to work on a particular problem. This system of organization, now much used in intramural programs in industry and elsewhere, is here applied to a predominantly extramural program. Its advantages include greater flexibility in mounting new programs

and ending completed or unsuccessful ones and continuing cross fertilization between basic research and work on current problems. This organization may, on the other hand, make it harder to avoid internal conflict and to formulate a coherent program. We believe the question of organization should be kept open and explored further in the next phase of the planning effort.

3. Basic Research. Should basic research be made a separate division of the NIE, as in Dr. Levien's program ("Strengthening Educational Foundations") or should basic research be supported as part of the mission of the separate program managers? Our panel is aware of the past contributions and sanguine as to the future potential of basic research; we want to encourage it. We are inclined to believe that it will thrive best if it is included with applied research and development, rather than treated separately.

4. Emphasis. The two programs lead to quite different emphasis on a number of problems. The most important differences probably concern (a) education for the disadvantaged, and (b) evaluation.

(a) Disadvantaged. The President, in his message on Education Reform, emphasized compensatory education and called on the NIE" . . . to determine what is needed . . . to make our compensatory education effort successful". Dr. Levien's program contains a major subdivision of his area I entitled "Improving Education of the Disadvantaged" while ours contains a section on "Aid to Deprived Children" yet despite these similar responses to the President's message, the emphasis is different. Our Panel believes that the best way to improve the education of the disadvantaged will be to improve the education of all. Our point is perhaps illustrated by "Sesame Street" where recent evaluation suggests that the relative

gains for "disadvantaged" are greater than those for "advantaged" children. Undoubtedly the program was motivated by the desire to help the disadvantaged. But the program is overtly directed toward and in fact promotes the education of all children; it might not be so readily accepted by parents of either group were it specifically labeled as education for the disadvantaged. For this reason we have organized our program so that the major emphasis falls on "improving education for the individual student" and on "improving the social organization of the schools".

(b) Both Dr. Levien's program and ours offer research on evaluation, again in direct response to the President's message. We have however placed greater emphasis on this area by suggesting a separate division on "Educational Goals, Standards, and Evaluation"; this organization contrasts with the several places in Dr. Levien's program among which the responsibility for evaluation is distributed. We believe that our greater emphasis and concentration of effort are needed for the following reasons. First, this area presents many difficult intellectual problems, especially those concerned with broader standards than those used in past evaluations. Second, since we, like Dr. Levien, believe that the NIE should have its intial in-house activity in the area of evaluation, we believe that a major separate division devoted to it is desirable.

July 26, 1969

EXPERIMENTAL SCHOOLS

The PSAC panel on Educational Research and Development strongly favors a program of experimental schools and looks forward to a significant improvement in the U.S. school system as a result. Nevertheless, we feel impelled to point out that the schools are but one part of our complex American civilization, and the benefits that can be obtained by changes in them, although important, are not unlimited.

I. Reasons for Change

Discontent with the schools as they are is widespread. Much of this discontent arises because so many of the students in our central city schools fall two or more years behind the national average in reading and arithmetic; much of the discontent arises because so many children dislike school, and drop out; much of the discontent arises because many students and educators find the schools rigid, and more concerned (the schools say, necessarily concerned) with discipline than with education. Some of the discontent arises because the objectives of education and the relevance of current education to our society are obscure. Some of the discontent arises because the fundamental theories of learning and of teaching have not yet been established, so that we do not honestly know how to achieve whatever objectives we set. We would like students to be happy in school, and to find

pleasure in learning throughout their lives; these objectives are not met for a large number of children.

II. Possible Experimental Schools

Despite the lack of general agreement on theoretical principles, we believe that certain experiments have a reasonable chance of success, and are worth trying. A few examples, chosen from many to illustrate favorable opportunities are listed below.

(1) Schools established on the model of those in Leicestershire (England) where the children are allowed considerable individual choice of what they study within an environment rich in educational artifacts (animals, maps, typewriters, calculating machines, scientific equipment, paints, etc.); the program is designed to insure that the children enjoy school.

(2) Schools where a great emphasis is placed on older children tutoring the younger nnes.

(3) Schools with strong emphasis on individually prescribed instruction, so that each child can progress at his own rate within the curriculum.

(4) Work-study schools, where students go to school part-time and have part-time jobs, so as to provide a link between education and the world outside.

(5) Other types of schools with greater emphasis on learning outside of the schoolroom, utilizing visits to and study in museums, factories, libraries, farms and hospitals. Similarly, much greater use can be made of instruction by TV at home or in school.

(6) "Schools", somewhat similar to those briefly outlined in (5), where a student uses a particular school only as a focus for his activities and may pick and choose, in a competitive system, among various schools for various activities.

(7) Schools where parents or students or members of the community or all of them, actively participate in planning the school and in all its activities.

The rationale for each of these experimental schools can be expounded at length; there is good reason to believe that all of them will prove superior, at least for some students, to our present system. Many of these ideas are compatible, and can be combined in a single experimental school. Furthermore a system where the parents and children have some options among competing schools might allow a better match between child and school, and superior education for all.

III. Limitations on the Output of Experimental Schools

A detailed discussion of these experiments and others is presented elsewhere. The purpose of this memorandum is to offer a caveat concerning the results that can be expected from any program of experimental schools. The list of experimental schools given above has been presented as one way of expressing the panel's view that they are well worth trying, despite the difficulties listed below.

a) Society

School children are necessarily influenced in their attitudes by the world which they will enter on graduation (or on "dropping-out"). In previous generations, students could leave school for good jobs, in which they would have an opportunity to learn and advance. Why does our society insist that all students remain in school and "enjoy" books and mathematics and laboratories until they are about eighteen? Of course, those who lack the minimum intellectual skills to compete in modern society should be encouraged to acquire those skills. But many of the activities in high schools today are unrelated to most employment opportunities. Engineers and scientists and economists need mathematics beyond algebra; few American housewives have solved quadratic equations during the past decade. Command of the English language, so that he can understand and be understood, is vital to every student. He should have the opportunity to learn Shakespeare if he wants to; one may hope that most citizens will, as adults, enjoy and appreciate good literature. But is it vital to success or happiness to read Shakespeare at sixteen? When a student has a modest command of English and arithemetic and some conception of our laws, why shouldn't he be allowed to go out into a job if he wants to?

Part of the answer is that, although the U.S. has little unemployment, many citizens do not have the opportunity to use their talents fully. Restrictive practices are partially responsible. Why, for example, should a black

student learn a skill, such as carpentry or electrical work, when he knows that his chances of being admitted to the union are slim? What sort of job can he get when he leaves school, with or without his diploma? When a student goes on to college, he may face similar problems. If, for example, he has his heart set on medicine, he begins his studies knowing that the number of places for entering students in medicine in the U.S. is less than 10,000. The schools cannot solve the employment problems in the U.S. but attitudes in schools are affected by and may be poisoned by restricted employment opportunities.

b) Preschool education

At the other end of the scale, one must look at the six year olds who enter schools. By now it has pretty well been established that children, entering the first grade, have widely different abilities and skills. The schools must try to let each child reach his potential. These potentials are widely different, undoubtedly in part because of genetic differences. Much of the public today does not wish to admit this fact, and confuses the well documented statement that different individuals (e.g., siblings) have different genetic potential with the statement that different races have different average potentials; this latter statement is either untrue or unproved. But some children are brighter than others, just as some are taller and some are better coordinated.

The panel is also convinced, however, that a large part of the differences among children who enter the schools at the age of six does not arise in genetics, but in differences in the preschool education to which the children have been exposed. Good evidence connects success in school to the status of the father and his education. Studies of children over the past few decades have suggested ways that may be superior for educating them before they reach school. But whatever the reason--inadequate preschool education or genetic factors--some children come to school with marked deficiencies relative to others. The schools, no matter how well they are run, cannot make all children equal, and it has not been proved that they can more than partially overcome those handicaps that children may have acquired by the age of six from poor preschool education.

c) The home

Finally, while a child is in school, several important influences impinge upon him, of which school is but one. He is strongly affected by his home environment, by his peers, by his neighborhood. The Central Advisory Council for Education (England) concluded that only about 20% of the variance among the performances of pupils could be accounted for on the basis of the quality of the schools. The situation may be different in the U.S., where the variation among schools may be greater than in England, but it would be quite unlikely that the schools could account for a major part of the variance

in the performance of pupils. The attitudes of parents, the economic status of the family, and the neighborhood--and variations in individual genetics--will all play roles which in sum will far exceed the influence of the school.

IV. Conclusion

None of this means that the schools can't be improved, or that they should not be improved, or that a program of experimental schools is not essential to improving them. None of this means that we cannot produce much happier and somehat better educated students in the U.S. It does mean that we shall not solve the problems of education simply by improving the schools. The problems of society and the schools are strongly coupled; probably we must solve both to solve either.

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DRAFT
FH Westheimer
January 8, 1969

WORKING PAPER ON OPPORTUNITIES IN EDUCATIONAL RESEARCH AND DEVELOPMENT

This working paper was designed as a guide to further study in the field of research and development in education, and not as a completed survey of the field. Many of the ideas have been culled from those with whom we talked; many of the proposals are already underway. The "conclusions" consist of questions for investigation, rather than recommendations for action. The document should not be considered as presenting a program to be implemented now, but, we hope, will prove a useful starting point for discussion and for intensive study of specific problems.

CONTENTS

I. What is the need for R and D in education?

1. General remarks. Before discussing the individual fields where we believe that research and development offer major opportunities, we should like to make some general remarks about the present state of educational R and D.

2. Aims of education. The debate on educational practices in the U. S. contains many unstated assumptions. First and foremost, the school system necessarily has not just one objective, but a considerable number, and there is by no means always agreement as to the relative emphasis that should be accorded them. The diversity of objectives is in part related to the decentralization of the schools, where each community in effect decides on the relative importance of the various aims such as those listed below.

a) Develop the competence needed for employment?

b) Develop the social skills (including the self-discipline needed to endure routine) required to accommodate to society?

c) Develop ethical values, including those of good citizenship?

d) Develop a questioning and open-minded attitude, so as to assist the individual and America through a period of change?

e) Develop enough cultural stimulus to enjoy intellectual life?

f) Keep the children off the streets and out of the job market?

Fortunately, we can agree on part of what to do in elementary school; all citizens must learn to read and write a little (even in this day of TV and tape recorders), and they should know some simple arithmetic. But we are not agreed, for example, on the general utility of learning to solve quadratic equations, and one skeptic questions the need for all children to learn to manipulate fractions; similar questions arise in other subjects.

3. Lack of established theory. Paralleling the lack of complete consensus on objectives, there does not yet exist enough solid scientific and practical knowledge about how to attain educational goals in an effective way, whatever these goals might be. Psychologists entertain varied hypotheses about the fundamental nature of children, about how to promote problem-solving skills, and how to enlarge creativity. Some research has been directed to these basic questions, but the issues are far from being resolved. Sociologists have little solid theory concerning the impact of "authority structures" on the educational process. Aspects of Freudian psychology are recognized as important, but their assumptions and conclusions are not established. No one knows how much can be gained by "intervening" (i. e., teaching something to a child) at any particular age, and some skeptics still question whether much can be done other than permit a child to learn at his own best pace.

4. The "treadmill". Because of the lack of fundamental theory and established empirical facts, the history of educational experimentation been something of a treadmill. Educational ideas have been brought forth, tried, perhaps become a fad, and then faded away; no one knows whether to repeat or continue the experiment. "Progressive" education has been in and out of the American schools more than once. In 1924, the schools in Winnetka*, Illinois, introduced individually prescribed instruction, together with the

*Washburne, Charleton W., "Birk's Individual System as Developed at Winnetka." Adapting the Schools to Individual Differences. Twenty Fourth Yearbook, NSEE, Part I. Bloomington, Indiana; Public School Publishing Company, 1925, pp. 77-82.

concept of tracking each student. The idea then disappeared from wide discussion in this country, though it subsequently received extensive development and application in Sweden beginning early in this decade. It is now the subject of intense efforts by the Pittsburgh R and D Center, and the Oakleaf School. Numerous experiments in school organization (see Section V) have been tried in American communities but little cumulative advance has been achieved because no one knows for certain what has happened.

In her outstanding† treatise on reading,† Chall concludes that ". . . experiments in beginning reading should not be undertaken as if they were the first studies of their kind. Research in reading should follow the norms of science. Each researcher must try to learn from the work of those who preceded him, and to add to a unified body of knowledge . . ." A major aim is to manage, somehow, to arrange for the kind of evaluation of projects that will enable the U. S. to know whether to continue them. Some of the problems involved are presented in Section VI.

5. Education of the Disadvantaged. The Head Start program provides an example of a major program for the education of the disadvantaged. In 1964, the Congress passed legislation under which Head Start was initiated, and in 1968, a total of $320 million was spent for about 723,000 children.

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†Cf. Draft, "Disciplined Inquiry for Education," Lee J. Cronbach and Patrick Suppes, eds., National Academy of Education, September, 1968, p. 6-29.

† Jeanne Chall, Learning to Read: The Great Debate, McGraw-Hill, New York, 1967, p. 314.

The program for any given pre-school was left to local option. In 1965 Getzels† visited six Head Start pre-schools within walking distance of his office in Chicago and found six distinct programs. For example, one was established in a predominantly middle class nursery. The curriculum included free-play, group games, show and tell, and neighborhood trips--activities which did not differ from what had previously been done regularly in this nursery. Another was in a local public school, which had not previously dealt with nursery or pre-kindergarten children, middle or lower class. Here the aim was to give the children experience with the tools of the classroom--pencils, crayons, books, etc. --and to prepare them directly for regular school activities. A third program, which grew out of a volunteer college student project, was designed specifically for the so-called culturally deprived children. The staff was selected on the basis of experience in pre-school education with such children, and there was heavy emphasis on auditory and visual discrimination, rhythmics, and self-expression. A fourth program was in a local Montessori school, and was informed by its philosophy and methods. Among the activities were "practical life" projects (like buttoning, tying, cleaning dishes, polishing copper, peeling carrots) which would teach the children "to look at, see, and handle materials."

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†J. W. Getzels, Teachers College Record, 68, 219 (1966).

Head Start, set up with admirable speed to meet a current emergency, could not be expected to be perfect. But certainly when the next large Federal program is initiated, we should be in a position to build upon the strengths and avoid some of the shortcomings of this pioneering program. The point is not, of course, that Head Start should not have tried a diversity of methods. Perhaps the only way to begin was by hit and miss. The difficulty is that inadequate attempts were made to compare the effects of one program as against another, so that the best of each might be applied to all. Now, however, under the Head Start Follow Through program (which received funds from Congress too meager for general operations), well-designed experiments are being undertaken so that different possible theories for the first years of schooling can be tried under proper experimental conditions, and the results more realistically evaluated. These experiments which were conceived jointly by HEW and OEO, are being designed by the Stanford Research Institute; they may well provide a solid base for subsequent Head Start and grade K-3 programs.

6. Experimental Schools. Under Title I of the Elementary-Secondary Education Act of 1965, about $3 billion have been provided for improving education of students from poor families. These funds, which are allocated on a formula basis for use by local school districts have provided textbooks, additional teachers, food, clothing and medical care for needy children and in some cases have financed new sorts of school programs. However, there has been very little systematic large-scale study of new models of schools for education of the disadvantaged, which might show ways in which Title I funds could be used more effectively. A move in this direction was made by the

proposal in the FY '69 budget assigning $10 M to a model school project to be carried out in the District of Columbia with support from the Office of Education. This approach, as called for in a Presidential message,* was to support a large-scale community school experiment in Anacostia, a poor and predominantly black section of the District of Columbia, with a population of 50, 000 of which 10, 000 are in school. In keeping with the President's message, basic plans were made by groups of citizens of the area. Members of the local community met to plan for the school project. They originally planned that half of the Federal money would be spent for community projects (e. g., a health center and adult education) and only about half for schooling the children. The budget for this project has now been cut back by Congress to $1 million for the first year. Each million dollars adds about $100 per pupil per year to the school budget.

It is important that these and other experimental school projects be designed to utilize past experience, break new ground, and come out in the end with firm knowledge of what had been accomplished. We are especially concerned to make sure that these and other experiments be designed in such a way that it will be possible to assess the results in terms of student achievements and attitudes and that it will be possible to identify the variables (extra money, community control, or whatever) that are responsible for whatever success the program has.

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*The Nation's First City, Message from the President to the Congress, March 13, 1968.

†The Anacostia Community School Project, "A Proposal and Response to President Lyndon B. Johnson's Request to Congress . . . "N. W. Nickens, M. Fantini and J. E. Coast, August, 1968.

7. Community Control. Many individuals today accept as axiomatic that a school can best be managed by placing control in the hands of a group consisting of local residents and especially parents of school children from the area where the school is situated. The way in which the group is to be selected, the extent of the power they should exercise over the hiring and firing of principals and teachers, the methods of deciding substantive issues about curriculum, etc. are often uncertain. In several school districts, community control has meant intervention by a self-selected group, sometimes influenced by parent-teachers associations, but at least somewhat representative of and interested in the local community. Such community control can affect the way in which the school is regarded by the parents and children, and as a consequence alter the motivation of the students. Naturally, it is vital to learn what the results of such community control really are. These results must be evaluated not only in terms of what the children learn (although this aspect of the schools is central) but also what their attitudes toward learning are before and after community control has been established, and what are the attitudes of the community.

8. A model for R and D. U. S. industry builds on university research in natural sciences, and conducts extensive research and development of its own. Many firms in highly technological industry spend 5 to 10% of their gross on research and development; many in mass-production industries spend 1-2%. The proportion of basic research in the total R and D expenditures in the total varies considerably, but the chemical industry* claims about 11%. By contrast

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*Chemistry: Opportunities and Needs, NAS-NRC Publication No. 1292(1965).

the amount spent on research and development in U. S. education is only about $150 M a year, or about 0. 3% of the total of $50 B spent on all education, and the proportion of the $150 M spent on basic research cannot be much more than 10%-15%. Based on the highly successful model of U. S. industry, research in education appears to be underfinanced.

9. Personnel. In order to carry out the various research and development projects outlined in this paper, a large number of skilled personnel* would be required. The supply of such personnel is limited; perhaps there are already more good ideas than qualified personnel to carry them out. We suggest that additional funds allocated to basic research may help draw new investigators into the field of education from a variety of the scholarly disciplines. However, we must not forget that although the supply of personnel should grow steadily in the years ahead, it may still prove the bottle-neck in expanding educational research.

The size of the research community that would be involved is such that the proposed additional funding is appropriate. For example, the size of the research community in the social sciences alone was about 22, 000 graduate students in 1966 in all fields of social science, including specifically about 9, 500 graduate students inpsychology and about 3, 500 in sociology*. An additon of $10 M would finance research by something like 1, 000 students; the pool is large enough that this should prove possible, although we realize that strong competing demands for the services of trained social scientists will arise in the near future from the inevitable expansion of pre-school programs and from other needs. The number of faculty members who would be able to begin projects

*Graduate Student Support and Manpower Resources in Graduate Science Education, National Science Foundation, June 1968

in the field would probably approximate 200. This will be a severe drain on the supply, but the number is not so large relative to the supply (almost 6,000 in all the social sciences, of which 2,300 are in psychology and more than 1,000 in sociology) as to be impractical. Moreover, the social and behavioral sciences are only one source for recruitment of new personnel for research in education.

V. Areas of interest

1. Taxonomy of educational R and D. The organization of research on education can be made on a number of different bases. It can be organized by age groups, by subject taught, by teaching methods, by where the teaching occurs, etc. The subjects we found of interest are not all drawn from the same method of organizing educational research and development, and in part for this reason overlap considerably. But they also overlap for two much more fundamental reasons. (a) Consideration of each area again brings up fundamental questions of the aims of education, and (b) consideration of each substantive area brings up important questions of evaluation; we must somehow break away from the treadmill where experiments are repeated, generation after generation, without our learning much.

2. Priorities. The areas that appear to offer promise for further work are these: Early Childhood (Section IV), Experimental Schools (Section V) and Evaluation (Section VI).

3. Other areas of interest. We are inclined to believe that development of more modern courses in psychology and sociology for teacher training, offer important opportunities for improvements. We also note that professors are inclined to study everything except themselves, and that the universities are probably in need of critical examinations and far-reaching change. The impact of commercial TV on learning is under investigation, specifically at the Center for Urban Education in New York, but we have not yet examined this subject in detail, nor have we looked at educational TV, or at experiments, such as that in Samoa, for the use of TV in the classroom, and we have only heard briefly of the project producing educational TV programs for preschool children.

4. Future opportunities. Future opportunities in educational research and development may also arise from fundamental discoveries in neurophysiology and biochemistry. If, for example, the mechanism of memory were understood at the molecular level, it might prove possible to answer some long-standing questions concerning the needs for redundancy in teaching, etc. It is even within the range of possibility that something would be learned concerning the direct impact of nutrition on learning.

Section IV outlines some of the possibilities for research on the processes of learning in early childhood. But the research need not and should not be limited to this age range. In the past decade, experimental psychologists have become more and more willing -- as knowledge has progressed -- to turn their efforts to the study of complex forms of human behavior, including concept formation, problem solving, and various aspects of language-using behavior.

Progress in our understanding, for example, of human problem-solving processes has been substantial, and a good many psychologists now see their way clear to tackling basic and applied research tasks that deal with human problem-solving behavior at the level of school tasks: learning grammar, or solving algebra word problems.

As illustration, it has been found that two students solving the same algebra word problem may be using two quite different processes to translate the language of the problem statement. While the one depends largely on the grammatical or syntactic structure of the problem sentences, the other creates a representation of the physical situation involved in the problem. It has been shown that the two kinds of students make different sorts of mistakes, and that diagnostic items can be devised that will reveal which procedure a student is following.

At present, neither the field of biological research nor that of human learning has advanced sufficiently to permit applications of research to practice. But the NIH and NIMH are supporting excellent research in the biological sciences and NSF, NIH, NIMH and the private foundations are sponsoring excellent research on learning and OE is expanding its support of such basic investigations. An important need is early recognition of ways to exploit new findings in these areas.

III. Research vs Development

1. General. The need to improve education is urgent. We must open the schools every year, and they should be upgraded now. We cannot afford to wait until research is complete until we start innovation. Yet--and this is the dilemma of education--the foundations upon which to build proper innovations are shaky. This section treats of the time scales for research and the need for accepting risk in development.

2. The time scale. The research that needs to be done in American education requires a change in the time scale in the expectations of educators and researchers in the traditional academic disciplines. Real time studies

of educational effectiveness require years at the least. It is for this reason that attempts must be encouraged to carry out laboratory experiments designed to isolate particular parts of the educational process, so that results can be obtained more quickly. But studies of early child behavior and intervention, studies of major compensatory programs, studies of curriculum reform will necessarily be slow, and may well take decades. Nevertheless, many essential studies have not been begun, or are only recently under way. We are perhaps in the position of the medical profession half a century ago; the problems are urgent but basic research is insufficient. Programs can be attempted on the basis of present knowledge, but they are unlikely to accomplish miracles, and the best hope is the slow one: thorough research.

3. Development now? Since, however, the problems in the schools are immediate and the need great, we as a nation must move ahead with development projects and perhaps even some full scale programs such as Head Start, doing the best we can with existing knowledge. When we do, we must do so with our eyes open. Since the fundamental knowledge is weak, development projects may fail* more frequently than would be the case for example for pilot plants in chemical industry, and the possibility of failure must be accepted. It raises the cost, but may shorten the time needed to achieve practical results. Most of the projects in this paper pertain to research, but at least a few relate to development, and there are undoubtedly additional projects that could be developed now.

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*Draft, Disciplined Inquiry, 5-13

Our plea with respect to such projects is that careful consideration for evaluation be incorporated into each from its inception, so that the nation will know whether it has succeeded, or, if it is a partial success, where it has succeeded. It is useful to know quite definitely that a project carried out under well defined conditions has failed.

We can illustrate the point more concretely. Admitting that our fundamental knowledge is very limited, we are not today experimenting on an adequate scale in applying, through development projects, that core of knowledge that is generally established and accepted about the learning process. For example, it is known* that learning is strongly affected by the amounts and kinds of knowledge of results (feedback) the learner receives. Increasing knowledge of results, quantitatively and in terms of diagnostic value, is one of the important guiding principles of most experiments in individualized instruction and programmed instruction, but there are many possibilities not now being explored for using knowledge of results as a major principle for developing new curricula components and improved institutional techniques.

The question of how much of our resources to devote to promising but insecure development projects is a difficult one to answer. One must balance the overenthusiasm of the proponents of a new scheme, and the overcautious attitude of those who are unwilling to take risks until all the research is complete. No one wants to waste resources, or to raise hopes that must then

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*S. S. Stevens, ed., Handbook of Experimental Psychology, John Wiley, New York, 1951, pp. 1267-1270.

be disappointed, or to run the risk of discrediting educational R and D by premature large-scale experimentation. But time is precious, too, and because educational R and D is so slow, we as a nation must take more risks with development.

4. Sweden: A model for the U. S. Considerable change has been effected in the Swedish school system over the past decade.* The fraction of the population that continues through high school has been expanded, curriculum development in many fields has been initiated, new classroom techniques have been introduced, and a new and freer spirit brought to education. Furthemore, and from our point of view importantly, the new developments have been monitored, with extensive longitudinal studies of the results of Swedish education. The methods can serve as a model for the U. S.

VII. Early Childhood

1. The child himself. Progress with respect to the pre-school education of children necessarily depends upon some model for the child. The older view of an empty vessel to be filled contrasts sharply with the modern view, arising in part from considerations of the work of Piaget, that the child is inherently curious. All of us know that the most exciting sports are those (such as skiing) that involve an element of danger; men often deliberately seek danger, excitement and the problematic as well as food and sex. Yet we often regard a child as someone whose curiosity must be stimulated, someone who would not learn unless he were made to, and who should answer questions rather than ask them. Whatever else is done in educational research, fundamental investigations into the nature of children and into the theory of learning must be encouraged.

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*T. Husen and G. Boalt, "Educational Research and Educational Change: The Case of Sweden", John Wiley, New York, 1968.

2. The first few months. Numerous investigators have looked at the development of children in the first few months. In spite of continuing debate, the weight of evidence, largely from experiments in orphanages, strongly suggests that at least a minimum of handling and "tender loving care" is necessary for the normal development of infants; permanent retardation apparently results from depriving them of this stimulation. Probably enough is known to warrant development programs, to teach this much to mothers, and especially to the mothers of disadvantaged children. Professor Bruner told us of the variation in the way in which mothers set about inducing six-month olds to seek a toy that is not in view; is this an important kind of early intervention in problem-solving? Or is it wasted? B. L. White* claims that training in the first few months can improve visual-motor coordination in infants, but the experiments are not entirely convincing and all sorts of social and psychological questions remain to be answered even if and when the positive effects of education in the first few months are proved to be real. Much evidence indicates that children in normal, middle class homes receive enough attention and affection so that they generally develop in accord with their potential. But modern child psychologists are troubled and excited by the evidence that many Americans do not share in this experience, and with the possibilities that we can modify the environment of the "disadvantaged" so as better to take account of their experience and potential. We need experiments

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*B. L. White in "Early Education," p. 154 ff.
B. M. Foss, Determinants of infant behavior, John Wiley, New York, 1961, 1963, 1965; J. Kagan and H. A. Moss, Birth to Maturity, John Wiley, New York, 1962; E. S. Schaefer and N. Bayler, Maternal behavior, Child behavior and their intercorrelations through adolescence, Monog. Soc. Res. Child Development, 1963, Serial n. 87.

in educational pluralism.

A related research problem from the very early months is that of the measurement of IQ. Psychomotor development up to 18 months is uncorrelated with the IQ of the adult. Many data* indicate the absence of clear predictive links between early behavior (the first two or three years of life) and later achievement. Yet these findings are so contrary to "common sense" and the convictions of most parents, that we can only conclude that we have not yet found the observations of early behavior that will have predictive value.

3. Intervention. The questions of when to "intervene" and how to "intervene" are central to education. An example of effective intervention is now underway at the City University of New York.† Both lower-class and middle-class Negro 2 to 3 year olds, although they differed considerably in their language abilities, increased their command of language rapidly when taught the meanings and use of prepositions. S. H. White‡ wrote that "The contemporary move towards new pre-schools is premised upon the belief that the intellectual problem of the lower-class child is already of serious size by the time he reaches first grade. Some of us believe that the earlier intervention is offered, the better for the child, but such an assumption rests upon analogies from embryology, analogies from folk theories, and not upon any real understanding of the intellectual development of the child . . ."

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*B. S. Bloom, Stability and change in human characteristics, John Wiley, 1964.

†Francis H. Palmer, City University of New York, work in progress.

‡S. H. White in "Early Education", R. D. Hess and R. M. Bear, eds. Aldine Publishing Company, Chicago, 1968, p. 206, 207.

In classical studies,* one of a pair of twins was taught to walk stairs at an early age; this training gives him only a transient advantage over his sibling. Similarly, at least some of the educational aspects of the Head Start programs have apparently conferred advantages that were soon lost after the children returned to conventional classrooms.

Research on intervention is needed to buttress and direct the educational aspects of such experiments as Head Start.

4. Learning to talk. Learning to read may be the most important part of education in school; learning to talk may be the most important educational experience in life. R. H. Hess and V. C. Shipman remark that† although there are "marked discrepancies on all cognitive tasks, . . . One of the most striking differences among the social status groups was in their verbal behavior."

Children learn to talk in the home, rather than in school. Parents have not been instructed as to how they should set about teaching them. Perhaps such instruction is unnecessary in the average middle-class American home, where children have ample opportunity to hear and respond to sophisticated speech, but "disadvantaged" children may be deprived principally in the area of language development. Thus, what may be the most important teaching for children is managed by untrained amateurs. Even though professionals may not be agreed as to an ideal program for the mothers of the "disadvantaged,"

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*M. B. McGraw, "Growth: A study of Johnny and Jimmy," Appleton-Century, New York, 1935; A Gesell and H. Thompson, "Learning and growth in identical infant twins." Genet, Psychol. Monogr., 6, 124, 1929.

†R. H. Hess and V. C. Shipman, "Early Education," p. 99.

some development effort in this area is probably warranted now. Furthermore, the research efforts to date are not commensurate with the magnitude of the problem. We need more studies analogous to that on teaching the use of prepositions to 3-year olds. The following items exemplify the field:

(a) S. H. White* asks " . . . whether the lower-class home is a deprived environment for the intellectual development of the child before age 3--that is, before he has progressed enough in language to need the stimulation of complex language structure which the lower-class parent cannot model for the child's language development." Now, we know from researches carried out at the Center for Urban Education (one of OE's Regional Laboratories) that television is abundantly available in New York slum houses and that children spend many hours daily in front of the sets. One wonders whether TV offers useful models to the children of proper diction and complex sentence structure, or whether such models, to be effective, must be "reactive", i.e., must allow or perhaps demand replies from the children.

(b) Recently some studies have been initiated related to the analysis of Negro dialect. Non-standard pronunciation of English is irrelevant, or may indeed be charming, if it does not interfere with understanding, and hence with learning. If, on the other hand, errors in speech are related to important errors in grammar, they may cause confusion as to meaning. Teachers must be aware of those special peculiarities of dialect that interfere with effective

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*S. H. White, in "Early Education", p. 207.

use of standard English to convey precise meaning. Chall* summarized some of William Labov's findings as follows: "He found large-scale phonological differences among Negro speakers of non-standard English that coincide with important grammatical differences . . . Thus with the loss of / l / the colloquial future is identified with the colloquial present, e.g., you'll = you . . ." Such scholarly studies can easily prove of immense practical value in improving communication in the classroom.

5. Experimental control of social behavior. The social behavior of young children constitutes an important part of their early education. Favorable effects on social behavior have been experimentally demonstrated by the technique of contingent reinforcement; that is, favorable adult attention is offered when but only when the child exhibits favorable social behavior, and no attention is accorded to unfavorable behavior. In this way, investigators were able very quickly to get a 3 year old nursery school girl to walk upright, whereas she normally crawled 80% of the time, and temporarily reverted to this infant behavior when contingent reinforcement was temporarily withdrawn; they stopped a 4 year old boy from crying, although his original behavior included an average of 7 crying episodes per morning, they induced an apparently "lazy" boy to join other children in climbing activities, etc. Without agreeing on all of the objectives of education, we can probably agree that the behavior patterns that existed in these cases before training were undesirable.

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*Jeanne Chall, 13th Annual Convention, International Reading Association, April 24-27, 1968.

D. M. Baer and M. M. Wolf, "Early Education", pp. 123-25.

Eventually, of course, the role of reinforcer must be assumed by the child himself. This is particularly important in the case of studying, where most of the reinforcement has to come from the student's own feeling of satisfaction in a job well done. Much more research is needed to discover how children develop these self-evaluating, self-reinforcing abilities and how they are affected by the child's history of reinforcements from parents and teachers. *

6. A library of toys. The Far West Regional Laboratory (as well as other investigators such as Bruner) is experimenting with a library of educational toys for pre-school children, together with instructions on their use. Since nursery school is expensive, and since much learning does, and perhaps should, go on in the home, the idea of a lending library of toys, with instruction for parents, is an attractive one. This idea must be combined with good evaluation. We shall need to know what kinds of effects, if any, using the toys have, the extent to which they will be accepted and used, what toys teach anything, what is taught by them, and the ideal size of the library of toys (subject to economic limitations) for maximum benefits.

7. Reading. U. S. children usually begin to read at 5 or 6. Next to speaking, this is probably the most important overt intellectual activity of humans, and one that has been extensively research. Chall* concludes that several different methods--the linguistic approach, the phonic approach, ITA

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*Irwin Katz, The Socialization of Academic Motivation in Minority Group Children, M. David Levine (ed.), Nebraska Symposium on Motivation, 1967, Lincoln: University of Nebraska Press, 1967, pp. 131-191.

*Jeanne Chall, op cit., p. 305.

(initial teaching alphabet) are all useful, and any and all are superior to the "look and say" method that is most commonly used in the U. S. Her conclusions are not of course uniformly accepted, and are currently being tested. Even if they were uniformly accepted, concurrent with attempts to implement them, additional research is needed.

A second aspect of reading concerns content. As recently as 1967, Chall commented:* "I came across no evidence that a certain kind of content in beginning reading influences reading achievement favorably or unfavorably . . ." Nevertheless, she went on to say, "My own personal preference for first and second graders is folktales and fairy tales. They have universal appeal. In my work with children, I have never found one who could not identify with 'Cinderella', "The Gingerbread Boy', or 'The Three Little Pigs'. These tales contain struggle and triumph, right and wrong, laughter and tears--themes that have disappeared from modern stories based on familiar experience." We suspect that the pablum in "nice" readers has difficulty in competing for children's attention with TV. Further experiments concerning the impact of thematic content on learning are in order.

Patterns of family interaction may also condition a child's progress in learning to read. A child's attitudes toward authority are shaped, for example, according to whether he lives with one or both parents, and according to the severity with which he is disciplined. These attitudes, moreover, affect his readiness to respond to and learn from teachers in the classroom. Important

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*Jeanne Chall, op. cit., pp. 311-312.

as these family influences are on the child's capacity and willingness to learn, they are not sufficiently understood.

Even when Americans do learn to read, their training probably stops too soon. The Robinsons† conclude that " . . . college students read at the rate of 250-300 words per minute . . . they should be reading two to three times faster. Many poor readers have been trapped with an inadequate system in which comprehension is accomplished by "listening" to what is silently said." It isn't clear that enough research on reading, beyond that for beginners, is going forward.

8. TV. Educational and instructional TV have expanded, from their inception in 1953, to 124 stations in 1966. Although in principle this system can reach 125 million viewers*, its audience is not yet comparable to that of commercial TV. Few studies have been made of the educational impact of commercial TV, although (as already noted) the Center for Urban Education has made a hopeful beginning. The expansion of educational TV has been strongly recommended by the Carnegie Commission on Educational Television,* and their recommendations to be implemented by the Corporation for Public Broadcasting should certainly be beneficial. Students are in school only six hours a day, and many of them spend half that long before a TV set - and do so voluntarily. We urge that, in addition to encouraging educational TV, a real effort be made to evaluate the effect of programs in both educational and

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†H. B. Robinson and N. M. Robinson, Early Education, pp. 39-40.

*Public Television: A Program for Action. The Report of the Carnegie Commission on Educational Television, Bantam Books, 1967.

and commercial TV on both the information and the attitudes of children. Perhaps our greatest teaching opportunity comes from the possibility of reaching children, through TV, in their homes.

VIII. Experimental Schools

First and foremost among the problems of the schools is the question of value judgement: what are they for? This problem has already been outlined in section I-2, it dominates discussions of experimental schools.

1. School as a "zero-sum game." There is a considerable tendency to regard school as a competition among the students, where some students win only if others lose, rather than as a place where all students acquire minimum competence in needed skills, and other learning is acquired according to the student's interest and desire. Everyone learns to walk and run; only a few people want to learn to race. Not everyone learns to speak properly, or to read, or to do simply sums; everyone should learn to do these things in school. It isn't clear how much more should be required. One type of experimental school would attempt to let everyone who learns the minimum feel that he has succeeded, while at the same time providing students with the opportunity and encouragement to learn more. This proposal, however, needs careful development and evaluation, since the aggressive and competitive nature of man may be instinctive,* and should be given scope in sports and perhaps in other school activities.

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*A. Sturr, Human Aggression, Atheneum, N. Y., 1968.
K. Lorenz, On Aggression, 1966.

2. The Leicestershire Schools. Among the most original schools in widespread and apparently successful operation are probably those in Leicestershire, England. These schools allow the children enormous freedom to work with a wide variety of school materials under a teacher's guidance. They have been described as follows:*

"Forty to 45 children, ages 5 through 7, attached to the room . . . Focal points, consisting of tables, chairs, bookshelves, bins, lockers, peg-boards, sinks, a carpentry bench, a clay table, a stove, easels and a sand table . . .

"It is perfectly all right if some children want to paint all morning . . ."

All sorts of interesting items are included in the school equipment, and the British manage this on a budget of only $6 per child per year; it would cost much more in the U. S. The list of the equipment recommended by a Leicestershire expert for a U. S. school requires six printed pages; the first two of these pages is shown in Appendix II.

The Boardman School in Boston was begun on an experimental basis along the lines of the Leicestershire model. However, it differs sharply from the English equivalent: (a) the school serves the "disadvantaged;" it is an integrated school, but overwhelmingly Negro, so the children's backgrounds differ sharply from those of English boys and girls. (b) In contrast to the

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*Education for Initiative and Responsibility, Edward Yeomans, National Association of Independent Schools (4 Liberty Square, Boston) November, 1967.

schools in Leicestershire, where one teacher serves 40-45 pupils, the Boardman School has one adult for each 8 children (a teacher, an apprentice and an aide from the community for each 25 children).

We believe that U. S. educators should study the Leicestershire schools, try to evaluate the degree of success they are having, and evaluate whether the type of experiment they represent could successfully be imported into the U. S.

3. A projected experiment in the U. S. One way to carry out an experiment on the impact of school materials on learning would be at constant cost. This means that an increase in the materials used to interest and excite the students would be made at the expense of a higher ratio of students to teachers than that customary in our schools. It may be quite difficult to determine, by trial and error, the fraction of the cost to be devoted to materials that would maximize educational advance toward some particular criteria. But if, as we suspect, the present allocation to materials is grossly insufficient, then experiments along the lines indicated might lead to significant improvement in the schools.

One school system reasonably typical of those in the U. S., in 1965 spent about $4 per pupil on textbooks, another $2.65 per pupil for books for the library, and about $1.75 per pupil for audiovisual aids. In 1966 they spent about $17.50 per pupil for all books and school supplies. The schools were spending only 2-4% of their budget (over $500 per student per year) on materials. Over 80% is spent on teachers' salaries. Granted for the sake of argument that the teacher is the center of the school (and perhaps she is not; perhaps it is the

pupil) it is still an open question whether $9-$17.50 a year is enough for materials. An Assistant Superintendent of Schools in an eastern city mentioned that the absolute amount has not changed enough in the past three decades even to compensate for the effects of inflation. Could it be that films, TV, science equipment, typewriters, adding machines, etc., are under-emphasized in the classroom? Was the ratio of materials to salaries ever the best? We have heard educators explain that many schools are grossly underequipped with respect to materials for student use, but pressures from parents and teacher's unions make it virtually impossible to put new money to work except for lowering the student/teacher ratio. We do not know how to reconcile these observations with an estimated FY 68 expenditure of $439 million of OE funds for audio visual materials and instructional equipment ($254 million of it under ESEA Title I where schools have wide discretion), but are concerned at the apparent lack of materials in classrooms.

Good use of materials requires thought, planning, and research. New materials cannot be introduced effectively without additional training for teachers, to show them how the materials had best be used; this point has been emphasized once again by the recent experience of the Center for Urban Education, in its program to upgrade science teaching in New York. The effect of different materials to enrich the classroom must be evaluated; the schools must have some way of knowing whether the money spent for, say, adding machines or water colors or mechanical puzzles, has enhanced the educational objectives of the school. We are suggesting that there is enough evidence to warrant

controlled experimental schools where the question of the most favorable use of materials is investigated. An increase of the student/teacher ratio by one would free about $20 per pupil-year to add to that presently spent for materials. It seems worth trying.

4. Individualized instruction. Certain kinds of experimental schools that facilitate individualizing the instruction available to different students, and allowing students to progress at the rates they are capable of are now under study in this country — the Pittsburgh Oakleaf project, and the development project of the Philadelphia Regional Laboratory, based on the former project, are an example. Research and development efforts directed at exploring individualized instruction, the various forms it might take, and the technologies that might support it should receive increased support. At present, much of the work in this area takes conventional curricula and provides individualization of rate of progress and path through the fixed content. It is generally agreed that any increased efficiency in basic learning provided by this sort of individualization should free time and provide the foundation for more creative student activity. Indeed motivation for the individualized basic instruction might often be provided by participation in more creative activity (e. g. , a student might wish to learn spelling and usage in order to write about his experiences). So far, however, little has been done to explore these possibilities.

5. Authority structures. Experimental schools are needed to investigate the authority structures of the schools and classrooms. Several experiments in this area are now under way in the U. S and elsewhere.

a) One area for more systematic experimentation is that of use of teachers including team teaching, specialist elementary school teachers, part-time teachers from outside the schools, etc. Particularly interesting are experiments involving new sorts of school programs as well as new use of teachers.

b) A second important type of experiment would allow older children to help the younger. This could be done as in the Leicestershire experiment, where children from three age levels (e.g., 7, 8 and 9) are in class together. Or it could be a more formal arrangement, where, for example, eleven year olds were allowed to help with pre-school children, etc. Maccoby* suggests that "There might be some important gains in making greater use of older children in our pre-school programs . . . once trained, they could increase the total amount of individual attention it is possible to devote to children in a pre-school program, and there is the further advantage that training older children to act as teachers and helpers might improve their performance as parents and teachers when they are grown."

Central to this and other suggestions is the necessity to set up some sort of evaluation, so that, when the experiment has been tried, one knows whether it has succeeded. Implicit in Maccoby's suggestion is including in

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*E. Maccoby, "Early Education", p. 199.

longitudinal studies provision for finding out ten or fifteen years later, whether children who helped in nursery school do make better parents. (This also involves knowing the criteria for better performance as parents. Fortunately, we would have a decade in which to find an answer.) It's hard to comtemplate waiting so long to get information but it's absurd to do the experiment and then neglect to follow it up.

(c) A third type of experiment is to decrease the level of authority traditionally exercised by the teacher, thus allowing students more self-direction in their work or more participation in determining the instructional materials to be used.

(d) The suggestion has often been made, and at least partially substantiated, that boys regard school as effeminate because the teachers are predominantly female. Further research on this matter is needed. An additional subject worthy of investigation is the result of group teaching with one male and one female teacher.

6. Learning outside of the school. There is no reason but tradition to think of education exclusively in terms of schools. At least for children old enough that the schools are not serving largely a babysitting or a disciplinary function, one might consider a three or four day school week with more of the school work in the home, or elsewhere. More school assignments to be completed at home could be tried, and to the extent that they are successful would start students on the road to responsibility. Many schools depend to some extent on TV programs for the home, visits to museums,

theatres, music schools, explorations of the city with sketching and map-making, visits to municipal courts, police stations, city council meetings, legislatures, visits to construction sites, zoos, aquaria, factories, farms. A wide variety of entertaining and educational TV programs can be devised and experimented with; some such programs may prove the most important teaching medium for the future. When the schools plan trips for children, they can focus attention to how they can be made more than sightseeing; for example, through allowing students to map out a set of visits with specific objectives in connection with a study they are carrying out. Experiments are in order to see what is the best mix between formal school hours and other activities. The chances are good that the educational value will be maximized with many fewer formal classes. This is not to say that there isn't a lot of mathematics and history and foreign language to learn; but visits to the real world can greatly increase the motivation to learn, as well as being instructive in themselves. We should stress, too, that these learning experiences are available to, and to some extent utilized by the whole community; they constitute in part the "cultural" aspect of city life. We must not confuse learning with schooling, learning experiences with school experiences, or the opportunity to learn with the opportunity to go to school. Some further evaluation of the educational value of city life would be instructive.

7. "Store-front" and "Opportunity" schools. Another variation on informal schooling comes in "store-front" schools. At present, these are voluntary schools for dropouts, where girls learn reading and arithmetic as part of the process of preparing meals for the group, where a real store

is run to provide motivation for learning real tasks, where young men learn some carpentry and how to read blueprints, and how to plan work. We need to follow up the graduates of these "store-front" schools to see how successful they become, and what their knowledge and attitudes are relative to those of the graduates of ordinary high schools. But the apparent success of these schools is sufficient to suggest that many more be started, and that methods for the intensive study of their results be built into the original plans for the experiment.

8. Integration of school and work. Some succcessful school programs integrate school and work. An ideal held up to us by one member of our group (J. D.) is a fraction of work during school years, a fraction of school during the working years, so that school and work fade imperceptibly into one another, rather than being sharply divided at graduation as is now cutomary. Similar ideas are expressed by Tyler* and others. Such a system appears to have many advantages, and a number of experiments with the scheme are warranted. To the extent that is has been tried, it provided motivation for learning. Work is the driving force behind teaching functional illiterates to read and do simple arithmetic in the Detroit school system's Skill Center. Work is the driving

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*Ralph W. Tyler in Agenda for the Nation, Kermit Gordon, ed., The Brookings Institution, 1968, pp. 207-236.

force behind OEO's Job Corps program. A mix of work and classes constitutes one of the experimental programs in the Minneapolis schools. These programs can offer students the opportunity to try out more than one job, before making a final decision, and could make the transition to a permanent job easier for those who really do not want to go on to college, but are forced to go by social pressure. These programs might also make the continuation of learning easier for those who enjoy both work and learning. It goes without saying that such programs are beset with difficulties such as obtaining agreements with unions and amendments to the child labor laws. Nevertheless, the experiment is well worth trying--and monitoring.

9. Curriculum. Nothing that is said above about experimental organizations of schools is intended to detract from the need for curriculum development in all fields of knowledge, * or the need for experiments with individually prescribed instruction, or with language laboratories, or with computer managed instruction, or with talking typewriters, or with computer assisted instruction. The experiments discussed in V do not affect the need for better teachers, or the possibility that microteaching or other technological aids can assist in training teachers. The experiments we have discussed, and that we believe should be further investigated, are those concerned with attempts to alter the structure of the schools, to break into the "cell and bell" cycle, and so enliven the system.

IX. Evaluation.

1. Evaluation of programs. Throughout the report, we have repeatedly stressed the need to make value judgements concerning the aims of education, and devise methods of evaluation suitable for these objectives. But it is necessary to distinguish immediately between evaluation that is intended to assess the value of a program, and testing that is intended to determine the relative performance of individual students. A program could be a great success if all the students acquired certain skills or values, although one could not effectively differentiate among them with grades.* Further, the methods of evaluation for programs are quite different from those for the linear ordering of people. Grading requires testing every student, and the volume of work frequently forces routine methods and routine examinations. Further, the examinations tend to set the tone of the courses taught, and if the examinations are routine, out of date and unimaginative, so are the courses. Evaluation of a program can by contrast be done with a small carefully chosen "random" sample, selected much as the samples are chosen for public opinion polls. Elaborate methods--including interviewing-- can therefore be used for each individual polled, without undue expense in time or money for the evaluation procedure. Further, matched samples of different individuals, before and after exposure to a program allow testing with minimum distortion of results from the test itself.

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*R. W. Tyler in "Perspectives of Curriculum Evaluation", Rand McNally, Chicago, 1967, p. 14.

It would be useful to develop a general model of academic achievement in which such factors as the student's age, sex, socio-economic status, and various measures of achievement and various characteristics of the curriculum and the school system itself would be related to the student's subsequent progress through the educational system. Such a model would attempt to predict what would happen to the student at various choice points in his school career, his probability of dropping out, graduating, or continuing to college, etc. If such a model could be properly formulated and validated, it might provide a baseline against which the effect of program innovations could be evaluated. Although much relevant information about academic achievement has been collected, at the present time there seems to be no theoretical integration of these data.

2. Computer-assisted examinations. In the previous section, we noted that the press of large numbers of examinations for large numbers of students has led almost inevitably to routine examinations. Teaching is to some extent controlled by a consideration of the examinations that students are required to pass. Since many examinations tend to stress individual items of factual knowledge rather than reasoning and the synthesis of knowledge, teaching may tend to become unimaginative, with stress on rote memorization.

A possible answer to this problem lies in computer-assisted examinations. Although the cost of computer-assisted instruction may be unreasonably great at the present time,* we could perhaps afford some computer-assisted examinations; teaching may rise to the standards set by these examinations. Thus the examinations could be used as a lever to move the educational system.

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*A. Oettinger, op. cit.

Examples of computer-assisted examinations that are now possible or under investigation are these: (a) The University of Illinois Medical School has introduced real case histories into a computer memory, and programmed the machine to give information to the medical student if but only if he asks for it. Thus the student can get the results of any lab test he wants (provided it was carried out for the real case), or get the result for the patient of specific treatments. If the student delays too long, or makes a bad mistake, the computer may be programmed to report that the patient has died. (b) IBM has programmed a biology course, where at least some of the lessons would make excellent examinations. The computer offers the student a flower of a specific kind, and labels it-- say--as No. 603, white. The student then makes crosses of this flower, and the computer tells him whether these crosses are white or pink. After a number of crosses, the computer asks whether the flower is a pure genotype, and if the student says yes (e.g., w, w) the computer asks the degree of probability that the answer is correct, and the number of crosses needed so that the probability will exceed 98%. This type of testing brings out the reasoning process as well as the "answer" to questions. Such examinations are at least worth trying.

3. Different types of evaluations. Evaluation depends on objectives for education. Among the objectives suggested together with possible evaluation procedures, are these: Acquiring skills, including (a) subject matter skills, (b) skills in problem-solving and (c) skills in problem seeking, and (d) skills in interpersonal relationships.

As of today, the schools concentrate on (a), and can test reasonably well as to whether someone can read French, or can extract square roots. (The debate as to whether these are useful things to learn is separate from the present discussion.) Schools may fail to test broader aspects of subject matter, and they do not now test whether subject material is retained over the years, and have not extensively investigated whether the benefits of overlearning warrant the costs in time, but these things could be the subject of research.

The schools do some testing today on problem-solving, (b) and methods of testing are clear enough; furthermore, problem-solving is something that we want to encourage. There isn't much emphasis today on (c) problem-seeking, but if one states this as an objective, then problem-seeking is testable. Furthermore, it is possible to test for skills in interpersonal relationships, (d). For example, the Human Resources Research Office (HumRRO, supported by the Army) has set up sound-tape and movie sequences where a conflict is portrayed, where an officer in the army has a decision to make that depends as much on personal relationships as on technical proficiency. The film strip stops where the decision must be made, and each officer in training has to discuss the decision he would make, and the basis for it. Somewhat similar programs for social studies are used in some suburban high schools.* Evaluation should be designed to test these courses; only a small sample of students need be tested to find whether such courses are effective.

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*Edgar Dale, Audiovisual Methods, Holt Rinehart and Winston, New York, Revised Edition 1954, Chapter 22.

Additional goals include (e) promoting ethical principles, (f) preparing people to lead interesting lives (g) developing their motivation for learning. (e) A number of tests have been devised* to find out whether students cheat when they are not watched. However, the social behavior in question is so complex that these tests may be grossly inadequate. Other methods of evaluation need to be developed; perhaps personal interviews with schoolmates, parents, teachers and friends can reveal something about a student's honesty, generosity, enthusiasm, etc., although these methods raise delicate questions of invasion of privacy. Many school programs are supposed to contribute to the student's character, patriotism, and citizenship.

(f) Preparing people to lead interesting lives means giving them cultural education (including natural science, of course, as part of culture) beyond what they need for their jobs, and interesting them sufficiently in cultural activities to encourage them to continue. Modern testing embraces aesthetic participation and appreciation, but further methods of evaluation are needed--including longitudinal tests--to establish whether a student has acquired and maintains enthusiasm for learning, and whether school has enriched his later life. Very little testing has been carried out on adults ten years out of school (see VI-4 below), but such tests could be devised and conducted at reasonable cost on the model of sample surveys; we could begin for

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*Draft, Disciplined Inquiry, 5-4.

the first time to get some idea of what school offers other than specific information and skills available at the time of final examinations in June.

(g) Again, motivation for learning probably must be evaluated long after students have left school. Obviously, the time lag in getting information back to curriculum developers is frustrating; but compare this difficulty with that of conducting no evaluations, so that one simply does not know whether a given program has or has not contributed to increasing the motivation of an individual toward learning. Once a continuing commitment to evaluation of long term effects of educational programs is established and in operation for a few years, a continuing stream of data will result. Our present situation is that we have little that is firm to base development upon.

4. Vocational relevance. One of the objectives of schooling is certainly to prepare citizens for a useful life. This means giving them some basic tools, including literacy, that will be needed almost no matter what they do. It may mean giving them some additional tools so that they can if they wish compete for an occupation (medicine, law, engineering, etc.) that demands great training. It may mean offering citizens more than they immediately need on the assumption that the increasing technological and social complexity of our nation will place greater demands on employees in the future than it does now. Nevertheless, if we intend to justify our educational system in large part on its vocational relevance we should decide what is indeed vocationally relevant. Perhaps some skills should be taught later in life--a continuing learning process similar to the reeducation that the NSF has attempted through summer and

academic year institutes for teachers, or like the one that the Army carries out with its technicians when new weapons are introduced.

We can, for example, ask what mathematics will be needed by our citizens. We could begin by finding out what mathematics our citizens now use. An investigation in Sweden of farmers, clerks, draftsmen, machinists, etc. *, showed that many of them had forgotten some detailed manipulative skills, but had improved their abilities to make approximations, and to do simple mental arithmetic. Similar examinations in America, in diverse fields, would be revealing as to the knowledge that citizens have forgotten and of that they have improved by use; the results would at least be suggestive of the directions to move the curriculum to satisfy the particular objective of education for useful work. A curriculum guided by such studies might appear more relevant to many students, and would improve their motivation. Obviously, we would not want to limit schooling to those skills that are immediately applicable, but we should at least know which items are related to work, and why we are introducing other items into the curriculum.

5. Longitudinal Testing. We have repeatedly stressed throughout this report the need for longitudinal testing using accepted sampling techniques. Such testing is being carried out by the School Mathematics Study Group for the "new math" and conventional math programs, to see how the students who have had the various sorts of courses perform in later math and science courses

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*T. Husen and G. Boalt, op. cit.

and whether attitudes very according to the courses taken. Such longitudinal testing is the core of the Swedish research mentioned above. Longitudinal testing is an essential if implied part of the "National Assessment", where we would take a census of educational skills and knowledge perhaps every decade, and so determine how much progress we are making toward improving American education. In fact, longitudinal testing is vital to almost all of the experimental programs we have cited; although it is expensive, difficult and tedious, it is essential to acquiring solid information.

The most distinctive advantage of longitudinal studies is that the investigator can see what has happened to the individual as time passes, and therefore can sort out the other influences, to see what the impact of the educational experience has been. The longitudinal method provides a great deal of data, and provides them in a way that permits us to hold some factors constant and vary others. Such studies therefore move a step toward the kind of design that is possible under genuine research conditions.

APPENDIX I

We have listed below some of the research projects, developmental projects, and experimental schools that offer major opportunities for exploitation now. Many of the projects we list are already underway. We make no claims to originality. We have listed projects that we believe should be encouraged, or, if they are not in progress, should be initiated.

1. Projects for research: Encourage research to answer these questions.

   a) Can infants be trained? Is it advantageous to train them?

   b) When should teachers "intervene" with infants? How?

   c) What can be done to improve the ability of children to handle the complexities of meaning and language?

   d) How can reading ability, beyond the elementary level, be improved?

   e) What is the influence of the sex of the teacher on children's learning?

   f) What are the best ways to evaluate new programs?

   g) What is the vocational relevance of various school subjects?

   h) How can academic motivation be strengthened?

   i) What important differences exist in problem-solving strategies?

   j) What are the effects of length of teacher's service on the effectiveness of their teaching performance?

2. Projects for development. Develop:

   a) A program to illustrate and explain the "handling" of infants, so as to assure that they get at least the minimum attention they need for normal development.

   b) A program to explain the need to talk a great deal to young children. Specific programs using prepositions, using complex sentence structure, using detailed explanations are probably warranted.

c) A program to explain how (and when) to use conditional reinforcement to achieve normal behavior in children.

d) Programs for toy libraries, and accompanying instruction for the educational use of toys.

e) Programs to develop computer-assisted examinations.

f) Programs to enhance the amount of learning that takes place outside the schools, by providing a wide range of community facilities available to children and adults, and relevant activities associated with those facilities.

3. Experimental Schools. Set up or encourage these schools or classrooms:

a) A school with minimum requirements but a rich program, so as to constitute a "non-zero sum game".

b) Schools with many more artifacts than customary, at the expense of a higher pupil/teacher ratio.

c) Classrooms with team teaching.

d) Classes with much instruction by older children.

e) Store-front schools

f) Schools that emphasize learning activities outside of the classroom at museums, factories, at home, etc.

g) Schools that incorporate employment as part of the curriculum.

h) Schools experimenting with individualized instruction, and making maximum use of knowledge of results to facilitate self-diagnosis for learning.

4. Other Experiments. Our listing of these experiments in research and development is not exhaustive, but illustrative.

APPENDIX II

EQUIPMENT

(Equipment Recommended by Roy Illsley for a Room of 30 Children, 8- to- 11-years old, in the Boardman School, Boston.)

Flat-topped tables—various sizes and heights. (If desks have to be used, then they should be covered with plastic cloths for protection.) About 6
10 single desks
30 chairs (fairly small)
Screens to use as room dividers
Low bookcases or shelving to display apparatus
Blackboard or chalk board which children can use
Pegboard and corkboard for display of work

Reading Corner

Bookcases
Small mats or pieces of carpet
Cushions
Good selection of fiction and non-fiction books
Vases for flower displays
Easy chairs if possible (about 4)
Small, low, round table (coffee table)

Woodwork Bench with tools

Saws
Hammers
Screwdrivers
Awls
Small hand-drill
Rasps
Sandpaper
Glue—strong
Pieces of wire
Pliers
Doweling (already shaped—long round pieces)
Nails (plenty), different sizes
Screws (plenty), different sizes
Files
Good supply of soft and hard wood scraps
Balsa Wood
Steel rulers

Maths.

Dienes MAB & AEM Equipment (1 set of each)
Cuisenaire Classroom Kit
About 500 1″ coloured wooden cubes
Collections of (200 of each)
a) shells
b) buttons (various sizes, colours, shapes)
c) plastic washers
d) coloured pegs for pegboard
e) plastic counters
f) any other small objects which can be counted

Rulers, 12 wooden
Tape measures
Yard sticks
Measuring tape (1 long)
Capacity measures
Kitchen scales
Bathroom scales
Two-pan balance
Balance (on which washers will fit)
Ordinary clock
Egg timer
Stop watch (preferably large)
6 pairs of compasses
1/2″, 1″, 1/4″, 1/10″squared paper
Scissors
Coloured gummed paper (squares), 6 x 6, 4 x 4
About 100 metal washers, about 1¼″ diameter
Thick and thin string
Geo-boards with elastic bands
Small plastic geometric shapes
Named-plastic geometric shapes
A trundle (round wheel whose circumference is 1 yd. or 1 metre, used to measure whilst walking)
Plastic solid geometric shapes—prism, cube, etc.
Set of Poleidoblocs
Some kind of adding machine
Some small collections of model cars
model animals
model soldiers, etc.
(for set work)
Scales with weights

English

Tape recorder and tapes
Collection of *"odd"* objects, e.g., a) lock with key
b) inside of musical box
c) odd-shaped coloured bottle
Good quality coloured card from which I can make English equipment
Typewriter for the use of children
Collection of anthologies of poems
Supply of Biro's ballpoint pens for use of the children
Phrase-strips

Art

About 4 double-sided easels
Hole punches
Permaplast modeling clay
Manila paper , 9″ x 12″
Matt boards—pebble white, 22″ x 28″
Newsprint paper (unprinted), 18 x 24

REPORT TO THE PRESIDENT'S SCIENCE ADVISORY COMMITTEE ON EDUCATIONAL RESEARCH AND DEVELOPMENT IN THE U.S. OFFICE OF EDUCATION BY THE PSAC TASK GROUP ON EDUCATIONAL R AND D

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DRAFT
December 1968

DRAFT

EDUCATIONAL RESEARCH AND DEVELOPMENT IN THE U.S. OFFICE OF EDUCATION

I. Background

The Task Group on Educational R&D was established by the President's Science Advisory Committee (PSAC) to survey the field of educational R&D and advise the Committee as to particularly important and promising areas where a PSAC panel might be helpful. In the course of its study the Task Group became firmly convinced of the great promise of research and development for substantial improvement of education in the nation. It also came to believe that the principal government program, that of the Office of Education, while promising overall, is nevertheless suffering from some drawbacks, of which the most serious are inadequate basic research, failure to utilize effectively the intellectual resources of the nation, and lack of focus of its programs. These thoughts were communicated informally to Asst. Secy. Rivlin and Commissioner Howe, who said it would be useful to have these views in written form. The present report, not contemplated at the beginning of our study, is made in response to their suggestion. The criticisms contained in the report are offered constructively, and are intended to help strengthen the important research and development programs of the Office of Education and help prepare for the use of the educational funding that we believe should be forthcoming in later years when present deficiencies have been substantially overcome and the Office is prepared to utilize such funds effectively.

Since the task group has visited only four of the Regional Laboratories, and five of the R and D Centers, its conclusions are necessarily tentative, but we nevertheless believe that our recommendations, if adopted, would mark an important step toward improving the operations of the Office of Education. We have presented these recommendations as Section II of this report, and have postponed our findings to Sections III-VI and the Appendix, and our discussion to Sections VII-X.

Educational research and development is not yet highly developed. In contrast to the large body of experimental fact and quantitative theory in the natural sciences, which provides a solid basis for development and engineering, very little in the way of principle has been established in the field of education. No consensus can be obtained as to the way in which men learn, or what motivates them; no consensus has been achieved as to the aims of education or the extent to which we achieve our goals. Perhaps we know something of how to begin the teaching of reading, but this subject is still debated, and much remains to be learned; probably we do not know the best ways to teach infants to talk. We are not certain of the relevance to modern life of much of the history and mathematics we teach. We have not experimented broadly with the organization of schools; for example, we have not determined the extent to which older children can instruct younger ones. Our testing has concentrated on the competitive grading of students, rather than on evaluation of new programs. These few examples are illustrative of the many problems and major opportunities in research and development in education.

The Office of Education has an important role to play in furthering the objectives of better education in America. It has established nine Research and Development Centers and 20 Regional Laboratories, and supports numerous other ventures in research and development. Although the functions of the Centers and Laboratories have not yet been firmly established, they certainly are intended to exploit new research findings, so that they can be utilized by the schools now. This is a vital function, and it is essential that it be done well. In this report, we have tried to suggest ways for improving the operations of Centers and Laboratories, and for assuring a proper flow of basic research findings for them to exploit. The specific examples cited in the later sections of this report are for the purpose of illustration of opportunities and shortcomongs, and represent incomplete grounds for the critical evaluation of individual laboratories.

II. Summary of Recommendations

A. Recommendations to the Department of Health, Education, and Welfare

The Task Group believes that the activities on educational research and development within the Office of Education, and the National Institutes of Child Health and Human Development, Mental Health, and General Medical Sciences could advantageously be coordinated, and that further emphasis on their research and development activities are warranted. Therefore we recommend that the Department of Health, Education, and Welfare establish a high level General Advisory Committee, reporting to the Secretary, to review and to oversee all educational research and development sponsored by the Department of HEW.

B. Recommendation to the Office of Education.

a) In order to ensure that the fundamental, long-range activities of OE receive adequate attention, we recommend that OE establish a special Committee on Basic Research in Education. This Committee would review all the basic research in education within OE. It would be kept informed as to the details of various projects by the panels described below, and would in turn keep the General Advisory Committee informed of the progress of fundamental investigations in OE. (Presumably the Directors of the NICHD and NIMH would likewise keep the General Advisory Committee informed about basic research in education in their areas.) In particular, the Committee would be charged with recommending and justifying to the Commissioner of Education the level of funding and the specific research projects that, in its opinion, would best contribute to fundamental knowledge in the field.

b) In order to provide a more efficient and critical comparison of the merits of projects on educational research and development sponsored by OE, we recommend that OE establish a system of review panels, analogous to those in NIH, devoted to educational research and development. These panels would review both unsolicited proposals for basic research, and projects for research and development in the Regional Laboratories, R and D Centers, or elsewhere in OE. Reports of these panels would be available to both agency officials and to the General Advisory Committee. Presumably similar reports by other panels in HEW that review proposals in the area of educational research and development would also be available to the General Advisory Committee.

c) We recommend that OE discard the Field Reader system, both because it is inefficient and because it will be unnecessary when the panel system is instituted.

C. Recommendation to the Bureau of Research. In order to take advantage of opportunities in basic research, and to provide a much-needed intellectual framework for development, we recommend that the Bureau of Research of the Office of Education commit at least 10% of its funds for support of unsolicited proposals in basic research and assign these funds on the basis of the priorities recommended by the Committee on Basic Research in Education.

D. Recommendations on the R and D Centers. In order to improve the quality of their educational research and development, and to insure its relevance to our educational system, we recommend that the R and D Centers.

a) Appoint to the senior research staff only persons with appointments in the university departments and schools where research skills are required, and the appointments be made from a variety of such departments.

b) Establish a clear and continuing relationship with a school system, or with one or more elementary or secondary schools of the sort that exists between the Learning R and D Center and the Oakleaf School.

c) Seek means of improving the balance and integration of their research and development efforts.

E. Recommendations on the Regional Laboratories. In order to improve the quality of their educational research and development, and to insure its relevance to our educational system, we recommend that each Regional Laboratory:

a) Cooperate with OE to establish a specific mission with a well worked out comprehensive program for development and applied research.

b) Concentrate primarily on educational development (with related applied research) and dissemination of information about educational R and D.

c) Make much more extensive use of university personnel from various departments as consultants and advisors.

d) Establish a clear and continuing relationship with a school system, or with one or more elementary or secondary schools of the sort that exists between the Learning R and D Center and the Oakleaf School.

III. Basic Research Relevant to Education

Much of the confusion in the field of education today arises because the basic theory of human learning and of related fields is in sorry shape; it isn't possible to predict with reasonable assurance whether a given innovation will be advantageous. Further confusion arises because the objectives of education are frequently unstated or inadequately stated. That is, short range and easily measured objectives, such as the immediate mastery of a subject, may be specified, but longer range, broader objectives may be ignored; such broad objectives include, for example, an ability, or at least an interest, in solving intellectual problems, and retention of a moderate fraction of subject matter and skills over a period of years, and the development of appropriate social and ethical attitudes.

Fundamental questions as to the nature of children, as to the extent to which they are inherently curious, as to the needs they may have for both discipline and discovery, as to the nature of the learning process, and many other questions should be investigated, where the results can have a great impact on education.

Although examples of basic research on educational matters have been relegated to the Appendix, in order to preserve continuity in this document, such basic research in our view, exemplifies the most urgent business of OE. Work of this sort (see Appendix) is egregiously underemphasized in the programs carried out under the auspices of the Office of Education.

IV. R and D Centers

The Office of Education has established 9 Research and Development Centers at various universities throughout the U.S., and has allocated about $8 M. to them for fiscal '69. Fundamental questions arise as to what the philosophy of the R and D Centers is, and what it should be. Members of the Task Group visited the Centers at UCLA, Berkeley, the University of Oregon, Stanford, and the University of Pittsburgh. A very brief statement of some of our findings and conclusions is presented in the paragraphs below. A short description of our Task Group procedures, and some excerpts from one of our internal working papers are presented in the Appendices.

The R and D Centers at Berkeley and the University of Oregon are concerned principally with general research problems, whereas that at Stanford is carrying out applied research and development, much of which is nearly indistinguishable in type from that at the Far West Regional Laboratory. The R and D Center on Evaluation at UCLA is, according to the group that visited the West Coast centers, carrying on some activities that are neither research nor development. The group reports that in one of these activities the measure of 'education objectives' is what teachers say they want to teach, its 'experimental' and 'comparison' groups in three high schools are not properly matched; and the observational techniques

used yielded very questionable information.

Firm recommendations concerning these Centers will be difficult until the basic question is settled: What are they for? But even if they are to carry out considerable basic research, it is clear that they are not and should not be the principal centers for such research in education in the U.S. That function is and must remain much more broadly represented among the universities and research institutes of America. One possible role for the Centers would be that of forming a bridge between the university community that performs basic research relevant to education, and the Regional Laboratories that presumably carry out the development. At present, each of the R and D Centers has a rather narrowly defined mission, whereas the Regional Laboratories are much more flexible; this situation seems the reverse of the logical one. The ideal number, scope and organization of R and D Centers is still uncertain.

One of the best R and D Centers on which our members have reported is that at the University of Oregon, where work is underway on the development of administrative arrangements designed to provide for continuous change in instructional programs. Pertinent research addresses such questions as the involvement of schools in the community power structure and as the conditions under which social science teachers feel free to encourage discussion of current issues. We believe that the quality of work at the Oregon Center is high largely because all of its senior research personnel must have regular faculty status in research-oriented departments or in the School of Education. The Pittsburgh R and D Center has established a close working relationship with a secondary school (the Oakleaf School) that allows direct experimentation with their program

of individually prescribed instruction within a real school environment; this close relationship with an experimental school could serve as a model for other Centers. An additional positive factor for the R and D Centers comes from their Advisory Committees; these appear to be of high quality and active.

However, the task group wishes to raise the question of whether the Centers could not be abandoned as discrete administrative organizations. If their best work (including linked research and development) could be maintained as project research under adequate review, it might better serve the goals of improving education. As things now stand, in some cases unconnected and inadequately reviewed projects of quite different quality are held together under the umbrella of a Center.

V. Regional Laboratories.

The Office of Education has established 20 Regional Laboratories in the U.S. and has allocated about $24 M. to them for fiscal '69. These organizations have their own Boards of Directors, but generally derive most or all of their funds from the Bureau of Research of the Office of Education.

1) Worthwhile developments in progress. A number of the projects we saw impressed us favorably. For example, most of the Task Group are convinced of the practical potential of using almost immediate feedback, from videotape, to help teachers learn how to teach (Stanford R and D Center and Far West Regional Laboratory) and of the library of educational toys (Far West Regional Laboratory); we were impressed by the research at the Center for Urban Education on the impact of commercial TV on disadvantaged children,

and on evaluation of the integration of the schools in Bridgeport. The curriculum development at the Educational Development Center is of high quality. We anticipate useful future development of computer managed instruction (Southwest Regional Laboratory), although much work remains to be done before it can be employed in schools.

2) A detailed example of development. Most of us* believe that the potential of use of TV feedback for teachers is considerable, and that the method should be developed; it is being exploited both by the Far West Regional Laboratory and by the Stanford R and D Center. However, basic questions are left unanswered by both the Laboratory and R and D Center. A TV camera is used to provide teachers with almost immediate feedback, so that they can observe their own behavior and the reactions of their class to what they have done. Studies show that the immediate feedback coupled with taped episodes of teaching by an expert can affect teacher behavior, although it is not clear to what extent, or for how long, or how well this method can work if no live observer analyzes the teacher's performance and the responses of the class. Furthermore, relatively little has yet been learned of the effects of teachers' behavior on the students. At the R and D Center, we were told of an elaborate study of such behavior and of its short-term effect on student learning. Of the 150 variables in teacher technique that were explored, four (explaining links, rule-example-rule, gestures, and pacing) showed a significant correlation with improved short-term learning. The R and D Center was not however willing to claim a causal relationship even to short-term learning for these techniques, since accidental correlations may appear in a study of so many variables.

*At least one member of the Task Group is skeptical about the importance this development.

Cooperation between the R and D Center and the Laboratory is certainly desirable. They did not, however, spell out for us a division of labor, or alternatively present a comprehensive joint plan for applied research and development. Such a plan might, for example, specify a number of teaching techniques, and investigate both the utility of TV feedback in developing these techniques for teachers and the effect of these same techniques on students. After the results of applied research of this sort were in hand, the technique of TV feedback could be better exploited.

3) Advisory Personnel. Although many of the personnel we met at the Laboratories are deeply interested in their work, some of them have had insufficient research and management experience to carry out their projects effectively. Furthermore, the Laboratories make little use of consultants, who might be able to supplement the knowledge of the staff. Few if any of the persons listed as consultants in science for the Center for Urban Education are recognized scholars, although one member of CUE explained that they were in contact with highly qualified people on an informal basis. Furthermore, the Southwest and Far West Laboratories make little use of qualified persons from outside their own laboratories. The policy of the Southwest Regional Laboratory is set forth in a personnel policy document: outsiders are to be used for "glitter" but the Laboratory feels that consultants are not helpful to "help get an activity going" or "give us ideas." The Far West Laboratory has made little attempt to draw on the broader intellectual resources of Berkeley or Stanford beyond existing educational projects, but the director has stated that he plans to pursue the matter with the help of Robert Karplus at Berkeley.

Similarly, the Field Reader Catalog of the Office of Education lists, in vast majority, undistinguished individuals. Specifically, the entire list of readers in biochemistry consists of two: A Professor of Chemistry at an institution which has never submitted a proposal for research in chemistry to the NSF and a Professor of Home Economics. Although this example is extreme, task group members found that few highly respected persons from their principal areas of competence were included in the catalog.

4) Professional competence. The reading program at the Southwest Regional Laboratory illustrates both the lack of coordination among the laboratories and the lack of depth of the personnel. A program for elementary reading is underway in that laboratory, at CUE, and at the third Regional Laboratory. Reading is of such importance as to warrant competitive efforts, but neither of the laboratories we visited was abreast of what the other was doing. The work at the Southwest Laboratory was being pursued without seeking the help of creative writers, such as poets and novelists, who might be able to contribute to the development of more interesting material for elementary reading. It was not clear to us that the staff at the Southwest Regional Laboratory was strong enough or that it had the standing leadership to carry through such an important project. The results are those to be expected. Except possibly for better illustrations, their "See, Sam, see" series seems to parallel the "Look, Dick, look" books (Fun with Dick and Jane", etc.) of a commercial publisher. The Laboratory believes that its program is superior in that an attempt is being made to determine the effectiveness of their reading

materials with children. Such a program could perhaps be of value if well done. But a great deal of effort and much scholarship has previously been expended on elementary reading. The program at the Southwest Regional Laboratory had been begun with little consideration of the story-lines, and did not seem to us to have been planned with the detailed care needed to make an important contribution in a field where so much work has already been carried out.

Lack of sophistication may also be illustrated by consideration of the program for computer managed instruction at the Southwest Regional Laboratory. Most (but not all) task group members consider this a worthwhile project, although serious questions have been raised concerning student response during testing. In any event the program needs some back-up research to find out how much detail can be effectively utilized by teachers, and what questions, among those that can be answered by a computer, are worth asking. So far as we could judge, the programmers have not yet addressed these questions. Furthermore, those staff members who were present when we visited the laboratory had not given any consideration to the question of cost and were apparently surprised by being asked.

The Task Group recognizes that most of the world's work must be done by people of average ability, but individuals of high intelligence and professional competence must be used where their talents will have the greatest impact. Research and development, in education as elsewhere, are fields where talented individuals are essential. Much experience with research and development in the sciences has shown that important advances are usually made by extraordinary individuals. The stories of individual achievement in academic research are

familiar; the role of talent in industrial research and development, although no less real; it has been well documented for the General Electric Co. by Suits and Bueche (Applied Science and Technological Progress, National Academy of Sciences, June, 1967). Granted that development must be carried out by large teams, a high level of competence on these teams and first-rate leadership of them appear to us to be of primary importance. This statement applies especially to laboratories for educational R and D since this field presents extraordinarily complicated problems requiring highly talented investigators from many disciplines for their solution. It is equally important that the staff of the Office of Education have available to them the best advice the country has to offer not only in formulating policy but also in review of proposals and projects. Fortunately, many talented individuals in universities and elsewhere are ready to cooperate, at least as consultants, in educational R and D.

Although we came away with the impression that the staffs of the Regional Laboratories generally needed strengthening, we found that most of the people with whom we talked are enthusiastic about their work, and some of them are highly competent; this statement applies especially, but not exclusively to much of the staff of EDC and to some social scientists at CUE.

5) Wasted opportunities. We are convinced that the Office of Education is failing to make the most of its opportunities to involve outstanding scholars in its programs. Brilliant individuals with an intense interest in improving the teaching of specific disciplines have been bypassed.

Of the 300 or so board members for the Regional Laboratories (other than EDC) in a 1967 OE listing, only a half-dozen have been involved in the great effort toward curriculum development in science that has occurred in the past decade (and several of these are dissatisfied with the management of these Regional Laboratories). None of the 116 listed key staff members of these Regional Laboratories has been a leader in these efforts toward curriculum reform. Several outstanding scientists interested in education have been unable to establish effective working relations with nearby Regional Laboratories and have no connection, or only nominal connections, with these laboratories.

Of course, some of the Regional Laboratories have sought the cooperation of the academic community; for example, the Regional Laboratory at St. Louis works with excellent mathematicians, and that in the District of Columbia has made a special effort to involve artists. EDC has certainly recruited excellent scientists and social scientists (but is only nominally supported by OE). Nevertheless, the general statement stands that the Regional Laboratories have not made the most of their opportunities to involve the general academic community in their affairs.

We claim no originality in our concern about the involvement of a wide range of talents in the Regional Laboratory and other R&D programs of the Office of Education. The intention of those, inside and outside the government, who conceived the program were set forth in the 1965 Presidential message to Congress:

> Regional Laboratories for education offer great promise. They draw equally upon educators and practitioners in all fields of learning -- mathematicians, scientists, social scientists, linguists, musicians, artists, and writers.

Since that time, concern has been expressed by a number of members of various intellectual communities at the failure of the Laboratories and the Bureau of Research to make use of the full range of intellectual resources that are available. In its report of July 13, 1968, the National Advisory Committee on Educational Laboratories said:

> Finally, there is the need to facilitate the identification of problem areas that need R&D attention but are not presently being covered by existing Center and Laboratory activities. This need suggests far better communication with the country's intellectual leadership concerned with the improvement of education than the present USOE arrangements permit, or than is implicit in the present structure and linkages of existing Centers and Laboratories.

Dr. Francis Chase, in his report the National Program of Educational Laboratories, dated December 17, 1968, said:

> Some of the measures necessary to improve functioning can and should be taken by the centers and laboratories severally. One of the most important of these is to add additional talents and methodological competence to achieve a better balance in staffing. The present laboratory staffs tend to have a high percentage of persons trained and experienced in educational administration. Such disciplines as anthropology, linquistics, psychology, sociology, and statistics are less well represented on most laboratory staffs. The newer disciplines of information processing (and theory), system analysis, and program planning are likewise underrepresented in most laboratories. Even curriculum specialists and creative teachers are not found as often as might be expected. With notable exceptions, the centers tend to rely on educational psychologists and curriculum specialists more heavily than on scholars from basic disciplines. Some have not succeeded in bringing to bear on the problems with which they are wrestling the rich resources of talent theoretically available in universities. Progress is being made in improving the staff "mix" and in

on-the-job development of staff; but further efforts in these directions are in order by both laboratories and centers.

Much the same observations may be made in regard to governing boards and advisory groups. In all but a few cases, there would be great advantage in bringing in points of view not now well represented. A wider representation of research communities might bring important new perceptions and considerations to bear on policy and operational strategy; and the same may be said for occupations and socio-cultural groups which at present lack effective spokesman on boards and committees. Artistic and humanistic points of view likewise deserve effective representation.

Disciplined Inquiry for Education*, a report of the Committee on Educational Research of the National Academy of Education had this to say:

> Perhaps the most important recommendation we can suggest to the Office of Education is that it find better channels for frank communication with the scholarly community. Many communications that come from the Office suggest a lack of understanding of the values and thought processes of the academic world. This gap persists, despite the fact that a reasonable proportion of the staff members have fine academic qualifications and experience (usually, however, limited to Schools of Education). Something in the in institutional pattern seems to isolate them and distort their language. Most applicants are hesitant to criticise a potential source of funds, and persons holding contracts feel diffident about acknowledging their troubles to U.S. Office of Education monitors who have failed to establish a colleague-like relationship. Consequently, the Office does not know which of its rulings, policies, and practices alienate and impede the investigator.

If the changes suggested in these quotations and in the present paper are made, the Task Group would agree with the National Advisory Committee on Educational Laboratories that "R&D Centers and Educational Laboratories can evolve into major instruments of educational improvement and innovation in the years ahead."

*Note added in June 1969: This report has now been published as Research for Tomorrow's Schools, L. J. Cronbach and P. Suppes, eds., Macmillan Co., 1969. The statement above is on page 251.

6) Relationship with the schools. We have previously noted that the R and D Centers would benefit from closer working relationships with schools, such as that between the Pittsburgh R and D Center and the Oakleaf School. Such relationships appear essential to the purposes of the Regional Laboratories. We feel that it is insufficient to have a loose cooperative arrangement with a school system, but that most Laboratories should be closely associated with a school or with schools where considerable departure from conventional teaching is possible, as at the Oakleaf School.

7) General evaluation and comparisons. With the exception of the Educational Development Center, the general level of activity at the Regional Laboratories of OE that we visited was of only mediocre quality. Further, (a) although a few problems are specifically regional, most of them are national in scope, so that projects had best be formulated in national rather than local terms. (b) The Laboratories are not in a position to attract the best personnel; ways in which this situation can be changed by closer association of laboratories with universities are discussed in Section X-5. Given the present structure of the Laboratories, our estimate is that good graduates would go first to universities, second to the R and D Centers at the universities, third to industry, fourth to the Regional Laboratories, and last to teachers' colleges. Furthermore, we estimate that the number of first-class researchers available at present is inadequate to supply the demand as far down on the list as the Regional Laboratories. (c) The developmental projects in progress do not appear to have been examined from an overall viewpoint to assess duplications and significant omissions or to assure

that the best available people are being brought to bear on important problems; the selection of problems and the quality control are poor. (d) Although the overall direction by OE is inadequate, we hear complaints that repeated inquiries by OE and requirements of reporting to OE have hampered the day-to-day operation of the Laboratories.

In the end, the question arises as to what one can buy with a research or development dollar. Putting aside for the moment the question of basic research (where the task group feels that major opportunities lie), we can restrict this discussion to questions of development. How do the developments carried out by specific Regional Laboratories compare with the curriculum developments that Begle initiated at Stanford in mathematics, or Zacharias initiated in science and social studies; how does the potential of Microteaching at the Far West Regional Laboratory compare to that of Computer Assisted Instruction in Suppes' laboratory at Stanford, etc? By and large, all of these efforts have a place, but we felt that the quality of the work was such that one was generally getting more per dollar in the developmental projects outside the Regional Laboratories.

VI. ES 70

ES 70 (an integrated curriculum for the '70's) is a major project within OE. OE has said it expects to expend $30-35 M. for it over a period of about five years, with perhaps ten times that amount for the program from other sources. Although an impressive chart has been drawn up to show how the project will be carried forward, none of the specific curriculum material is yet available. ES 70 has

begun to make contact with some excellent investigators; for example, the project is loosely tied to Harvard's Project Physics, and may incorporate it as part of ES 70, although this specific curriculum material was designed and developed independently. However, in general ES 70 at present is not far enough along, and is too nebulous to judge its nature and quality. But we note that a large share of the resources available for educational experimentation in schools has been allocated to this project, that it will create something that may be viewed as a National curriculum, and therefore may prove inflexible, and that the project builds upon a single educational theory based on the concept of behavioral objectives. By this we mean that the program is designed to create highly structured curricula "engineered" from previously defined "behavioral objectives" that are capable of precise definition and measurement. Although this theory has many adherents, it is not uniformly accepted; in fact, a vigorous school of critics believes that, for much learning it will not lead to the best results. Perhaps a more open-ended curriculum, that seeks to build on the student's natural curiosity, will better increase his initiative and responsibility as well as this knowledge. Although a program based on behavioral objectives should be vigorously pursued, we hope that this will not virtually exclude consideration of other models.

VII. Proposal for Discussion

In Sections III-VI of this report, we presented our observations, conclusions and value judgements concerning the programs of the Office of Education. Our recommendations have already been summarized in Section II. The following sections (VIII-X) offer some discussion of the reasons for the recommendations that have been offered.

VIII. Fundamental Research in OE

Our discussions of basic research in education (see Appendix I) have led us to conclude that important fundamental work is in progress, but that in most cases the results have not been well enough substantiated, or investigated in enough depth to provide a safe platform for developmental activities. For example, research has shown that three-year olds, to whom the use of prepositions has been carefully taught, show a significant improvement in command of language. But many similar studies are needed to provide the basis for a major effort in developing better methods to teach young children to talk. Because of our conviction that many opportunities for improvements in education can be based on expanded research, we recommend that no less than 10% (about $10 M.) of the budget of the Bureau of Research of the Office of Education should be set aside for basic research on learning and for other fundamental investigations that may bear upon education. This would create a fund sufficient to support small, "unsolicited" fundamental projects at universities throughout the nation, and would supplement the research at the R and D Centers and Regional Laboratories. It would not be sufficient to fund large projects such as new experimental schools or extensive longitudinal studies of teaching methods; these, if approved, would require additional financing. Furthermore, we anticipate that the number and competence of those engaged in fundamental investigations in the field of education will grow over the years, under the stimulation of these research grants from the Office of Education. When and if the research community is stronger, it should be able to utilize larger sums effectively, with profit for the nation. We suggest however that the Bureau of

Research begin with a sum around $10 M. We feel confident that, for the present, competent research workers in departments and schools of education and in psychology, sociology, and other fields will be able to offer considerable imaginative and potentially useful work within this budget. We have in mind that a considerable fraction of the additional funding be used to draw new investigators from various scholarly disciplines, including the social and behavioral sciences, into research in education.

The size of the research community that would be involved is such that the proposed additional funding is appropriate. For example, the research community in the social sciences alone was about 22,000 graduate students in 1966 in all fields of social science, including specifically about 9,500 graduate students in psychology and about 3,500 in sociology*. An addition of $10 M would finance research by something like 1,000 students; the pool is large enough that this should prove possible, although we realize that strong competing demands for the services of trained social scientists will arise in the near future from the inevitable expansion of pre-school programs and from other needs. The number of faculty members who would be able to begin projects in the field would probably approximate 200. This will be a severe drain on the supply, but the number is not so large relative to the supply (almost 6,000 in all the social sciences, of which 2,300 are in psychology and more than 1,000 in sociology) as to be impractical. Moreover, the social and behavioral sciences are only one source for recruitment of new personnel for research in education.

*Graduate Student Support and Manpower Resources in Graduate Science Education, National Science Foundation, June 1968.

If no increase in appropriations is granted to OE for research and development during the next fiscal year, the Task Group would then be forced to recommend cutting the budgets assigned by OE to other R and D activities in order to fund basic research. Part of the research funds could even come from the money now allocated to the Regional Laboratories. Since the National Advisory Committee for the Regional Laboratories, in its report of July 13, 1968, pointed out that some of these Laboratories have not gotten off the ground and since that Committee has seriously considered phasing out the weaker ones, this reallocation of funds to support basic research would more or less accord with the implications of the recommendations of the National Advisory Committee, and would in our view strengthen the overall program of OE.

2) The Task Group feels strongly that all of the basic research funds described above must be assigned on the basis of merit to "unsolicited" research proposals (i.e., research proposals that are originated by the prospective investigators and submitted by them to OE). The selections should be made by review panels at regularly scheduled meetings; the panel system should be modeled on that currently used by NIH.

3) The membership of the panels should include individuals who are active in research in subject disciplines as well as those concerned with investigations in the field of education. If, as we hope, a general panel system (described below) is established for all the research and development in OE, these panels would of course also function with respect to basic research in education. However, the findings of the panels with respect to basic research would be reported

separately to a special Committee on Basic Research in Education (see below), so that the latter would be in a position to advise a General Advisory Committee and the Commissioner of Education.

4) Since the Office of Education is necessarily and properly concerned with the prompt improvement of the educational system, it has no choice but to emphasize opportunities for development and for dissemination of information. Although we recognize the urgent and immediate need for better education for America, and the importance of both development and dissemination, it goes almost without saying that long-range as well as short-range goals should be supported. In order that these long-range goals, and the opportunities in basic research, be strongly represented within OE, we recommend that a standing Committee on Basic Research in Education be set up to advise the Commissioner of Education on basic research. The Committee should be composed of individuals of high caliber, such as those on the Committee on Education recently established by the National Academy of Education and the National Research Council. The Committee should advise the Commissioner on the appropriate level of funding for basic research in education in OE and on the selection of individuals in basic research for the evaluation panels; the Committee would in turn receive advice from these panels as to the priorities to be accorded specific research proposals.

IX. Overall Review of R and D Relevant to Education

Advisory Committee. The Department of HEW conducts educational research and development in the Regional Laboratories and R and D Centers of OE, in universities and elsewhere on grants from OE, from NIGMS, NICHD,

and NIMH. We recommend that the Department of HEW establish a high-level General Advisory Committee that could oversee all the educational research and development within the Department. This of course includes the various activities of OE (Regional Laboratories, R and D Centers, unsolicited research projects, wherever they may be located), and other projects, including the research on education and learning sponsored by NICHD, NIMH, and NIGMS. The new committee would thus have broader assignments than those of the present Research Advisory Council and National Advisory Committee on the Regional Laboratories and would replace those groups. It might appropriately report to the Office of the Secretary of HEW.

Obviously, the effectiveness of such a Committee would depend in large measure on the quality of its membership. We are confident that a strong inter-disciplinary group capable of opening up new paths for educational research and development can be assembled. Good sources of nominations for members, outside HEW, should be the new NRC-NAE Committee on Basic Research in Education and government agencies including the National Science Foundation, the National Endowment for the Arts, the National Endowment for the Humanities, and the Office of Science and Technology.

We see as major functions of the General Advisory Committee:

i. Identifying the problems and opportunities in educational research and development.

ii. Recommending how the Department of HEW can shape its programs (alone or in cooperation with other agencies) to make significant contributions to educational R and D.

iii. Controlling the quality of HEW's program of support of educational R and D.

iv. Helping to marshall the whole range of intellectual resources (in universities, industry and government) that can contribute to educational R and D.

The General Advisory Committee cannot possibly study thoroughly all the projects in all the Regional Laboratories, R and D Centers, universities and other laboratories. It will therefore require the support of advisors who can master the details of individual projects, and supply the Committee with unprejudiced information and expert opinion. We believe that this can best be carried out by panels with responsibility for the analysis of the various educational specialities, wherever they are under investigation.

(a) High quality advisory committees, one for each Regional Laboratory, could oversee the work of that laboratory, and could report either to General Advisory Committee discussed above or to the Boards of Directors of the Laboratories, or to both. Each committee could help to raise the performance level of its associated Laboratory. Such committees would not, of course, replace the panels needed to judge the quality of the unsolicited proposals for basic research, or the panels or other mechanisms needed to make recommendations concerning the R and D Centers, or other research (e.g. ES 70) sponsored by OE. Advisory Committees of the type here discussed would constitute a special device for aiding the Regional Laboratories.

(b) Alternatively, and we believe preferably, a panel system could be set up that could be integrated with those recommended earlier to deal with unsolicited proposals for basic research. The panels could also possibly be

integrated with those already in existence in HEW (e.g., in NIH and NIMH) that function with respect to educational research. When decisions must be made among a number of possible projects dealing with the same subject matter but in different laboratories (in Regional Laboratories, R and D Centers, universities or elsewhere) a panel can generally arrange them, through discussion and study, in a sensible order of priorities; this listing can then be used to upgrade the entire research and development effort.

The panel system has demonstrated its utility within HEW for a decade; it has helped to achieve and maintain quality in HEW's program of basic research and has functioned well in considerations of development projects in medicine. Furthermore, a somewhat similar system of panels (mixed with other monitoring devices) functions for the research and development activities within AEC. For example, a continuing High Energy Physics Advisory Panel, made up of experts in the field, advises AEC on policy and facilities for this limited area in all its various laboratories; a panel on Controlled Thermonuclear Reactions reviews the relevant AEC programs in each of the AEC laboratories once a year, and reports on them to AEC. Panels in education should, however, avoid the pitfall of using personnel from the Laboratories on its panels.

The panel system has a number of advantages. First and foremost, it is a device of proved utility within the government's scientific community (e.g., AEC, HEW) and therefore should prove practical. Second, the panels could monitor all the activities of the Bureau of Research rather than requiring both panels and special advisory committees; the panels would automatically help to integrate the

research and development activities of OE, and by assigning priorities to individual projects would serve to upgrade OE's activities. Finally, panels on specific subjects would not feel identified with the success of any particular laboratory or project, and so could not be "captured"; the panels would be likely to remain unprejudiced.

A possible organization of panels is as follows:

a) Organization and administration of education

b) Measurement and evaluation

c) Curriculum development

d) Teachers, and teacher-student relations

e) Social environment of the schools

f) Learning and motivation

g) Language and cognitive processes

We have considered the possibility of panels organized on the basis of educational level, but prefer the type of organization (although we hold no brief for the specific classification) that we have suggested. The reasons for our preference is that most investigators are concerned with a subject area (e.g., curriculum development in science, or testing and evaluation) rather than with all possible subjects at a given age level; the organization we have suggested permits the selection of experts for the advisory panels.

3) Quality in a panel system. An important -- perhaps an overriding-- consideration in the use of a panel system is the quality of the personnel involved.

The "Field Reader Catalog" of OE provides a particularly poor selection, comprising individuals many of whom are undistinguished in their subject disciplines. The task group strongly recommends that the entire system of field readers be abandoned, and that review of projects be carried out by appropriate panels.

We believe that the task of devising a panel system and recommending panel members should be given to the General Advisory Committee described above. We believe that it should solicit nominations from the OE Committee on Basic Research recommended above, the NRC-NAE Committee on Basic Research in Education, the National Science Foundation, the National Endowment for the Arts, and the National Endowment for the Humanities, and the Office of Science and Technology. In each instance, the request should be for highly competent persons from schools of education, from among school superintendents and school principals, and from among the social scientists, natural scientists, humanists and artists who are concerned with various subject disciplines. It will be necessary to achieve a reasonable balance between those concerned with research, those concerned with development, and with those concerned with dissemination of information. The primary emphasis however should be on quality, with an attempt to produce panels that can stand up to comparison with those used by the NIH in the natural sciences, where Nobel laureates and distinguished scholars of international reputation participate in the decision-making process.

4) Role of HEW Staff. In our view, this advisory system cannot be really effective without first rate bureau, division, and program directors. The institution of a strong advisory system, which will bring into OE a much broader spectrum of capable persons from many disciplines, should make these staff positions more challenging and attractive.

Furthermore, the success of the panel system will depend to a considerable extent on the quality of the staff within the Bureau of Research. The civil service ratings and numbers of staff in the Bureau of Research should, in our view, be modeled on those of the administrative staffs for NIH and NSF. We are in complete agreement on this point with the plea for more, and more highly qualified personnel that is contained in Dr. Rivlin's draft report of May 21, 1968.

X. Organization of Developmental Activities at the Regional Laboratories.

1) Centralization of responsibility. We believe that OE must review, consolidate, and assign priorities to the research carried out in the Regional Laboratories, and, together with advice from the Laboratories, arrive at missions for them. Although OE cannot dictate to a Board of Directors, it can often persuade them; in any event OE cannot escape the responsibility for skillful allocation of its funds. The initial proposals for research have come from the laboratories themselves, and many will continue to do so. However, some overall supervision is required; development, in contrast to research, is too expensive to permit us the luxury of much duplication. The needed centralization of authority in OE will not be excessive; much funding (e.g., ESEA Title III funds) now goes out to the states, and so is freed of Federal control. However, our recommendations for new panels (see above) will require further staffing of OE.

2) Missions. The Regional Laboratories have been established primarily to develop ideas that can be exploited to improve American education, and to disseminate information about established programs. These Laboratories should form an essential link between research and practice. If and when the system operates properly, the Laboratories will fulfill an essential and previously underserviced function. In order that the Laboratories maximize their contributions to the development of new educational practices and the dissemination of proven practices, we recommend that each should have one or more clearly defined missions and whatever research they conduct should be principally directed toward support of the development activities defined by these missions. In addition, each laboratory should have some freedom to propose new projects, represented by some specific percentage -- say 25%--of its budget. We recommend that the Office of Education and the laboratories jointly determine these missions and discuss the proposals for new projects; they may, of course, seek advice from the General Advisory Committee. For example, one laboratory might have the mission of developing TV feedback for teachers, and should then be expected to carry out studies of its effectiveness, and on appropriate objectives for the feedback. If the laboratory also brought forth, on the basis of its activities outside its principal mission, a concept such as the library of educational toys for preschool children, an appropriate panel could recommend whether the work should be expanded or transferred as a primary mission to some other laboratory, or abandoned.

3) Consultants. We have noted earlier that some of the Regional Laboratories have made poor use of consultants. The Laboratories would be much improved if they would draw upon scholars in subject disciplines, as well as from schools of education, as consultants and advisors; these should include psychologists, sociologists and others concerned with fundamental theory relevant to education, as well as natural scientists, humanists and artists who could help with specific problems in education related to their specialties. The lack of communication between the Regional Laboratories and the academic community constitutes a serious threat to the long-term efficiency of the effort to promote educational development.

4) Number of laboratories. In Appendix B of the Report (July 13, 1968) of the National Advisory Committee on Educational Laboratories, Francis Chase takes up the question of the preferred number of Regional Laboratories. He notes that "There are many thoughtful persons who . . . would argue for the discontinuance of the weaker laboratories or for mergers which would increase the strength of the resulting laboratories." He discussed the possibility of a "gradual phasing out of the weaker laboratories in order to reduce the number operating for the next several years to ten or fewer . . ." Although Dr. Chase did not finally endorse this view in this report, OE has since announced its intention to withdraw support from five of the laboratories.

5) Administration. After OE and the staff of a given laboratory have agreed upon the mission for the laboratory, OE should make every effort to keep

at a minimum any interference with day-to-day operations. Some reporting by and some visits to the Laboratories are required so that the panels can properly evaluate their progress. If a project is not carried out in a satisfactory manner, OE should recommend the transfer of the work to another laboratory, or refuse to finance it.

The obvious route to improving the quality of the Regional Laboratories is to improve the personnel in them. If the Laboratories obtain better consultants, and make better use of consultants, they may find it easier to attract first rate research people. If they made better contact (or, for some of the Laboratories, any contact at all) with the general academic community, they may be more successful in recruiting. In this connection, the Federal Council for Science and Technology in March, 1968 noted that a whole range of relationships with universities including consultation, exchange of personnel, research contracts with universities and their facilities, employment of graduate students on thesis research problems, and joint research projects have been very beneficial to government-supported laboratories and to the universities themselves. Of course, the panel system suggested above should lead to the hiring and retention of better personnel, since the panels will presumably give higher priorities to the more imaginative and the more competently managed projects, but this process of improvement is necessarily slow. The Directors of the Laboratories have a crucial part to play in selecting personnel, and OE has therefore a major responsibility in making sure that the Directors create the conditions and take the care needed to get better staff.

Appendix I - Basic Research

The following specific examples of basic research related to education and child development will illustrate the problems and opportunities in the field and serve by example to define what we mean by basic research in this paper. Each could be discussed at length; they are briefly mentioned to identify the type of research in question, with the understanding that each is inadequately treated here.

1. Social behavior of infants. Infants learn at an early age to respond to others (e.g., by smiling) but become attached to a specific individual or individuals only at about 4-6 months. This finding has the practical consequence that when a hospital stay is necessary for an infant before he reaches the latter stage, the hospital nurse will probably serve as well as the child's mother to comfort him.

2. Intervention. In a well documented and imitated study, one identical twin was taught to walk stairs, and the other left to learn it himself. The latter, when he learned, learned much more quickly than his brother, so that the "intervention" (teaching) was not highly useful. By contrast, teaching the use of prepositional phrases proved useful in increasing the command of language in two groups of Negro children of widely different capabilities. These studies are relevant to the question of when to "intervene" by teaching, and what to teach.

A somewhat related finding is that of Begle, that algebra can be taught not only to gifted young children, but also to young children of below normal I.Q., but that in the latter case the children require much more time to learn.

3. Language. Children generally expand their vocabularies from a few words to several hundred over a brief period (about three weeks) of their second year. However, the meaning of the word "not" is learned rather late.

4. I. Q. I. Q. is not constant, but can increase (or decrease) during life. I. Q. for children under 18 months (as measured from motor activity) shows essentially a zero correlation with I. Q. of the corresponding young adult, whereas I. Q. at 4 years correlates well with that of the young adult.

5. Conservation of matter. Piaget's experiments on conservation of matter (pouring a liquid from one container to another of a different shape in full view of the child, to see whether he believes matter is conserved) bring out the conception of a child as an organism for formulating and testing hypotheses, rather than as an empty head to be filled. The differences noted by Piaget appear not all to be semantic, but real; at certain ages children faced with two rows of candies choose predominantly the longer row, not the one with more candy.

6. Social problems. An example is the influence of the predominance of female teachers in alienating boys from school, and causing them to feel that school is effeminate.

7. Physiology. An example is the finding that some children are naturally placid, and others naturally squirmers.

8. Nutritional deficiencies. It now appears that severe nutritional deficiencies in the mother can produce permanent mental retardation in her child.

9. Longitudinal studies of the utility and retention of learning. Husen and Baalt have measured the mathematical abilities of Swedish farmers, clerks,

accountants, etc., and found that often the ability to make useful estimates had increased, while other mathematical skills had decreased since graduation from school. Such studies bear, for example, on the question of what minimum skills citizens need in order to function usefully in society.

10. Sociological studies of the unanticipated effects of the educational system. High school and junior college counselors have been introduced into the systems to aid students, but often discourage those from low socio-economic backgrounds from continuing their educations at levels appropriate to their abilities. Another example: the agricultural vocational training program in Ghana appears inadvertently to divert trainees away from future agricultural work, and to raise their aspirations for placement in civil service positions.

11. Educational research, supported by OE, includes investigations of the consequences of integration in schools (Bridgeport Study) and an investigation of commercial TV programs. The latter study showed that, at the same time that the schools were, apparently unsuccessfully, trying to teach children the days of the week and the idea of sequence, the children were able to recite the days, hours, channels and program titles of TV programs.

The task group is enthusiastic about the possibilities of significant intellectual and potentially practical advances stemming from such fundamental researches.

Appendix II - Task Group Procedures

In the course of carrying out its survey of current work in educational research and development the task group was briefed by a number of government agencies and visited (sometimes through subgroups) university groups, an educational policy research center, 5 educational R&D centers, 4 regional educational laboratories, curriculum development projects, schools, the Ford Foundation, industries, and individuals. The full list is given in Appendix III.

In connection with a briefing by the Dept. of HEW (June 19, 1968) the group was furnished with or referred to the following documents:

Office of Education - Research and Training
FY 69 budget submission to Congress for the Bureau of Research

Review of Education Research and Development
(preliminary draft, June 13, 1968) Office of Assistant Secretary for Planning and Evaluation, Dept. of HEW

OECD Review of Educational Research and Development in the United States

Field Reader Catalog
Office of Education, Bureau of Research, February 1968

Issue Paper for the Bureau of Research, 5-2-68

Prior to a subsequent briefing (July 8-13, 1968) by the OE Bureau of Research on the National Laboratory on Early Childhood Education, the preschool TV project, OE plans for reading research, and ES '70, OE furnished literature on the Laboratory and ES '70. A subgroup

discussed ES '70 further with Drs. Bushnell and Morgan on August 8.

Prior to its first sites visits to regional laboratories, R&D centers, and other projects (May 22-25, 1968) the group was given the following OE documents provided by the Bureau of Research:

Programs in Progress - Regional Educational Laboratories

Research and Development Centers - Programs in Progress

In the course of its work the group was very kindly furnished the following documents by Commissioner Howe:

Report to the U. S. Commissioner of Education by the National Advisory Committee on Educational Laboratories, July 13, 1968

Educational Research and Development - Promise or Mirage? by Francis Chase

Visits to laboratories, centers and other projects were arranged well in advance by telephone followed by a letter which included the description of the Task Group's objectives and membership (see copy at the end of this Appendix). Directors were asked to provide, for reading in advance, a moderate amount of descriptive material including a list of officers, advisors, staff members, and outside consultants. They were asked to start their presentations with a brief description of the overall organization and program and proceed to discussion of some of the individual programs with pertinent written materials available to be taken away by interested task group members.

The Task Group was always more interested in seeing examples of the research (e. g., trying out the programs of computer assisted instruction, seeing the videotape of Microteaching, etc.) than in hearing extended descriptions of programs. In every case the directors and staff were cooperative and gave the Task Group a good idea of their work.

TASK GROUP ON EDUCATIONAL RESEARCH & DEVELOPMENT

A task group established by the President's Science Advisory Committee is surveying current work in educational research and development with the objective of defining one or more particularly important and promising areas to which initial efforts of a subsequent panel of the Committee might be directed. The task group is concerned with education at all levels and in the whole range of areas of study. It is conferring with a spectrum of interested persons inside and outside the Federal Government and visiting Regional Educational Laboratories and Research and Development Centers, curriculum development projects, and university groups.

The membership of the group is as follows:

Frank H. Westheimer (Chairman), Department of Chemistry, Harvard University
Robert D. Cross, President, Hunter College
John B. Davis, Superintendent of Schools, Minneapolis
Jacob W. Getzels, Department of Education, University of Chicago
William R. Hewlett, President, Hewlett-Packard Co.
William Kessen, Department of Psychology, Yale University
Colin M. MacLeod, Vice President for Medical Affairs, The Commonwealth Fund
George A. Miller, Psychology, Rockefeller University
Herbert A. Simon, Department of Industrial Administration, Carnegie-Mellon University
Neil J. Smelser, Department of Sociology, University of California (Berkeley)

Although it is not confidential, public announcement of the establishment of the task group or its membership is not planned.

APPENDIX III

Task Group on Educational Research and Development
President's Science Advisory Committee

Briefings and Visits

Department of Health, Education and Welfare

Office of the Secretary

Alice M. Rivlin, Assistant Secretary for Planning and Evaluation
Edwin F. Rosinski, Deputy Assistant Secretary for Health Manpower
Philip DesMarais, Deputy Assistant Secretary for Education

National Institutes of Health

John Sherman, Associate Director for Extramural Programs

National Institute of Child Health and Human Development

Dwain N. Walcher, Associate Director for Program Planning and Evaluation
Leon Yarow, Acting Chief, Social and Behavioral Science Bureau

National Institute of Mental Health

James Lieberman, Chief, Center for Studies of Child and Family Mental Health

Office of Education

Harold Howe II, Commissioner of Education
R. Louis Bright, Associate Commissioner for Research(res. Aug. 68)
*Norman J. Boyan, Acting Associate Commissioner for Research
Howard F. Hjelm, Director, Division of Elementary-Secondary Education Research
Marian B. Sherman, Project Officer
David S. Bushnell, Director, Division of Comprehensive and Vocational Education Research
Robert M. Morgan, Deputy Director

* Visited by subgroup

Office of Economic Opportunity

Walter Williams, Head, Research Planning Division
Edith Grotberg, Head Start Research
Charles Cole, Manager, Data Systems, Upward Bound
William LaPlante, Chief, Curriculum Development Branch, Jobs Corps
Gilmore Wheeler, Chief, Evaluation and Research Branch, Job Corps

*Department of Defense

Office of Assistant Secretary of Defense (Manpower and Reserve Affairs)

Lynn M. Bartlett, Deputy Asst. Secretary (Education)
(Now Asst. Secretary (Education) Dept. of HEW)
Nathan Brodsky, Director, Educational Programs
Leo G. Fradenburg, Deputy Director

Manpower Planning and Research Offices

J. K. Johnson, Acting Director, Individual Training
William A. Fletcher
Ralph R. Canter, Military Manpower Research Coordinator

Office of Deputy Chief of Staff of the Air Force (Personnel)

Robert Gerry, Chief of Instructional Technology, Division of Training Devices and Instructional Technology

Human Resources Research Office

(George Washington University, under contract with Dept. of the Army)

Meredith P. Crawford, Director
W. A. McClelland, Associate Director
R. G. Smith, Jr., Asst. Director for Operations
C. J. Lange, Asst. Director for Planning

National Endowment for the Arts

Roger Stevens, Chairman
David Stewart, Director of Educational Programs
Mrs. Douglass Cater, Assistant to Chairman

* Visited by subgroup

National Endowment for the Humanities
Barnaby Keeney, Chairman

National Science Foundation
Leland J. Haworth, Director
Thomas D. Fontaine, Associate Director, Education
Keith R. Kelson, Deputy Associate Director, Education
Lyle W. Phillips, Division Director, Undergraduate Education
Howard H. Hines, Division Director, Social Sciences
Thomas H. Gallie, Jr., Office of Computer Activities

University Groups

Center for Cognitive Studies, Harvard
Jerome Bruner, Director

Suppes-Atkinson Computer Assisted Instruction Project,
Stanford Univ. (OE, NSF)

University of California, Berkeley

Lawrence Hall of Science
Harvey White, Director
Alan Portis, Deputy Director

John Kelley, Dept. of Mathematics

Robert Karplus, Dept. of Physics and Director, Elementary
School Science Curriculum Project (NSF)

Herbert Kohl, Dept. of English and School of Education

*Board of Educational Development

* Visited by subgroup

Educational Policy Research Center (USOE)

Educational Policy Research Center at Stanford Research Institute

Educational R&D Centers (USOE)

Center for Research and Development in Teaching, Stanford Univ.

*Center for Advanced Study of Educational Administration, Univ. of Oregon

*Center for Research and Development in Higher Education, Univ. of California (Berkeley)

*Center for Study of Evaluation of Instructional Programs, UCLA

*Learning Research and Development Center, University of Pittsburgh

Regional Educational Laboratories (USOE)

Center for Urban Education, New York, N. Y.

Education Development Center, Newton, Mass. (created by merger of Educational Services Incorporated and New England regional laboratory)

Far West Regional Educational Laboratory, Berkeley, Calif.

Southwest Regional Educational Laboratory, Los Angles, Calif.

Curriculum Development Projects (NSF)

School Mathematics Study Group, Stanford Univ., E. G. Begle, Director

Science Curriculum Improvement Project, Robert Karplus, Director (listed under University Groups)

Elementary School Science Project, Social Studies Project, Introductory Physical Science Project, (Jr. High School), Education Development Center — listed also under Regional Laboratories

*Visited by subgroup

Schools

Detroit Public Schools (including Skills Center for adults)

I. S. 201 Model School, New York, N. Y.

Anacostia (D. C.) Community School Project

Foundation

Ford Foundation, Mario Fantini, who works with urban school programs including I. S. 201 above and model school program in Washington

Industry

*American Telephone and Telegraph Co. (First Aid and Personal Safety Course)

General Learning Corp., New York., Francis Keppel, Chairman and President

*International Business Machines Corp., Yorktown Heights, N. Y.
E. N. Adams (Computer Assisted Instruction)

Individuals

*Francis S. Chase, Dept. of Education, Univ. of Chicago
Chairman, National Advisory Committee on National Educational Laboratories

*Ralph W. Tyler, Science Research Associates
President, National Academy of Education
Chairman, Research Advisory Council, USOE
Vice Chairman, National Science Board
Director, National Assessment.

*Jerrold R. Zacharias, Institute Professor, Massachusetts Institute of Technology

*Jeanne Chall, Professor of Education, Harvard University

*Visited by subgroup

APPENDIX IV

Excerpts from an internal Task Group working paper of July 23, 1968 on Visits to the Center for the Study of Evaluation of Instructional Programs at UCLA (CSEIP), the Center for Research and Development in Higher Education at the University of California, Berkeley (CRDHE), and the Center for the Advanced Study of Educational Administration (CASEA).

Basic Facts about the Centers. The mission of CSEIP is to develop and field test systems for evaluating instructional programs, to develop measures and techniques to be used in evaluation, and to develop appropriate theory for evaluation. The mission of CRDHE is "the study and improvement of higher education," and it conducts research on topics like educational impact and student development, the structure and functions of institutions of higher education, problems in higher education in an urban society, and the study of colleges and universities as instruments for continuing education. It also develops some research instruments and engages in a certain amount of developmental activity, such as conferences and dissemination. The mission of CASEA is to do research on and develop administrative arrangements for educational enterprises at various levels. They have not done much research on higher education, but rather have concentrated on primary and secondary education. Earlier their research focus was on the school and the community, but more recently they have turned their attention more to the internal organization of the school and have concentrated on the ways in which different administrative arrangements are conducive or not to innovations.

* *

The UCLA Center (CSEIP) is in the Graduate School of Education, and has drawn most of its staff from this school. The evaluation project connected with the Los Angeles Model Mathematics Program (LAMMP) has almost no redeeming features. For example, its measure of "educational objectives" is what teachers say they want to teach; its "experimental" and "comparison" groups in three high schools are not properly matched; and the observational techniques used yielded questionable information. The study of different types of institutions of higher learning and their different impact on students was also beset by a number of methodological problems, and appeared to be a sort of descriptive characterization of various types of schools. The Berkeley Center (CRDHE) is run mainly by professional researchers, with only a few members being recruited from the staff of the Graduate School of Education. In past years a few first-rate sociologists were associated with the Center, but all have departed. The research of this Center appears to be focussed on important problems — the impact of institutional structures on students, student participation, the relations between the university

and its urban environment, racial issues in universities, the characteristics of graduate training, and so on — but, once again, the way they are approaching it does not reveal a thorough grasp of theoretical and methodological aspects of research design. Yet at the same time the Center is strongly committed to pure research, and is little involved in the practical affairs of institutions of higher education, especially the University of California. But they have been unable to recruit substantially from the faculty resources at Berkeley. The result is mediocre research on an extremely important set of issues. The Oregon center (CASEA) presented probably the best quality of research of the three centers and we tie this directly to the rather strict University of Oregon policy that research associates should also have faculty appointments and to the diversity of departments (economics, education, political science, psychology, and sociology) from which research associates are drawn. The two pieces of research we learned about in some detail - that by Zeigler on the conditions under which social-studies teachers encourage expressive discussion of issues, and that by Pellegrin on the involvement of schools in community power structure - were being conducted competently, even though they could not be judged as brilliant research. The fact that the research at Oregon struck us as superior to that at the Berkeley and UCLA centers is remarkable when one remembers that the University of Oregon does not have a general stature nearly so high as either Berkeley or UCLA.

* *

The basic dilemma that we saw in these Centers was that of maintaining a proper balance between research and development, and a meaningful integration between the two. Any given activity in any given center seemed to lean too heavily toward one, with the consequence that the other was neglected. The LAMMP project at UCLA could probably best be described as neither research nor development, since its research was so poor, and its implications for educational reform unclear. The research on institutional styles in higher education also being conducted at UCLA (CSEIP) suggested no developmental possibilities that could be inferred from its design. The emphasis of CRDHE at Berkeley was almost entirely on the research side. CASEA at Oregon leans more in the Berkeley direction, though recently they have moved toward the developmental direction — mainly because of pressure from OE — and are beginning research in Wisconsin and Pennsylvania in connection with innovational programs proceeding in those states.

* *

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20506

March 30, 1972

MEMORANDUM FOR

Members of PSAC

I have been asked by Mr. David Beckler to send to you a copy of the attached memo for your information. This memo reviews the trends in graduate enrollment for scientists and engineers for the past three academic years. The data were supplied by Dr. Charles Falk at NSF.

Carl M. York
Technical Assistant

cc: Mr. D. Beckler
Dr. LLaster
Mr. Lannan

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF SCIENCE AND TECHNOLOGY

WASHINGTON, D.C. 20506

March 21, 1972

MEMO FOR DR. DAVID

SUBJECT: Graduate Enrollment in Science and Engineering

Enrollment Data

We have data on first-year, full-time enrollment in the sciences in PhD granting institutions, which was collected by the NSF in connection with their traineeship program for the academic years 1969-70, 1970-71, and 1971-72. The information has been grouped into three categories:

a) The top 20, High-Quality Graduate Institutions--selected on the basis of the number of NSF fellows who selected a particular institution for graduate study and the amount of Federal R&D money awarded to the institution,

b) 127 Intermediate Institutions: These have awarded science PhD's before 1960, but are not included in the top 20.

c) 65 Developing Graduate Institutions--those who awarded science PhD's only in 1960 or afterwards.

The following table indicates the changes that have taken place in first year enrollments in all areas of science and engineering.

Table I

No. of Institutions		No. of Students in Science(FTE)	Per Cent Change 1969-70 1970-71	Per Cent Change 1970-71 1971-72	Decrease in No. in 2 Yrs.
224	All institutions, Total	142,169	- 2.2	- 5.0	~10,000
20	Top 20 High Quality Institution	~38,000	- 7.4	- 7.8	~5,700
	7 Public		(- 4.1)	(- 12.6)	
	13 Private		(- 11.1)	(- 2.1)	
127	Intermediate Inst.	~92,000	- 0.2	- 4.2	~4,000
65	Developing Inst.	~11,500	- 0.1	- 3.0	~300

Table II gives the percentage change for 1970-71 by field of science and for the several classes of university.

Table II
First-year, Full-time Enrollment
Per Cent Change, 1970-71 to 1971-72

	All Graduate Institutions	Top 20	Intermediate	Developing
All areas of science, total	- 5.0	- 7.8	- 4.2	- 3.0
Engineering	- 4.7	- 6.7	- 4.4	1.0
Physical sciences	- 6.5	- 7.1	- 6.9	- 3.3
Mathematical sciences	- 9.4	-15.4	-10.1	11.7
Life sciences	- 2.8	-14.6	.5	- 6.7
Psychology	.2	- 2.6	2.4	-11.5
Social sciences	- 6.1	- 5.1	- 6.4	- 6.4

Some additional anecdotal information is available. For example in the University of California system, the two year cumulative decrease in enrollments was - 18% at Berkeley, - 28% at UCLA, and - 40% at San Diego (La Jolla). However, these decreases came as part of a university-wide ceiling on graduate enrollment, constant or decreased funding from the state legislature, and other non-federal constraints. In another case, Princeton cut back by - 25% over this period, to meet financial limitations in its budget, as well as to recognize that there were fewer job opportunities for its graduates in the sciences. At Chicago there was a - 19% decrease in 1970-71 which was exactly compensated by an increase in 1971-72 to give a net two-year effect of zero change in the number of entering students. Although the detailed rationale is unknown, again these changes reflect an internal managerial decision.

Data on Federal Fellowships and Traineeships for Graduate Students in the Sciences and Engineering

The following table shows the numbers of new awards and continuation awards of Federal fellowships and traineeships to graduate students in the sciences. Not all new awards go to first-year students, but the figures provide an indication of the change in Federal support available for first-year students.

	Awards Used In Academic Year			
	1969-70	1970-71	1971-72	1972-73
New Awards	7,100	6,700	3,800	2,000
Continuation Awards	15,000	14,000	13,500	9,500

Data on Federal R&D in Colleges and Universities

The following table shows the trend in Federal R&D funding at universities with a substantial increase beginning in FY 1971.

($ Billions)

1968	1969	1970	1971	1972	1973
$1.5	$1.5	$1.5	$1.7	$2.0	$2.3

Findings

1. Fewer first-year, full-time science students enrolled in graduate schools in academic years 1970-71 and 1971-72 than in previous years. The reduction in enrollment was greater in academic year 1971-72 than in the previous year.

2. The enrollment reduction during the two years has been greater in the institutions identified as the "top 20" than in the other institutions. However, the enrollment reduction by the private institutions among the "top 20" occurred primarily in academic year 1970-71, and the reduction in these institutions in 1971-72 was smaller than for any other class of institution.

3. The reduction in Federal science fellowships and traineeships is not large enough to be a significant cause of the enrollment reduction. The number of new Federal fellowship and traineeship awards declined by only 400 in academic year 1970-71, while first-year enrollment declined by about 3000. In academic year 1971-72, new Federal awards declined by about 2900 from the previous year, while enrollment declined by about 7000.

4. Federal funds for R&D in universities as a major supporter of graduate education has turned up sharply in 1971 after a "real" decline for 3 years. The increase is more than enough to compensate for overall reductions in direct training. However, the impact of recent increases has yet to take effect on institutional reporting.

Other Observations

1. Other factors than Federal support have apparently had a major influence on graduate enrollments, including growing financial problems, slow down in undergraduate enrollments (which calls for less graduate assistant support), and perception of fewer employment opportunities for scientists and engineers with advanced degrees.

2. Many major institutions, for a variety of reasons, have as a matter of policy sharply reduced their graduate school enrollments (e.g., Princeton by 25%).

3. The increases in Federal R&D beginning in 1971 should be beginning to be felt on campus. These increases will tend to go to the higher quality institutions and help sustain quality in graduate education as a by-product.

What We Cannot Conclude from This Data

1. It is not possible to conclude that the enrollment reduction will continue in future years. There is some indication, particularly with the top 13 private schools, that the reduction was primarily a one-shot thing.

2. It is not possible to conclude that a larger percentage of graduate students will be going to "lower quality" schools in the long term. The "lower quality" institutions may just be slower in reducing enrollment, or the "top 20" may begin to increase enrollment again.

3. It is not possible to conclude that the enrollment figures indicate a reduction in the quality of graduate education:

   - Reduced enrollment may help improve the quality of education for those entering the system.

   - The best students applying for admission will be enrolled.

   - The "Intermediate" and "Developing" institutions may be better in educating quality students to deal with the application of science and technology than are the "top 20."

4. It is not possible to conclude that the overall Federal support picture is now detrimental to the institutions involved. The research dollar should offset decreases in direct training. For example, even though NSF is phasing out its traineeships program, the total number of graduate students it expects to support, both directly and through research, will increase from 14,400 in 1971 to 16,600 in 1973.

5. It is not possible to conclude that the reduction will result in a future shortage of properly trained scientists and engineers.

Recommendations:

It is recommended that no change be made at this time in current Federal policies or programs concerning support of science graduate students or graduate institutions as the result of this data, and that we continue to rely on the research support approach for growth. We will continue to follow the trends in graduate enrollments, and attempt to improve our knowledge of the causes and effects of the changes, so that appropriate Federal action can be taken in the future if it becomes necessary.

Carl

Carl M. York

12/21/71

EDUCATION FOR A TECHNOLOGICAL WORLD

The Nation's welfare is becoming more and more closely tied to its development and use of technology — this is the basic thrust of the technological opportunities program.

At the same time there is growing uneasiness on the part of many citizens about technology. This uneasiness leads to both the social problem of alienation and the practical problem that persons who fear technology are less likely to make good use of it — to the detriment of themselves and society.

Experience shows that this fear and hostility with regard to technology is generally eliminated or at least reduced by opportunities to become familiar with technology and understand its goals and what it can and cannot do.

The computer is both the central element of modern technology and the source of the greatest fear and hostility. It is also a piece of technology that is very easy for almost everyone to use in a meaningful way once the proper conditions are established and it is an almost limi tlessly rich source of fascination and learning.

The computer is thus clearly the means par excellence of introducing the student to technology generally as well as being in itself centrally important to the student. High school is the logical place to introduce the student to the computer at this time, since we know how to do it and we thereby bring the computer to virtually all students. Fortunately, technological advances have

brought the equipment cost of bringing the computer to the student down to $4 per year in grades 9 - 12.

Despite the low cost, the inertia of the educational system has limited the number of students with access to the computer to 10%. A four year Federal program can provide the impetus for a large fraction of schools to provide such access and to pick up responsibility themselves in subsequent years.