Chapter II

Science and Technology Activities of the Federal Government in Relation to a New Department of Education

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INTRODUCTION

What would be the effects of a new Department of Education on the science education and research, and educational R&D functions of the Federal Government? The answer to this question obviously depends upon the functions, activities, and organization of the new department. The proposal now being most seriously considered would establish a relatively narrowly defined agency by putting the existing Education Division of the Department of Health, Education, and Welfare (HEW), plus some other education activities of HEW, and some education functions from other agencies (of which the most significant would be transfer of the Science Education Directorate of the National Science Foundation (NSF)) into a new Department of Education. This proposal, embodied in the Pen bill (S. 991, see the appendix, and H.R. 9618 identical) and endorsed with some minor reservations by the administration is analyzed in this paper.

A DEPARTMENT OF EDUCATION AND THE SCIENCE EDUCATION DIRECTORATE OF THE NATIONAL SCIENCE FOUNDATION

When attention is centered on the effect of establishing a Department of Education on the R&D functions of Government (including graduate training in the sciences), the most important single consideration by far is whether the Science Education Directorate of NSF should be transferred in whole, in part, or not at all to the proposed department.

BACKGROUND

The Written Record

The case for transfer first appeared in one paragraph of a significant report by Rufus Miles, Jr., A *Cabinet Department* of *Education* (American Council on Education, 1977, page 90):

> The Education Directorate of the National Science Foundation is that part of the Foundation which is most directly related to the pedagogical functions of educational institutions, as distinguished from their research functions. It is concerned with fostering needed innovations in curriculum materials, techniques for the teaching of science, and the use of technological advances for instruction, as well as with the general improvement in the quality of scientific and technical manpower. It constitutes less than ten percent of the total program of the National Science Foundation, most of which is, of course, devoted

to research. It is now time to transfer this small component to the new Department of Education, if one is estabilised. It is unlikely that this transfer would meet with strong opposition from any influential source. 1

The Science Education Directorate is, as Miles notes, more directly related to the pedagogical functions of educational institutions than to their research functions, and the functions of the division are adequately stated. The budget for the division is, as Miles points out, less than 10 percent of the total NSF budget. However, these considerations hardly constitute a full and satisfactory base for the conclusion that "it is now time to transfer this small component to the new Department of Education." The central reason advanced by Miles for transfer is that the functions of the Directorate are more directly related to the pedagogical than to the research functions of educational institutions. This formulation accepts as conclusive a rationale that is, in fact, the issue to be debated. It actually makes a proposition to be tested rather than establishing a case.

The only early statement opposing the transfer has been made by Charles Saunders on behalf of the American Council on Education as an umbrella organization, and seven associates of higher education, including the Association of American Universities and the National Association of State Universities and Land Grant Colleges, to which all universities conducting substantial amounts of research belong. The statement opposing the transfer reads as follows:

> We would oppose transfer of the National Science Foundation's Education Directorate (or for that matter any other part of that appropriately independent Foundation). Most members of the higher education community believe that the location of the Education Directorate within the National Science Foundation affirms the importance of the interdependence of science education and scientific research. To separate the two would inevitably damage the quality of both, by depriving them of their mutually supportive relationship. These programs should be developed and administered with a sensitivity to the science and research environment on campus in which they will function. They should be staffed by professionals, some on temporary assignments from colleges and universities, who are familiar with existing NSF academic science research and training programs and with emerging educational needs and training opportunities. A staff in a separate department, isolated from the Foundation's research environment, in our view, would neither bring the same perceptions and experience to these programs nor attract the quality of experienced individuals drawn to them by the unique research environment of the Foundation. We see no reason to disrupt the present relationship, with the reduced effectiveness which would be bound to occur, for the sake of adding another agency to the new Department of Education.[2]

The interdependence of science education and scientific research is a good general point, but as will be noted below, it is useful to look at specific aspects of the Science Education Directorate of NSF. To separate specific programs might or might not "inevitably damage the quality of both by depriving them of their mutually supportive relationship." The precise nature of the potential disruption, if any, that would follow the transfer of specific kinds of activities now carried on by NSF must be examined. The importance of developing and administering the programs of the NSF Science Education Directorate "with a sensitivity to the science and research environment on campus in which they will function" is also a weighty consideration, but it must be applied to specific programs.

Turning to the strongest opinion expressed in the legislative branch, the Pen bill (S. 991), proposed in Sec. 7(a) 12 that the Science Education Directorate be transferred. The Humphrey bill (S. 225) Sec. 8(d) had the more cautionary proposition that there be:

> . . . transferred to the Secretary all functions of the National Science Foundation which the Director of the Office of Management and Budget determines relate to instructional personnel development programs, instructional pro-

'U.S. Senate, Committee on Governmental Affairs, "Department of Education Act of 1977," Committee Print, 95th Congress, 1st session, U.S. Gov't Print. Off., Washington, D. C., Oct.12 and 13, 1977, p. 174. Miles later indicated that he had not thought in detail of the pros and cons of transfer of functions performed by the NSF Science Education Directorate.

*U.S. Senate, Committee on Governmental Affairs, creating a Department of Education, hearings before a committee of the whole (March 21, 1978). Statement by: Chades B. Saunders, Jr., Director of Governmental Affairs, American Council on Education (p.5).

gram development, and programs in computer innovations designed for use in education.[3]

There are no analyses accompanying the bills and no statements by the sponsoring Senators or Representatives indicating why the various positions have been taken. A range of bills have been introduced in the House, but serious consideration was deferred until early August, pending the establishment of a final position by the administration and passage in the Senate. In the first congressional hearings on a new department,[4] none of the Senators mentioned the issue. Nor did representatives of the National Education Association (NEA), nor any of the six former Commissioners of Education, mention the issue. While the question has been debated more thoroughly in later congressional hearings, it has thus far not been one of the central issues related to creation of a new departments

Finally, there is the position of the administration, which constitutes the most careful analysis of the issues. James T. McIntyre, Jr., Director of the Office, of Management and Budget (OMB), presented the summary views of the administration on formation of a new Department of Education in the form of commments on the Pen bill (S. 991) before the Senate Committee on Governmental Affairs on April 14, 1978. The administration's position recommended transfer of some of the functions of the Science Education Directorate:

> Although we do not advocate the transfer of the entire Science Education Directorate from the National Science Foundation, we think that a Department of Education responsible for improving educational quality should directly involve science education programs designed to upgrade school and college curricula. However, we think that the graduate training and scholarship programs, which recruit and prepare scientists for the Nation's scientific research effort, should remain in NSF, as well as some smaller education programs directed at improving communications between the scientific and nonscientific communities.

The administration position was elaborated by the Office of Science and Technology Policy (OSTP) in testimony given to the same Committee on April 18 by Philip M. Smith, Assistant Director of OSTP. He outlined the rationale for the President's proposals by first stating the advantages and disadvantages of transferring programs:

Transferring the science education programs would have the following ***advantages:***

- A Department of Education, which assumes the responsibility for improving the overall quality of schools and school curricula, should be given responsibility for involving talent, program expertise, and information within the scientific communities.
- Transfer of science education responsibility will improve the likelihood of enlarging Federal impact on the quality of science education programs offered in all the Nation's schools and colleges. The NSF has not had the resources to demonstrate fully and disseminate the products developed with its research and development funds.
- A major department with a mandate to report annually on the "condition of education" and with an annual budget for education programs in excess of $12 billion may be in a better position to articulate appropriate Federal policies and to reallocate available resources to meet all educational needs, including science education.
- Consolidating those Federal educational programs aimed specifically at improving access of minorities, women, and the handicapped will emphasize the administration's commitment to alleviating problems of inequity and discrimination in education.

The proposed transfers could have the following ***disadvantages:***

- Transferring science education programs from NSF could reduce the involvement of the science and research communities in science education.
- An agency without scientific and research talent operating at its helm would be less sensitive to and supportive of science education programs. In contrast, both the

[3] U.S. Senate, op. cit., p.421:S.225, Sec 8(d).
[4] Ibid., S.991, S.255, S.300, S.894, and S. 1685.
[5] Hearings to date: 3/20/78; 4/14 & 4/18/78; 4/27/78; 5/8/78; 5/16 & 5/17/78.

Director and Deputy Director of NSF were trained as research scientists.

- The substantive link between science education programs and basic research programs would be reduced by separating these programs. Science focuses on the creation of new knowledge, and teaching it effectively depends on that knowledge. To minimize this potential disadvantage, the proposed Department of Education would have to work closely with NSF and assure continued scientific input.

- Policies relating to increasing access to and participation in education, which dominate most Federal education programs, might take priority over the policies stressing high standards, excellence, and competition, which are stressed by NSF officials and the NSF Board.

In weighing these advantages and disadvantages, OSTP came to the conclusion that programs should be transferred:

> . . . in those cases where there is a desirability of implementing on a wide basis activities characterized by knowledge dissemination, the widespread introduction of new educational technologies, the training of professionals such as teacher training programs or special assistance programs to help improve the opportunities for sectors of our society such as minorities, women and the handicapped.

On the other hand, OSTP:

> . . . concluded that it is desirable to have a continuing role for NSF in those programs most closely related to science such as the fellowships or those programs where there is a close tie between science and learning. We expect therefore that the NSF will have a continuing and important role in educational research specifically directed at science, knowledge and understanding for both formal education and in broader education of our citizenry concerning science and technology.

Applying these principles to specific programs produced the following proposal, which for the first time stated the details of the President's plan for disposition of the Science Education Directorate:

Disposition	Millions of dollars
Faculty development, undergraduate programs, minority, women, and handicapped programs, R&D, proposed for transfer.	$56.3
Graduate research training and science and society programs remaining at NSF	$21.3
Total	$77.6

Personnel: Approximatel y 90 transfer, approximately 30 remain at NSF.

In summary, the written record to date states three positions:

- Transfer the whole education Directorate (Rufus Miles, Jr., in *A Cabinet Department of Education);*
- Transfer none of the functions of the Directorate (American Council on Education testimony of March 21, 1978); and
- Transfer part of the functions of the Directorate (administration position as stated by OMB and OSTP on April 14 and 18, 1978). (Among all of these documents, only the OSTP statement presented an extended discussion of the issues.)

The discussion in the following pages is an independent effort to provide a fuller anaylsis of the considerations that would lead to any one of these three possible choices. The following text assesses the possible effects of such reorganization on the Federal educational R&D programs, and graduate science and engineering activities.

The Functions of the Science Education Directorate

The content and magnitude of the programs of the NSF Science Education Directorate are shown in table 1, which is derived from the President's budget proposal for fiscal year 1979.

Criteria for Deciding to Transfer Programs

The basic issue is the standard one encountered in all reorganization proposals: what concepts and missions of Government are to serve as the guiding, primary principles for organization? When NSF was established and as it has evolved, science has been considered as a valid central organizing principle. Now, education has become a relatively more significant

Table I.—Possible Effects of Federal Educational R&D Programs and Graduate Science and Engineering Activities

Program description	FY 1979 Budget request (in millions)
Advanced scientific training, and minorities, women, and the handicapped in science	**$17.3**
Fellowships and traineeships, predoctoral and postdoctoral.	14.8
Minorities, women, and handicapped in science	2.5
Science and society	**5.4**
Public understanding of science.	2.4
Ethics and values in science and technology	1.3
Science for citizens.	1.7
Science education R&D and information dissemination	**12.7**
Research in science education	3.9
Development in science education	7.8
Information dissemination	1.0
Support for college and secondary school students and teachers	**12.5**
Secondary school student science training	2.3
Faculty improvement	10.2
Institutional support	**29.7**
Comprehensive assistance to undergraduate science education	14.9
Minority institutions science improvement.	5.0
Resource centers for science and engineering.	2.8
Undergraduate instructional improvement. ...,	7.0
Grand total	**$77.6**

function, and the relative importance of science and education as principles guiding the organization of the Federal Government have to be worked out. The question is whether the set of functions relating to science, and performed by NSF, should redivided in order to form a more unified set of educational functions in a new Department of Education.

The advantages and disadvantages of transfer noted in the OSTP testimony should be borne in mind. They and other relevant considerations can be stated in the form of questions.

1. Importance of a New Department

- What relative weight should be given to establishing a well-rounded new department as contrasted with maintaining the quality and continuity of operating programs?

2. *What Relative Weight Should be Given to the Conflicting Values of Pluralism and Coherence?*

- Should pluralistic maintenance of programs in the same field in a number of agencies be given greater weight if there is a greater component of experimentation in the program? or,
- Should coherence—consolidation of programs in the same field in one agency-be given greater weight if there is greater significance to the building of a new administrative structure and administration of programs which have relatively fixed guidelines?

3. *The Education and Science Environments*

- Will the program flourish best in an atmosphere colored by education or by science?
- Is the program primarily an education program with an incidental science content, or the reverse?
- Is the program directed at professional educators or professional scientists?
- Should educators or scientists have the primary voice in the development, administration, and evaluation of the program?
- Can the optimum mix of educational and scientific influences be attained best in NSF or in a new department?

4. *Quality and Effectiveness of Programs*

- What relative weight should be given to the past effectiveness of programs in their current setting as contrasted with the potential effectiveness in a new setting?

5. *Administrate Considerations*

- Are circumstances such that the function can be administered most efficiently in NSF

or in a new department?

- What attention will be paid to the function at the top of the agency?
- What are the prospects for budgetary support?
- Where are the best people available to administer and advise on the program, currently and in the future?

6. *Political Considerations*

- What political and administrative costs and benefits are generated by transferring programs or by keeping them in NSF?

For several reasons, it is difficult to produce fully persuasive answers to most of these questions. Different persons and groups are inclined to put different weights on various criteria. For example, those who place great weight on the potentialities of a new department for infusing all of education at the Federal level with new leadership and ideas, and for achieving a new coherence for education in the Federal structure incline to favor transfer of most or all of the functions of the Science Education Directorate. Those who place great weight on the need for leadership and scientists, participation of the scientific community, and national competition on the basis of quality recommend that none or few of the functions be transferred.

The structure of the new department is not known yet and it maybe created without detailed specifications. Clear choices are hard to make because it is not known how the transferred functions would fit into the administrative structure of a new department, and hence, whether they would have relatively high or relatively low status, visibility, and access to power. Finally, the quality of potential leadership in a new department is unknown. The administration has recognized the significance of such questions. The OSTP testimony noted that:

> There are many details to be worked out effectively and we are committed to help in this regard to ensure that programs are transferred effectively and that they receive prominence and attention in the Department of Education. Clearly, science programs within a Department having so many elements need to be carefully organized. A broadly based Department would facilitate the type of functional organization that is desirable. This Office will participate in planning and effecting transfers of science education programs to assure an orderly transition.

The Meaning of "Transfer"

Transfer of the functions of the Science Education Directorate can mean amendment of the National Science Act to remove the authority of NSF to conduct activities of the type transferred to a new department, or it can mean transfer of money, people, and current activities to a new department while leaving the NSF statutory authority intact. The primary advantage of the latter course is that it provides flexibility. If functions were transferred to a new department it would be advantageous in some cases to carry on complementary activities in NSF. For example, OSTP pointed out that a new department might not be able to do everything that ought to be done in science education, but that, "the safeguard is that NSF would retain its current broad statutory authority for support of science education." In case things went poorly in the new department, the existence of basic statutory authority in NSF would permit retransfer of functions.

There would appear to be no advantages to be gained by repealing the statutory authority of NSF to carry out transferred functions.

SPECIFIC PROGRAMS

Advanced Scientific Training, Minorities, Women, and the Handicapped in Science

The fellowship and traineeship portion of the program of the Science Education Directorate was initially the sole NSF activity in the educational area. It developed during the 1960's when there was a clear and urgent need to provide a strong Federal stimulus to the training of scientists for an expanding national research program and for an expanding system of higher education. Now there are not general shortages of scientists, although there are specific foreseeable needs of some magnitude. The fellowship and traineeship item (including programs for women, minorities, and the handicapped) now comprises only about 25 percent of the total budget of the Science Education Directorate. Using the argument that a Federal stimulus to the production of scientists is no longer an urgent priority warranting a

separate program in NSF, the program could be transferred to the new department and administered as a segment of a broader fellowship program.

However, there are considerations which argue for continued administration of the fellowship and traineeship program by NSF. For example, the relationships between research and requirements for academic staff on the one hand and the flow of highly trained scientists and engineers continues to be complex, dynamic, and impossible to predict with precision. These characteristics of the system make it important to link support of basic research with fellowships and traineeships in science and engineering. In addition, the Nation needs a central point where attention is paid to the content of graduate and postdoctoral education, to future supply and demand, to the interrelationships between research and graduate education, and to the quality of graduate and postdoctoral programs in the sciences. Another significant consideration is that there are still specific shortages that can be best detected and relieved if the education and training program is closely linked to the research function. Finally, the traineeship and fellowship program of NSF is designed not to improve general access to higher education as a social imperative, but to sustain the quality of personnel in fields of direct significance to NSF and to symbolize the national interest in sustaining high quality in graduate education in the sciences.

All in all, there seems to be no more reason to transfer the NSF trainee and fellowship programs than to transfer similar programs conducted by other agencies, such as NIH.

The case for keeping the $2.5 million program for minorities, women, and the handicapped in NSF is short and powerful. Every major agency of the U.S. Government should be sensitive to and involved with the national effort to do away with discrimination, and the most direct way to do this is to have a specific program directed to that end. The new department will not need the small NSF program to expose it to all aspects of affirmative action or to demonstrate its commitment to doing away with discrimination.

The case for transfer is also short and powerful. Recall that the OSTP testimony stated:

> Consolidating those Federal educational programs aimed specifically at improving access of minorities, women, and the handicapped will emphasize the administration's commitment to alleviating problems of inequity and discrimination in education.

Science and Society

Science and technology play an influential role in most aspects of modern life and a dominant role in many fields. The power of science and technology make it important that the public at large understand the essential nature of science and technology, and that the power of science and technology be used with a sense of responsibility and within an ethical framework that provides appropriate guides and constraints. Attention to these matters is a proper concern of the Federal Government, and the concern is made concrete by the group of NSF activities called science and society, funded at a level of $6 million.

These NSF programs are educational in a very broad sense and could therefore be considered as a logical part of a new department.

On the other hand, the relationships between science and society can best be pondered and studied in the context of scientific and technological activities. Strong links between philosophers, social scientists, biological and physical scientists, and engineers are necessary for effective study of the relationships among science, technology, and society. These links can be forged more effectively in an atmosphere where science rather than education is the dominant theme. The role of science in society is changing. NSF should be both aware of the change and, to a degree, an agent of change. The programs under consideration serve this purpose. Accordingly, NSF has urgent and continuing interests in pursuing these matters, whereas no such stimulus would appear to exist in a Department of Education.

Questions of ethics and values and of public understanding of science involve sensitive issues, which are best approached with oversight provided by independent, informed advisors. The National Science Board performs this function.

It has been recommended that the public understanding of science program within the science and society program be divided; the formal education component moving to the new department and the science policy and broader educational component remaining. It's likely that

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such division would weaken both aspects. The program was designed to provide the public with information about science and to draw upon the scientific expertise available to NSF.

Finally, there does not appear to be a function or program in a Department of Education into which these NSF activities would fit easily.

Science Education R&D

The Nation needs a broadly based, intellectually vigorous, well-financed, well-directed, and well-advised research program on the important and intractable problem of understanding the learning process. The potentiality of developing such a program would exist in a new Department of Education, and this is one of the reasons for establishing a department. Transfer of the NSF science education R&D programs would add specialized talent, funds, and an informed constituency to the broader effort in the new department. If the program were transferred it would obviously be placed in the National Institute for Education (NIE), which is designed to foster such efforts.

To be useful, the products of research and development on science and education have to be disseminated. NSF has concentrated on research, and its efforts at dissemination have not been outstanding. Indeed, there is a statutory bar to dissemination of curricula by NSF. Accordingly, the dissemination function could be performed better by a department with the propensity, skills, and resources to mount large-scale dissemination programs.

However, there are countervailing considerations which argue for leaving this program in NSF. First, there is a possibility that the gains outlined above would not be realized. NIE has encountered difficulties which have not been entirely overcome. The transfer might well impair the effectiveness of the NSF programs rather than elevate the level of the NIE activity. In addition, the NSF program for science education R&D has been of high quality and, within the areas selected for emphasis, a success. The curriculum development efforts have been clearly superior to those sponsored by the Office of Education. The people involved in the programs have been national leaders. There is much to be said for maintaining diverse approaches to education R&D because the complexity and experimental nature of the subject makes different appreaches desirable. The training curricula developed by the Department of Defense and the language-training curricula and teaching methods developed by the Department of State are other examples of successful specialized efforts.

If program effectiveness, quality, and maintenance of diversity are given primary weight, the case for leaving the program in NSF is strong.

Support for College and Secondary School Students and Teachers

The NSF faculty improvement program, funded at a proposed level of $10.2 million, has a long record of success. Utilizing such devices as summer workshops led by experienced scientist teachers, the quality of science instruction in schools and colleges has been upgraded.

Similarly, the $2.9 million program for secondary school science training has been productive in identifying and encouraging talented young high school students to choose science majors in college.

The strength of the case for transferring these programs to a new department depends heavily upon decisions as to priorities among NSF missions. There is continuing tension between the doctrine that support of the best science is the central role of NSF and the doctrine that improvement of science education at the secondary and college level is an important goal. While the research support goal—and particularly support of basic research—remains the central mission of NSF, a moderate investment in science education is good for the country and good for NSF. More pragmatically, administration of these programs broadens the political support base of NSF beyond the scope of the relatively few institutions with investigators who claim the majority of research funds. From NSF's perspective it would be deleterious to lose a program that serves a wider community.

But even if science education below the graduate level is accepted as an important NSF function, two questions remain. How well can NSF perform the function as compared with a new

Department of Education, and how well might each of the agencies support the function?

Divorcing such programs as improvement of secondary school science training and science faculty professional development from NSF could have serious adverse consequences for the quality of the programs. One of the strengths of these programs as administered by NSF is that they have effectively involved a number of groups of scientists. The participation of high school science teachers, undergraduate teachers, active research scientists, and others expert in theories of learning and teaching have brought unprecedented spark and quality to these efforts. This has not happened to the same degree in similar programs sponsored by the Office of Education, and transfer of the NSF programs to a new department poses a clear danger that the productive, imaginative NSF approaches would be submerged and flattened out. The history to date of efforts along these lines in the Office of Education does not provide grounds for optimism.

However, it is not certain that transfer would have such adverse consequences for these programs. A major reason for establishing a new department is to attract a new and diverse group with fresh ideas as both staff and advisers.

Moreover, the case for transfer is strengthened by the fact that these programs are not closely linked to the research and graduate education mission of NSF.

This suggests that other grounds be explored as the basis for decision, and two candidates appear. One is the desirability of providing a broad base for the new department. Inclusion of a mandate to design and administer programs for science education would bring an interesting, vigorous, and important activity into the department. The generally accepted doctrine that each department in the executive branch should have a scientific component applies to the new department. On these grounds, transfer of the science education activity of NSF would be called for.

The second criterion is administrative feasibility and efficiency. Given the complexity, magnitude, political sensitivity, and social significance of the problems to be solved as a new department concentrates upon the attainment of equal **access** to postsecondary education and to equity **in** sharing the cost of postsecondary education, it would be prudent to avoid taking on additional tasks of an essentially peripheral character, particularly if they are being well-performed elsewhere. It would be unfortunate if transfers into the new department were made to give the appearance of a comprehensive department at the expense of the quality of performance of significant programs. On these grounds, the function would be kept in NSF.

The decision rests on the weight to be given to the various criteria.

Institutional Support

NSF now administers a group of programs that have as a common objective provision of resources to upgrade undergraduate science teaching. These programs are: comprehensive assistance to undergraduate science education, minority institutions, science improvement, undergraduate instructional improvement, and resource centers for science and engineering.

The case for leaving these programs in NSF rests primarily on the grounds that NSF has served a valuable innovative function, has nurtured the programs effectively, administered them well, and secured increasing budgetary support.

On the other hand, there are solid reasons for transferring the function. Of all the functions of the Science Education Directorate, it is the most remote from the central research and graduate education mission of NSF. Conversely, these programs would fit into related programs for institutional support that would be carried on by a new department.

With respect to both the programs for science education R&D and programs for institutional support, prospects for future financing in both NSF and the new department have to be weighed. Looking first at NSF, it is clear that these two programs are far from the top of NSF priorities. Given the immediate urgency of many lines of investigation of the highest scientific significance that are inadequately funded, and of unmet needs for research related to pressing national problems, it seems unlikely that long-range goals for better secondary school and college education in science will be given high priority by NSF. The fact that these programs would be part

of a department with a budget in excess of $12 billion might well make it possible to increase the appropriation substantially if this seemed desirable in competition with other important activities. On the other hand, there is no assurance that this would actually happen. Given the set of priorities facing a new Department of Education, the likelihood of sustained top-level attention to and budgetary support for a small program of secondary and college science education seems remote. The new staff may be more than fully occupied with matters of greater significance in the hectic months that are an inevitable phase of the establishment of a new Federal department.

AN ALTERNATIVE APPROACH POSTPONEMENT OF TRANSFER?

There is an alternative to immediate transfer of programs. That is, programs can be left in NSF for the time being and the question of transfer can be reconsidered later. This is the course that has been recommended by the administration for the National Foundation on the Arts and Humanities for its own programs:

> We recommend against the inclusion of the Arts and Humanities Endowments in S. 991 at this time. We believe, however, that the option of transferring these programs should be reserved for future consideration.

The statement went on to outline why transfer is not recommended at this time:

> Locating the endowments and most education programs within the same department offers opportunities to enhance the quality and diversity of American education. A close alliance between the arts, culture, and education could foster new ways for learning to take place,
>
> On the other hand, elimination of the independent status of the Endowments might significantly alter their existing missions, reduce their visibility, and undermine the effectiveness of their advocacy role.

Analogous considerations apply to the programs of the NSF Science Education Directorate, and the central question is the weight that they should be given. A further factor to be considered is the difficulty of assimilating and effectively administering a substantial number of small programs during the period of stress and confusion that seems to be inevitable when a large Federal Cabinet department is created.

However, there is a rejoinder to this proposal:

1. Once a major Cabinet department is established, it is difficult to transfer programs thereafter.
2. The NSF programs are so small in the context of a new department that the increment of administrative problems created by their immediate transfer, even during a hectic period, would be minor.

EDUCATIONAL RESEARCH AND DEVELOPMENT FUNCTIONS TRANSFERRED FROM HEW

Apart from the question of the implications for science and technology of transfers to a new Department of Education from agencies other than HEW, there are some important considerations relating to the status in a new department of educational research and development now conducted in HEW.

All of the reports' on a new department and all of the bills introduced thus far properly stress such matters as advice to the President on long-range goals and priorities, policies to foster the development of educational resources, conduct of surveys to collect, analyze, and disseminate relevant information, and provision of leadership by conducting studies and making recommendations to facilitate the continuing development of the American educational system. (See, for example, See, 6, *Functions* of S. 991, A Bill to Establish a Department of Education.) There is, in addition, the function of investigating the educational process itself. Effective performance of these functions requires a strong analytical and research capability in the department. This in turn necessitates an appropriate administrative structure.

Three kinds of analytical and research functions can be distinguished.

COLLECTION AND ANALYSIS OF EDUCATIONAL STATISTICS

The National Center for Educational Statistics (NCES) carries primary responsibility for collection and analysis of educational statistics. NCES is a unit reporting to the Secretary of HEW, and it would become a part of any new department. The primary problem to be solved here is to secure funds and staff adequate to give the Nation statistical information that is—to take a rough but usable measure—as complete and useful as that available in the health field. Currently the resources for collection and analysis of statistics are 2 to 3 times as plentiful in health as in education even though total national expenditures for education—$120 billion in 1976—almost equal those for health—$140 billion.

Table 2.—Resources for Health and Educational Statistics

	Staff		Appropriation (in millions)	
	No.	Index	Amt.	Index
National Center for Educational Statistics.	180	100	$14	100
National Center for Health Statistics	550	300	$34	240

This disparity will not be redressed unless there is a stronger administrative voice for education, and for the research function as part of the educational enterprise. The National Center for Educational Statistics should be transferred to the department, and its independence from any operating division should be retained. It should be responsible to a high official in the department. For example, Senator Pen's bill, S. 991, provides for an Assistant Secretary for Evaluation and Planning, and others have advocated that such a position be established. This Assistant Secretary would be the appropriate official to supervise and protect NCES, and to ensure that it is responsive to the needs of those whom it would serve both within and outside the department.

The same goal should be sought if the chosen route is strengthening of the education function in HEW rather than establishment of a new department.

ADMINISTRATIVE RESEARCH

A second analytical and research function is to improve administrative efficiency. Creation of a new Department of Education would require an intensive analytical effort on the distribution of functions, allocation of staff functions, the organization of the Office of the Secretary, lines of authority and responsibility, etc., while the details of the new organization were being worked out. A continuing program of analysis

will be required to keep the administrative structure and process well-tuned. There should be a central point of guidance, stimulus and, to some degree, performance of this function near the top of any new department. Most proposals and most students of organization advocate that an Assistant Secretary for Administration be named by statute. For example, Senator Pen's bill S. 991, proposes an Assistant Secretary for Administrative and Management Policy. The same goal should be sought for administrative research if there is an elevation of the status of education within HEW rather than creation of a new department. That is, establishment of a position of Assistant Secretary for Administration, or a post of comparable rank, to deal with administration of the enhanced education component of HEW.

RESEARCH ON EDUCATION

The third kind of research and analysis is concerned with the process of education itself—how people learn and how the learning process can be made more effective. This includes, among other things, curriculum development, and learning technology. This kind of research is also concerned with structures and processes for education, the management and organization of education, the financing, and the economics of education. This kind of research in HEW is centered in NIE. All of those who have considered the matter agree that the entire Education Division, including NIE, would become a part of any new Department of Education.

As far as organizational shifts are concerned, the desirability of transferring the science education activities of the Science Education Directorate of NSF to a new department, and specifically to NIE, has been analyzed above. If the National Foundation on the Arts and Humanities were transferred, it also would seem desirable to place their educational development activities in NIE.

Improvement and diffusion of learning technology would be an important aspect of science and technology in a new Department of Education. In fact, the opportunity to exploit more effectively such techniques as satellite communication, educational TV through the use of broadcast and cable, computer-assisted learning, and museum exhibits and demonstrations is one of the soundest reasons for setting up a Department of Education. However, the strengthening of these activities will depend primarily upon the firmness with which the techniques are advocated, the attitude of Congress towards funding, and the technical administrative and political skill of those who will operate the programs. Structural problems appear to be minor, and few, if any, transfers of functions from agencies other than the Education Division of HEW are called for.

If general policies and specific lines of research are to be chosen wisely in this most difficult area, NIE must retain its semiautonomous status and it would have to have high status within a new department. One sound way to ensure this status is to make the Assistant Secretary for Research (or for Evaluation, Planning, and Research) also the Director of NIE. It would not seem adequate to have NIE report to an Assistant Secretary.

In conclusion, the needs in research on education are substantive as well as structural. The report of the National Academy of Sciences to the National Institute of Education, Fundamental Research, and the Process of Education (Washington, D. C., 1977) states the central problem:

> The application of science and technology to improve education is of great importance. On the whole, however, we believe that the Federal Government has adopted policies that encourage superficial and wasteful research that has the appearance of relevance but lacks the substance of general principles. We recommend a significant redistribution of emphasis toward more fundamental research in education and toward a more measured approach to education R&D of all kinds. (p. 66.)

SHOULD A NEW DEPARTMENT OF EDUCATION BE CREATED?

This report centers on the effects of establishment of a new Department of Education on the R&D function, and thus assumes, as the basis of that analysis, that such a department may come into being. However, another aspect of the effects of a new department on the R&D functions should be considered. That is, could potential effects upon R&D arising from the creation of a new department be either so favorable or so adverse as to constitute significant arguments for or against establishment of a department? (Recall that a large Department of Education and Science that would include the entire NSF is not under discussion at this point. If such a department were seriously considered, the effects of reorganization upon the R&D function would be a central issue.)

To answer this question, the significance of the effects of creation of a new department on the R&D function must be put in the context of the important issues to be decided before a department is created. Some of the central questions are these;

1. Would a Department of Education be so small as to complicate rather than simplify the tasks of the President?
2. Would secondary education dominate a Department of Education?
3. Would the harm done by disagreements over what should be in a department outweigh the potential benefits from reorganization?
4. Is education as the focus for a new department more urgent than health or income maintenance?
5. Would creation of a Department of Education lead to the assumption of increasing power by the Federal Government over education?

In comparison with such questions, the potentially positive or negative effects of creation of a new department on the R&D function are minor and the case for or against a new department should be made with subsidiary attention to potential effects upon the R&D function.

If a department is not created, most of the functions performed by the NSF Science Education Directorate and the educational R&D functions performed by HEW will continue to be performed well. There is a very strong case for reorganizing HEW to lift the status of education and to create clear lines of authority and responsibility if a new department is not created.

HEW'S EDUCATION DIVISION

It is worthwhile considering briefly the Office of Education programs that the programs of the NSF Science Education Directorate would join in a new department. There are 44 substantial programs in OE.[6] They deal with student support, institutional support, and professional enhancement. The major groups of OE programs have little to do with each other. They do not form an integrated whole. None of them are specifically directed at science or science education. Therefore transfer would not represent completion of a logical scheme, nor would the NSF programs be integrated with the diverse OE programs. Rather they would form a fourth program segment, unrelated to the other three.

'The following are now in HEW's Education Division: Basic Opportunities Grants; Supplemental **Opportunit**, Grants; Work Study; Direct Loan Programs; Incentive Grants for State Scholarships; Special Programs for the Disadvantaged; Developing Institutions Program; Language Training & Area Studies; University Community Services; Aid to Land Grant Colleges; State Postsecondary Education Commissions; Veterans Cost of Instruction; Cooperative Education; Construction Grants & Interests; Intercultural Centers; College Teacher Fellowships; Graduate/Professional Opportunities; Legal Training for Disadvantaged; Public Service Fellowships; Mining Fellowships; Law School Clinical Experience; Wayne Morse Chair of Law & Politics; Library Resources; Metric Education; Gifted & Talented; Community Schools; Careet Education; Consumer Education; Women's Educational Equity Arts in Education; Packaging & Dissemination of Education's TV Programming; Teacher Corps; Teacher Centers; Planning & Evaluation; Guaranteed Student Loan Program; Health Professions Loan Program; Facilities Education Loan & Insurance; Research and Development-Dissemination & Resources; Basic Skills; Education & Work; Finance & Productivity; School Problem-Solving Educational Equity; Postsecondary Improvement-Extending Educational Opportunity & Improving Programs in personnel and instruction; Extending Resources Beyond Campuses; Lifelong Learning; Educational Statistics; Statistical Services; Institute for Museum Services; Educational Policy Research Centers; Support for Advisory Councils.

A DEPARTMENT OF EDUCATION AND SCIENCE

Research and development functions of the Federal Government would be fundamentally affected by a new Department of Education only if the concept were modified to establish a Department of Education and Science. This would involve shifting the entire National Science Foundation (and perhaps some other science activities) to the new department, and a large-scale redistribution of some current functions of HEW. One possibility along this line has been put forward in a report of the Carnegie Council on Policy Studies in Higher Education, *Federal* Reorganization Education and Scholarship (March 1977, p. 9). The Council proposed transferring the income-maintenance functions of HEW to the Labor Department to create a Department of Labor and Human Resources, splitting off the health functions of HEW and concentrating health functions from other agencies to form a Department of Health, and creating a Department of Education and Science by drawing together educational functions from other departments and shifting NSF to the new department. Other configurations such as a Department of Education, Health, and Science, can be easily imagined. The Carter administration has not proposed any such fundamental changes. The problems of designing a relatively simple and modest Department of Education are so difficult that there is no inclination at present to take on the additional political and administrative complexities of fitting together a Department of Education and Science, and of working out the disposition of the health and income maintenance functions of HEW.

It also seems clear that serious initiatives along these lines will apparently not originate in Congress in the absence of a proposal from the administration.

There are powerful reasons for not shifting NSF to a Department of Education and Science. There are also powerful arguments for not shifting the scientific activities of other agencies to a Department of Education and Science. In addition to the fundamental desirability of attaching an appropriate research and development activity to each major Federal department, there is the pragmatic consideration that centralization would put "too many eggs in one basket" in the appropriation process. These considerations are well summarized on pages 69-71 and on pages 100-101 in the Miles report. '

Nevertheless, continuing attention to the ***pros*** and cons of such large-scale shifts can contribute to pending decisions by exposing alternatives which will raise considerations relevant to the current debate. For example, the Carnegie Council, after reviewing the advantages of large-scale shifts of functions, came to the conclusion that, "We are doubtful of the need to create a new Cabinet-level Department of Education. " (page 2). These reasons were given: (1) such a department would be small; (2) education will be an area of relative stability as compared with such fields as energy, health care, and income maintenance; (3) creation of such a department would imply that the Federal Government is assuming basic responsibility for education; and, (4) a department of this kind might give more attention to elementary and secondary education than to higher education.

'Rufus Miles, Jr., A Cabinet Department of Education, monograph published by the American Council on Education, 1976, Wash., D.C.

CONCLUSIONS

This report considers in depth the considerations bearing upon transfer of all or part of the Science Education Directorate of the National Science Foundation to the new Department of Education as proposed by Senator Pen's S. 991. Representatives of the scientific and the academic communities have been skeptical about the wisdom of transferring any of the functions of the Directorate; OMB and the White House have supported transfer of ,those functions that are not closely linked to graduate training and research.

This analysis suggests that the wisdom of transferring each program within the NSF Science Education Directorate be evaluated separately, and the criteria suggested are:

1. How important is building up the new department versus maintaining successfully operating programs?
2. How will the goal of the program be affected by being housed in the new department?
3. What is the present quality and effectiveness of the programs versus their potential increased or decreased performance in a new setting?
4. What are the political and administrative considerations involved with transfer and subsequent smoothness of operation?
5. How important is the continued involvement of the scientific community?

The desirability of building a new department that is comprehensive, well-rounded, and capable of forming a highly integrated educational system must be weighed against the value of pluralism—allowing educational programs to exist in a number of agencies when the educational function is closely and productively linked to other functions such as research, defense, or foreign affairs.

THE NSF SCIENCE EDUCATION DIRECTORATE PROGRAMS

Five programs in NSF's Science Education Directorate must be considered. OMB'S plan would transfer $56.3 million of NSF's fiscal year 1979 budget of $77.6.

Advanced Scientific Training, Minorities, Women, and the Handicapped in Science

This program constitutes 25 percent of the Science Education Directorate's budget. It can be argued that there is no more reason to transfer this program than to transfer the analogous program at the National Institutes of Health. It is likely that such functions would be more efficiently performed by NSF—the agency involved in research and advanced training. Most informed observers agree. The OMB plan does not suggest that this program be moved.

Science and Society

This program has several components, all aimed at increasing the public's understanding of science. Most of these efforts are aimed at informal education of all age groups outside of school. However, formal education is also supported. The informal education function could be considered the responsibility of NSF and not appropriate to a department concerned with education rather than science. The administration proposal recommends that the program should be split, with formal educational activities moving to the new department. NSF contends strongly that it should be deeply involved with the social effects of science and that transfer would weaken both programs by taking them out of a scientific environment.

Science Education Research and Development

This R&D function is aimed at understanding the learning process. This is clearly within the purposes of the new department and would increase its knowledge and expertise in the area. Ideally this topic would be studied in depth and results widely disseminated. At present this is a high-quality program and transfer might undermine the strong professional support that now characterizes the program. Diversity of approach to this important problem is encouraged by support through NSF. The National Institute of Education would be enhanced by this NSF project but it would lose the prestige and strength of NSF

oversight. The administration proposes transfer in order to build a coherent new structure.

Faculty Improvement

Because this is a faculty improvement program not related to research or graduate training, it is a strong candidate for transfer. NSF fears that improvement of the capacity of teachers to teach science would be weakened and that the broad institutional base of the program productively balances the properly elitist base of the NSF research program.

Institutional Support to Upgrade Undergraduate Science Teaching

This program could logically be transferred because of its remoteness from the central research and graduate education mission of NSF. Transfer of the five subareas (1) assistance to undergraduate science education; (2) minority institutions; (3) science improvement; (4) undergraduate instructional improvement; and (5) resource centers for science and engineering would strengthen the new department's higher education division. The effectiveness of the program might decline if it were taken out of a setting where broad participation of scientists is assured,

IS POSTPONEMENT THE COURSE?

No one knows precisely what transition problems a new department would face, but they will be severe. No one can assess how well it will work or its importance in higher education. For these reasons it has been suggested that no functions should be transferred from NSF until the proposed Department of Education has been established and takes definite shape. The wisdom of transfers could then be more firmly assessed. The transfer of the National Endowment on the Arts and Humanities has been postponed on this basis. The argument is equally valid for the NSF functions.

ANALYTIC AND RESEARCH FUNCTIONS

Three kinds of analytic and research functions should be performed by a new department: (1) collection and analysis of educational statistics; (2) administrative research; and (3) research on education. The National Center for Educational Statistics in HEW should be transferred, fortified, and made to report directly to the appropriate Assistant Secretary. Administrative efficiency could be improved through an analytic and research function reporting directly to an Assistant Secretary for Administrative and Management Policy. Finally, HEW's National Institute of Education now conducts research on education and it should be a part of the new department.