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ABSTRACT

Ways in which the nation's schools could make economies, without sacrificing the quality of education, were investigated. Opportunities to achieve economies were identified in three broad areas: (1) The instruction of pupils, including the utilization of teachers and other professional instructional personnel; (2) The delivery of administrative support services, including pupil transportation, food services, operation and maintenance of physical plant, and others; and (3) The construction and utilization of school facilities. This report describes cost-saving opportunities in each area, reviews their applicability to particular sizes or kinds of school districts, and makes estimates of their potential to reduce, or at least slow, the rise in overall national educational costs. (For related document, see ED 058 473.)  
(Author/DB)

ED 058 500

# Economies in Education

Prepared by  
CRESAP, McCORMICK AND PAGET, INC.



Submitted to The President's Commission on School Finance

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THIS IS ONE OF SEVERAL REPORTS PREPARED FOR THIS COMMISSION. TO AID IN OUR DELIBERATIONS, WE HAVE SOUGHT THE BEST QUALIFIED PEOPLE AND INSTITUTIONS TO CONDUCT THE MANY STUDY PROJECTS RELATING TO OUR BROAD MANDATE. COMMISSION STAFF MEMBERS HAVE ALSO PREPARED CERTAIN REPORTS.

WE ARE PUBLISHING THEM ALL SO THAT OTHERS MAY HAVE ACCESS TO THE SAME COMPREHENSIVE ANALYSIS OF THESE SUBJECTS THAT THE COMMISSION SOUGHT TO OBTAIN. IN OUR OWN FINAL REPORT WE WILL NOT BE ABLE TO ADDRESS IN DETAIL EVERY ASPECT OF EACH AREA STUDIED. BUT THOSE WHO SEEK ADDITIONAL INSIGHTS INTO THE COMPLEX PROBLEMS OF EDUCATION IN GENERAL AND SCHOOL FINANCE IN PARTICULAR WILL FIND MUCH CONTAINED IN THESE PROJECT REPORTS.

WE HAVE FOUND MUCH OF VALUE IN THEM FOR OUR OWN DELIBERATIONS. THE FACT THAT WE ARE NOW PUBLISHING THEM, HOWEVER, SHOULD IN NO SENSE BE VIEWED AS ENDORSEMENT OF ANY OR ALL OF THEIR FINDINGS AND CONCLUSIONS. THE COMMISSION HAS REVIEWED THIS REPORT AND THE OTHERS BUT HAS DRAWN ITS OWN CONCLUSIONS AND WILL OFFER ITS OWN RECOMMENDATIONS. THE FINAL REPORT OF THE COMMISSION MAY WELL BE AT VARIANCE WITH OR IN OPPOSITION TO VIEWS AND RECOMMENDATIONS CONTAINED IN THIS AND OTHER PROJECT REPORTS.

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**ECONOMIES IN EDUCATION**

**A Report For The President's  
Commission on School Finance**

**Cresap, McCormick and Paget, Inc.**

**New York, New York**

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November 30, 1971

Mr. Norman Karsh  
Executive Director  
The President's Commission  
on School Finance  
1010 Sixteenth Street, N. W.  
Washington, D. C. 20036

Dear Mr. Karsh:

We are pleased to submit our report on economies in education. Our charge was to identify means by which school systems could reduce expenditures without sacrifice in the quality of education. We have identified opportunities, each the subject of a separate part of this report, in three major areas, as follows:

- Utilization of instructional personnel
- Purchasing and support services
- Construction and utilization of school facilities.

If implemented nationally, the proposed measures in this report would result in overall savings of more than 11 per cent, compared to expenditures during 1970-71, the year selected as the base, for analytical purposes. The amount saved would exceed \$5 billion.

The proposed measures are all in use in some schools, are compatible with the existing structure of education, and are consistent with sound educational trends. Nevertheless, their implementation would require major attitudinal and procedural changes, and significant commitment by educational agencies at local, state and federal levels.

It is probable that many of the measures proposed could only be implemented over an extended period of time, and accordingly the effect of their adoption would lessen the rise in educational costs rather than provide outright cost

Mr. Norman Karsh

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November 30, 1971

reduction. During the decade of the 1960's while enrollments increased 26 per cent, school expenditures measured in constant dollars more than doubled - far outstripping the growth rate of the nation's economy. The proposals of this report are intended to present means for maintaining and improving the quality of education while restricting cost increases to a rate that society is able and willing to pay.

It has been a pleasure to serve the Commission, and we appreciate the cooperation and support provided by its staff. We would be pleased to furnish further clarification or interpretation of the findings and conclusions of this report as may be desired.

Very truly yours,

*Cresap, McCormick and Paget Inc.*

CRESAP, McCORMICK and PAGET Inc.

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THE PRESIDENT'S COMMISSION ON SCHOOL FINANCE

ECONOMIES IN EDUCATION

PART A

INTRODUCTION AND SUMMARY

THE PRESIDENT COMMISSION ON SCHOOL FINANCE

ECONOMIES IN EDUCATION

PART A

INTRODUCTION AND SUMMARY

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## PART A

### I - INTRODUCTION

In the ten years from 1960 to 1970, the cost of operating the nation's public schools increased almost three times - from less than \$14 billion to more than \$38 billion. Part of the rise was caused by a 26 per cent increase in student enrollment, and part by a decline in the value of the dollar. However, school costs grew much faster than enrollment and general economic inflation. Over these ten years, expenditures per pupil measured in constant value dollars, rose 66 per cent.

During the decade, school costs grew more than twice as fast as the gross national product. Some of the effects of this rapid rise are being seen in rejections of school budgets, tax levies and bond issues. At some point, the rising costs of education will need to be brought more closely in line with the trend of the nation's economy; ways must be found to maintain and improve the quality of education at a price that society is able and willing to pay.

#### OBJECTIVES AND SCOPE OF WORK

It is against this background that the President's Commission on School Finance asked Cresap, McCormick and Paget Inc. (CMP) to investigate ways in which the nation's schools could make economies, without sacrificing the quality of education.

The task of CMP was to identify innovations and practical improvements that could be implemented within the present structure of education. It may be possible to design new forms of education, such as closing the schools and utilizing computers and television, which would show drastic reduction in costs, or increase in cost effectiveness. This study, however, was concerned with economy measures which - although they may be difficult to attain - are essentially compatible with the existing structure of education.

Opportunities to achieve economies were identified in three broad areas:

- The instruction of pupils, including the utilization of teachers and other professional instructional personnel

- The delivery of administrative support services, including pupil transportation, food services, operation and maintenance of physical plant, and others
- The construction and utilization of school facilities.

This report describes cost-saving opportunities in each area, reviews their applicability to particular sizes or kinds of school districts, and makes estimates of their potential to reduce - or at least slow the rise - in overall national educational costs.

#### METHODS OF STUDY

In carrying out the study, CMP examined innovative practices being used in pioneering school districts, reviewed the findings of prior research studies and conceptualized new opportunities for cost savings. The study did not include the conduct of original research in the sense of setting up experimental situations and observing the results, or conducting mass mail surveys of school districts.

The following steps of work were carried out, which are explained further in Appendix A-1, included in a separate volume.

- Information was obtained from individual school districts, listed in Appendix A-1, by personal visits and telephone conversations with district officials.
- Data were obtained from national and state educational organizations through visits and telephone conversations, including several divisions of the United States Office of Education (USOE), the National Education Association, Association of School Business Officers, and several state education departments and state commissions.
- Meetings were held with many other sources of pertinent information, including representatives of university schools of education, firms engaged in performance contracts, local government officials, architectural firms, foundations, real estate management corporations, educational consulting organizations, industrial trade associations and educational and professional publications.

- Prior experience of CMP in conducting management studies for more than 200 school districts was reviewed, and pertinent reports were examined.
- A literature search was conducted, and relevant research papers were identified and reviewed.
- Educational statistical data were obtained from USOE and other sources and analyzed.

### SCHOOL COST STRUCTURE

A detailed study was made of school cost data, to identify areas that offer promise for cost reduction, and to estimate the effect on costs of particular economy measures. The school year 1970-71 was selected as the base year for analysis and comparison.

USOE estimated 1970-71 expenditures for public elementary and secondary schools at \$44.4 billion, allocated as follows:

	<u>Expenditures(a)</u> (Billions)
Current expenditures for elementary and secondary day schools	\$36.5
Current expenditures for other programs including summer schools, adult education, community services, etc.	1.6
Interest on debt incurred in prior years	1.3
Capital outlays for school land, buildings and equipment	<u>5.1</u>
Total	\$44.4

(a) Totals may not add because of rounding.

It was necessary to subdivide the foregoing expenditures into more detailed expense categories, for which USOE had not developed data at the time of this study. Accordingly, USOE reports for prior years were analyzed, and the data updated to develop estimates of 1970-71 expenditures by category.

For purposes of this report, the resulting estimates of 1970-71 expenditures were grouped in categories, as shown in Exhibit I-1, which follows.

The expenditures were for the payment of employees salaries, the purchase of supplies and equipment and other purposes. By analyzing national data and budgets of representative school districts, CMP estimated the amounts spent for various purposes, as indicated in Exhibit I-2.

The figures represent net expenditures and do not include money spent by school districts for food and food service salaries, which were reimbursed by the sale of school lunches. Reimbursed expenditures are discussed in Part C of this report.

The economy measures proposed in this report are calculated on the basis of the foregoing 1970-71 base year figures, and estimates of cost savings are made in comparison with 1970-71 expenditures. An exception to this is that economies in school construction, discussed in Part D of this report, are related to projections of school construction made by USOE for the 1970's.

Since opportunities for school districts to make savings depend to a certain extent on the size of the district, CMP also made estimates of expenditures of school districts in six size categories according to total enrollment. This was accomplished by examining detailed USOE breakdowns of expenditures for prior school years, and adjusting them to reflect higher 1970-71 disbursements and changes in the number of districts in each category.

#### ARRANGEMENT OF THIS REPORT

This report is divided into four major parts, as follows:

- Part A - Introduction And Summary includes this introductory chapter, and succeeding chapters summarizing the remaining major sections of the report.
- Part B - Utilization Of Instructional Personnel describes opportunities to achieve economies through more effective utilization of classroom teachers and other instructional personnel.
- Part C - Purchasing And Support Services review measures for purchasing supplies and equipment more economically, and for better utilizing personnel concerned with plant operations and maintenance, pupil transportation, health services and food services.

PART A  
EXHIBIT I-1

ESTIMATES OR EXPENDITURES, BY CATEGORY  
1970-71

(Billions Of Dollars)

	<u>Expenditures(a)</u>
<b>Instruction</b>	
Salaries of teachers and other instructional personnel	\$22.6
Books, equipment and other instructional expenses	<u>2.5</u>
Subtotal	<u>\$25.1</u>
<b>Support Services</b>	
Operation of plant	\$ 2.9
Maintenance of plant	1.1
Pupil transportation services	1.4
Health services	0.3
Food services, net	0.5
Subtotal	<u>\$ 6.3</u>
<b>Other Operating Expenses</b>	
Administration and miscellaneous services	\$ 2.7
Current expenditures for other programs	1.6
Fixed charges for employee retirement funds, rent, etc.	2.3
Interest on debt	1.3
Subtotal	<u>\$ 7.9</u>
<b>Capital Outlays</b>	
School land and buildings	\$ 4.2
Capital equipment	0.9
Subtotal	<u>\$ 5.1</u>
<b>Total net expenditures</b>	<u><u>\$44.4</u></u>

(a) Totals may not add because of rounding.

PART A  
EXHIBIT I-2

ESTIMATES OF EXPENDITURES, BY PURPOSE  
1970-71

(Billions Of Dollars)

	<u>Expenditures(a)</u>
Salaries	
Classroom teachers	\$19. 5
Principals, supervisors and other instructional personnel	3. 1
Clerical, service and district administrative personnel	<u>7. 8</u>
Subtotal	<u>\$28. 4</u>
Purchases Of Supplies And Equipment	<u>\$ 5. 0</u>
Other Expenditures	
Contracted services for plant maintenance, transportation, health services	\$ 1. 0
Fixed charges	2. 3
Interest on debt	1. 3
Telephone, travel, postage, other	2. 2
Construction of school buildings	<u>4. 2</u>
Subtotal	<u>\$11. 0</u>
Total net expenditures	<u>\$44. 4</u>

(a) Totals may not add because of rounding.

Part D - Construction And Utilization Of School Plant discusses means by which capital outlays for school construction, and financing costs, could be reduced.

A separately bound volume contains appendixes referred to in this report.

## PART A

### II - SUMMARY

This chapter summarizes findings and conclusions on opportunities for school systems to achieve economies. The chapter is divided into six sections, as follows:

- Utilization of instructional personnel
- Purchasing of supplies and equipment
- Delivery of support services
- Construction and utilization of school facilities
- Summary of potential cost savings
- Implementation considerations.

#### UTILIZATION OF INSTRUCTIONAL PERSONNEL

Salaries of classroom teachers and other instructional personnel - principals, librarians, guidance counselors - represent more than half of total school costs. Only by making more effective use of instructional personnel can significant economies in overall school costs be achieved without weakening educational quality.

Salary costs are a function of salary levels and numbers of instructional staff in relation to number of pupils. It is not feasible or desirable to suggest that salary levels be reduced, and accordingly attention was focused on opportunities to make economies through revisions in proportionate relations among numbers of instructional personnel and pupils.

#### Class Size And Pupil/Staff Ratios

Over the years, the number of pupils per class has been declining, and with it the ratio of pupils to teachers. This, along with the rise in teachers' salaries, has been a major factor in the growth of educational costs. Teachers, school administrators and parents have generally favored smaller classes

on the grounds that this improves the quality of education. However, many research studies have been carried out on the relative effectiveness of class sizes in a range of approximately 10 to 35 pupils, and there has been no consistent finding that indicate a correlation between class size and pupil achievement, as measured by performance on standard tests.

Some researchers have concluded that the most important factor is the size of the total instructional staff in relation to the number of pupils, and that a teacher supported by paraprofessional aides can effectively teach larger groups of children. In this view - which many teachers argue against - the pupil/staff ratio is more important than the pupil/teacher ratio.

### Differentiated Staffing

A new approach to the long-debated subject of pupil/teacher ratios is provided in differentiated staffing which is now in use in a number of school districts throughout the country. Under this arrangement, the instructional group includes:

- Staff teachers who teach in teams, using techniques of individualized instruction
- Associate or beginning teachers who work under the supervision of experienced teachers
- Teacher aides who assist in both clerical and some instructional tasks
- Senior teachers who supervise staff teachers and participate in teaching teams
- Master teachers who also have district-level responsibilities for curriculum development.

Differentiated staffing has been developed along with a number of related educational innovations. It is often used with the open-classroom approach, in which instruction is individualized and each pupil proceeds at his own pace, studying learning materials, which are prescribed according to his level of advancement. Under this arrangement, the teacher becomes more a manager of the learning process and less a dispenser of facts - which many educators believe can be done as well or better by books, programmed texts, films and television.

In some schools, the introduction of differentiated staffing has raised district instructional salary costs because master and senior teachers are paid well over average teacher salary rates. However, plans that reduce total salary costs can be prepared. For instance, the teachers at Walnut Hills Elementary School in Denver developed a differentiated plan that has decreased instructional salary costs by 22 per cent. The size of the instructional staff was increased, but the use of team teaching and teacher aides made possible a reduction in the number of higher-paid positions.

### Model Differentiated Staffing Plans

CMP believes that differentiated staffing, used in conjunction with other innovative improvements in educational methods, presents an opportunity to reduce costs while maintaining or improving quality. For purposes of illustration and cost comparison, CMP developed staffing models for six typical sizes of elementary schools and five sizes of high schools.

The proposed models would increase the pupil/teacher ratio to 36:1 but would decrease the pupil/staff ratio to under 17:1, by providing teacher aides equal to the number of teachers. These ratios are comparable with those of schools now using differentiated staffing, and those using performance contracting - an approach that also makes extensive use of teacher aides and individualized instruction.

Under the proposed differentiated staffing program, just over half the teachers would have the rank of staff teacher, about 22 per cent, associate teachers, and the balance, senior and master teachers. To develop cost comparisons, the following average salary levels were suggested: associate teachers, \$7,533; staff teachers, \$8,890; senior teachers, \$11,300; and master teachers, \$13,000.

These levels would result in an average teacher salary figure equivalent to the 1970-71 national average. Actual salary levels would vary among different areas as they do now.

USOE furnishes data on school districts in each of six different enrollment size categories: over 25,000; 10,000 to 24,999; 5,000 to 9,999; 2,500 to 4,999; 300 to 2,499; and under 300.

CMP does not consider differentiated staffing feasible for districts with fewer than 300 pupils; but the plan was applied to the statistically average district in each of the other five size categories, by estimating the approximate number of schools of each size in each average district. The resulting cost was then calculated.

Detailed analyses of present salary costs and staffing had been made for the average district in each size category, and costs of present and differentiated staffing were compared. This revealed that adoption of differentiated staffing on a national basis offers a potential for reducing instructional salary costs by approximately 12 per cent. Compared to 1970-71 expenditures, this would amount to a saving of \$2.6 billion.

#### Responsibility For Coordination And Curriculum Development

Part of the saving that could be achieved under differentiated staffing would be brought about by senior and master teachers assuming some duties now carried out by supervisors, most of which are at the district office level. By assigning greater responsibility for grade level and subject area coordination to senior and master teachers, it is estimated that an average of approximately one supervisor would be needed for each 3,000 pupils, which would result in a 50 per cent reduction in the number of district level supervisors.

The foregoing would be facilitated if schools avoided unnecessary redesign of curriculum and instruction materials, and made greater use of curriculum advisory services and materials already available from universities, commercial publishers and other sources. CMP estimates that more than \$200 million of total salary cost is used for redesign of curriculum and instructional materials by individual districts and often this amounts to reinventing materials which already exist.

#### Substitute Teaching

Part of the projected savings potential would also result from reducing the use of substitute teachers which now costs almost half a billion dollars per year and which many educators believe is ineffective. Under the differentiated staffing plan, teachers would work in teams, and short-term teacher absences would be accommodated by assigning pupils to other team members, supervisors and teacher aides. Principals would also serve occasionally as substitutes to maintain effective relationships with teachers and pupils.

#### Instructional Technology

A review was made of research findings on opportunities to lessen educational costs through greater use of television, computers and other technological developments. Definitive cost data are lacking but it does not appear that the use of instructional technology in itself holds promise for cost reduction (unless a massive restructuring of the form of education is hypothesized). However, the use of new learning materials improves the capability of a differentiated teaching staff to individualize instruction. Thus, in this sense, instructional technology can contribute to cost reduction.

### Performance Contracting

Similar conclusions were reached regarding performance contracting - a new educational arrangement under which a school contracts with an outside organization, or its own teaching staff, to raise pupil achievement levels by specified amounts. Contractor compensation is related to the level of pupil performance. On the basis of data now available, it does not appear to CMP that performance contracting offers promise for large-scale cost reduction, or that the use of outside organizations is a feasible means of teaching in most of the nation's school systems. However, performance contractors are introducing learning modes that are consistent with the proposed differentiated staffing plans. School districts could develop internal performance contracts with their own staffs which could enhance educational effectiveness.

### Senior Option Plan

Further opportunities for economy would be presented by broad-scale adoption of senior option plans now in use in some high schools. Under this arrangement, seniors who have earned needed credits for graduation spend one semester in independent study, research or relevant work experience. One teacher can supervise a large number of students, and CMP calculates that if half the nation's seniors participated in the plan for one semester, the annual savings would exceed \$200 million compared to 1970-71 expenditures.

### Driver Education

Additional savings could be realized by changes in driver-education programs, which are now offered to about two thirds of eligible students. In the traditional method of driver education, one instructor works with a group of four students in the laboratory or in-car phase of the program. Some schools are now using a new simulator method, in which part of the student's training is taken in a machine that simulates actual driving conditions. This method enables the instructors to serve a larger group of students. Many educators and safety experts consider it the most effective training method. Its adoption nationally could reduce driver-training costs by approximately 25 per cent, or an estimated \$62 million, on the basis of 1970-71 costs.

\* \* \* \* \*

The combined effect of the foregoing measures would be to decrease instructional salary costs by approximately 13 per cent, or \$2.9 billion, compared to 1970-71 costs. This potential saving would also permit an equivalent reduction in payments to retirement funds of instructional personnel, which would amount to just under \$200 million.

## PURCHASING OF SUPPLIES AND EQUIPMENT

Based on analysis of 1970-71 expenditures, CMP estimates that schools allocated 11 per cent for purchase of supplies and equipment, which were used for instruction, operation and maintenance of plant, transportation of pupils and other purposes. Total volume of purchases was just over \$5 million, not including expenditures for food, new buildings, and contractor services which are discussed later in this summary.

A review of school district purchasing practices indicates significant opportunities for improvement. Detailed studies of New York and Massachusetts revealed that many of their school districts fail to utilize basic purchasing practices needed to assure economies. Data from these and other states indicate that prices paid for similar items vary substantially, and that school districts can reduce purchasing costs by initiating arrangements and procedures that will assure procurement of the correct items, in the most economical quantities and at favorable prices.

### Centralized Purchasing

The major opportunity for economy is in centralizing responsibility in professionally managed departments that can buy in volume and take advantage of lower prices. In larger districts, responsibility for purchasing should be centralized at the district office level under professional management. To achieve significant economies, smaller districts need to enter into centralized cooperative buying arrangements with other districts.

Under centralized purchasing, favorable prices are achieved by a combination of procedures, as follows:

- Agreement is reached among participating units on grades of items to be purchased. Standardized specifications are prepared.
- Requisitions from units are grouped, and purchase orders are consolidated.
- Competitive bids are taken from a maximum number of qualified vendors; or favorable terms are negotiated with those best qualified.
- Invoices are paid promptly to take advantage of cash discounts.
- Contracts for one year or other extended periods are negotiated for purchase and shipment of items used in volume.

Price is just one element in the total cost of procurement. Efficient programs minimize overall costs through other related practices, as follows:

- Procurement is planned in annual cycles to equalize the workload and avoid shipping delays, stock shortages and peaks in receipt of deliveries. For each category of items to be bought, dates are established for submission of requisitions, advertising for bids, award of contracts and receipt of shipments from vendors.
- Determination is made of items and quantities to be stocked, based on analysis of relative costs of warehouse storage, compared to direct shipment by vendors to participating schools.
- Item usage rates are analyzed and needs projected for the ensuing year. Stock levels, reorder points and economic order quantities are determined.
- Purchasing policies are defined, approved by the board of education and set forth in a written purchasing manual.

### Systems Contracting

An effective purchasing innovation, which incorporates many of the foregoing practices, is systems contracting. This approach was developed in industry and is applicable to school districts as a means for simplifying the purchase of high-volume supplies and lower-cost equipment items. The central purchasing department negotiates annual contracts with selected vendors that agree to maintain needed stock levels in their own warehouses. Individual schools or departments are empowered to issue requisitions directly to vendors against the contracts, which greatly reduces paper work in the purchasing department. Certain items are shipped directly to the schools, which saves in district warehousing costs.

Forms of systems contracting are in use in some school districts. It is distinct from the traditional decentralized purchasing arrangement in that contracts are negotiated districtwide on the basis of careful analysis of product usage rates. The National Association of Purchasing Management estimates savings of more than 20 per cent for industrial companies using this approach. Savings for school districts are calculated by CMP to range from 15 to 20 per cent - less than in industry because school accounting does not consider the cost of capital to finance inventories as an expense item.

### Large District Practice

Large districts have a particular opportunity to achieve economies through adoption of effective purchasing practices. A good example is the Dade County school system, a consolidated countywide district that enrolls about 250,000 pupils. Special features of the system are:

- Appointment of purchasing committees, which include product users, to develop specifications for each item or product category purchased, and to evaluate available brands and select grades to be purchased
- Systematic analysis of shipping and warehouse costs. Tight control of shipments and stocks, on the basis of accurate usage data for each item category
- Systematic evaluation of vendor performance
- Maximum use of competitive bidding, planned purchasing cycles, yearly contracts, and consolidation of purchase orders.

The chief business manager for the Dade County system estimates that, as a result of purchasing on a countywide basis, using systematic purchasing procedures and practices, overall purchasing expenditures are approximately 20 per cent less than under a decentralized system, in which each community district would purchase independently. A similar estimate of cost reduction was made by the purchasing director of Duval County, another Florida consolidated school district that is developing advanced purchasing systems.

### Cooperative Purchasing

The primary opportunity for smaller school districts to achieve economies in purchasing is to join in cooperative arrangements with nearby districts, or other governmental units. Some examples follow.

- In the Chicago suburban area, 17 districts cooperated in the purchase of instructional, art and duplicating supplies, with annual savings of 8 per cent, compared to three nearby districts that purchased independently.
- The Bergen County, New Jersey school districts have formed a cooperative unit which a study indicates will reduce costs by \$500,000 annually (estimated by CMP at 10 to 15 per cent), if maximum use is made of joint purchasing opportunities.

- The Council of Governments, which includes 24 jurisdictions in the Washington, D. C. area, has identified many items, for which the cost will be decreased by cooperative buying; for example, the annual cost of fuel would be reduced \$250,000.

An additional means by which smaller school districts can participate in volume purchasing is through contracts negotiated with vendors by state agencies. It appears that substantially greater use should be made of existing contracts in some states, and furthermore that state contracts should include a wider range of items. For instance, some states have concluded that costs of buses could be reduced by statewide adoption of standardized models.

\* \* \* \* \*

Potentials to achieve economies vary among districts according to district size, opportunity to join cooperative purchasing groups and the efficiency of the existing system. Overall, CMP estimates that adoption by all applicable districts of the proposed measures would reduce expenditures for supply items by 15 per cent, and disbursements for equipment items and books by lesser proportions. The overall reduction would amount to just over 10 per cent, or more than \$500 million, compared to 1970-71 expenditures.

#### DELIVERY OF SUPPORT SERVICES

CMP calculates that expenditures for operation and maintenance of school plant, pupil transportation services and health services were just over \$4 billion in 1970-71, exclusive of supply and equipment purchases previously described. Additional disbursements were made for food service operations, as described later in this section.

More than 70 per cent of the \$4 billion in disbursements was used to pay salaries of custodians, bus drivers, school nurses, carpenters and other support personnel, with most of the balance used for fees to transportation and building maintenance contractors.

Small but worthwhile economies can be achieved in support services - especially in larger districts - by improving the utilization of personnel. This is brought about primarily by adoption of systematic management and control programs based on operational studies and analyses.

### Operation Of Plant

This function includes cleaning of buildings, care of grounds, operation of mechanical equipment, and minor maintenance and repair work done by school custodians and operating engineers.

A key requirement in making the most effective use of custodians - whose salaries are the chief element in plant operating costs - is the use of systematic means for determining the number of custodians needed per building. The New York State Education Department, as an example, has developed formulas that relate custodian needs to building area, enrollment and number of teaching stations. Application of the formulas to school districts revealed wide variations in the number of custodians assigned in relation to need, and some districts were able to reduce custodial costs up to 15 per cent.

Well-managed plant operations programs utilize custodial manuals that set forth custodian duties, standards for cleaning and maintenance, and approved procedures. Individual custodians are assigned clearly stated responsibility for particular areas of buildings and grounds. Buildings are inspected periodically by the principal and head custodian.

### Maintenance Of Plant

This function is closely related to plant operations, since custodians normally carry out minor maintenance jobs, as well as cleaning duties. More extensive maintenance is done by skilled building trades personnel, either on district staff payrolls or through hiring of outside contractors. CMP calculates that a little more than \$1 billion was expended in 1970-71 for salary payments to district staff maintenance personnel and fees to contractors. Opportunities for economies are in the following:

- Systematic analyses of work volume to decide the number and types of skilled trade workers who should be maintained on the district staff
- Installation of a preventive maintenance program to equalize workloads and to give better care to machinery and equipment; use of detailed schedules for inspection, cleaning, lubrication, parts replacement
- Systematic project control and schedule program, utilizing formal work request methods, work order forms and estimating procedures for larger jobs.

### Pupil Transportation Services

Approximately 70 per cent of all pupil transportation services are furnished by district-owned vehicles, and the balance through contracted transportation companies. The relative costs of district-owned and contracted services depend on local conditions and should be analyzed individually by school districts.

Innovative means are being developed to improve use of personnel and equipment and reduce costs. Computer-based programs can be used to select the most efficient bus routes, and in one district this method reduced driver and operating costs by 12 per cent. Some districts use two-way radios in buses to speed up schedules. Large districts maintain equipment records in computers to control operating and repair costs.

### Health Services

The chief component in health services expenditures is the salaries of school nurses, who are employed by about one third of all school districts. Studies reveal that nurses assigned to individual schools spend most of their time doing tasks that could be performed by clerical staff members with some first-aid training. Salary costs of these districts can be decreased by assigning nurses only at the district office level, who would be responsible for coordinating districtwide health programs, such as mass inoculations, student physical examinations and arrangements for services of physicians and dentists.

An alternate approach used in many districts is to contract with local public health agencies for nursing services on a part-time basis.

\* \* \* \* \*

Opportunities to achieve savings in plant maintenance and operation, pupil transportation and health services vary widely according to district size, efficiency of present operations, levels of service provided and use of outside contractors. Overall, the potential for savings is more limited than in other functions, and it is calculated that the average school district could reduce costs by 5 per cent, which would amount to \$200 million compared to 1970-71 total net expenditures.

## Food Services

Besides the total net expenditures of \$44.4 billion in 1970-71, schools spent \$1.7 billion to buy food and pay salaries of food service personnel - an amount reimbursed by receipts from the sale of school lunches. (Schools also spent about \$0.5 billion on food service supplies and equipment, which was not reimbursed by receipts, and is included in the \$44.4 billion total net expenditures.)

Most schools that offer school lunch services maintain their own kitchens. A more economical arrangement, used by some districts, is a central kitchen in which packaged refrigerated lunches are prepared, then delivered daily to schools.

Compared to in-school kitchens, the decentralized arrangement reduces labor costs, saves on food cost by facilitating bulk purchases and better portion control, and decreases capital outlays for kitchen and lunchroom equipment. The New York City schools estimate the labor savings at 40 per cent. Five of six food service directors, which were surveyed, reported that the decentralized arrangement was the most economical, with costs per lunch at about \$0.42. A cost analysis of packaged lunches, sponsored by the University of Chicago, estimated 18 per cent lower costs for lunches prepared in a central kitchen with daily production capacity of 5,000 lunches compared with a 1,000-unit in-school kitchen.

CMP estimates that the centralized kitchen arrangement is most suitable for districts with enrollments of 2,500 or more, for which reimbursed expenditures in 1970-71 are estimated at about \$1.4 billion. It appears that this figure could be decreased at least 15 per cent, or \$205 million, by use of central kitchens.

The loss on food service operations, or net food service disbursements, in 1970-71 is calculated at \$529 million. Assuming that receipts from the sale of lunches would continue at prevailing levels, the effect of decreasing food and labor costs would offer a potential for reducing net expenditures by \$205 million.

## CONSTRUCTION AND UTILIZATION OF SCHOOL FACILITIES

Heretofore, potentials for cost reduction have been compared with 1970-71 expenditures. This section estimates potential savings in school construction that are related to future projections of capital outlays for school land and buildings.

USOE projects that during the decade of the 1970's, annual capital outlays for new schools will amount to just over \$4 billion, and that this will provide schools with a capacity of 70,000 instructional rooms. Three related approaches for saving on capital outlays are described in this section:

- Reducing the number of new rooms needed by utilizing existing schools more fully
- Reducing the size of new schools built by better planning procedures
- Reducing the costs per square foot of constructing new schools.

Also discussed are means for transferring a portion of capital needs for school construction to nonschool sources, and for reducing the costs of financing.

#### Avoiding The Need For New Construction

Needs for new schools can be lessened in some districts by using present school buildings more effectively. The greatest gain is achieved by adoption of the Extended School Year (ESY), in which schools are in session on a year-round basis, with shutdowns during holiday seasons only and for maintenance.

Reportedly, about 100 districts are now using some form of ESY and another 1,000 are considering it. One of the more publicized versions is the 9-3 or 45-15 plan, under which students are divided into four groups, each attending school for nine weeks and then having a three-week vacation. Thus, three fourths of the pupils are in school at any one time. The effect is to increase the capacity of the existing plant by as much as one third.

Experience of Valley View District Number 96 in Lockport, Illinois, is illustrative. This rapidly growing district adopted a 45-15 plan in June 1970, which immediately raised the capacity of six elementary schools by a full 33 per cent - in effect converting 180 classrooms to the equivalent of 240. Capacity of the junior high school was raised by a lesser amount - 26 per cent. The plan is working well and, in July 1972, will be adopted by the high school. Because of its fast growth, the district still needs new schools, but they, too, will operate on ESY and, accordingly, will be built smaller than if traditional schedules were to be used.

Adoption of ESY would eliminate or greatly reduce needed new construction by districts requiring additional capacity or replacement for old and outmoded buildings, and, accordingly, would drastically reduce national new construction needs. However, ESY is usually resisted by parents and other groups and it is not reasonable to expect that most districts needing new capacity will elect it.

Other methods that are available to increase capacity of existing schools - although usually by lesser amounts - are as follows:

- Improved scheduling of high school classrooms by use of computers
- Extending the school day by one or two periods (the use of double sessions is regarded as an emergency expedient to be avoided by better planning of needs)
- Remodeling of space to better match room and class sizes; conversion of "egg crate" schools to open-plan design which may increase effective capacity, as well as facilitate adoption of modern instructional approaches
- Providing necessary "balancing space" by renting and converting existing nearby facilities, or obtaining free space in churches or other buildings.

CMP estimates that each year during this decade about 10 per cent of all school districts will plan to build new schools. If these districts increase the effective capacity of their existing schools by an average of only 4 to 5 per cent, it is calculated that needs for new school capacity would be reduced 10 per cent.

#### Reducing The Volume Of New Construction

The volume of new construction needed could be further decreased by improving the planning of new schools. Many, if not most, school districts fail to develop master plans based on reasonably accurate enrollment projections, and school planners are insufficiently precise in relating enrollment demand to the size of new schools needed. The most obvious result of weak planning is overcrowded schools; however, detailed analyses by CMP and others reveal that many schools are overbuilt in relation to foreseeable need.

A common problem is failure to use sound planning standards to determine accurately the kinds and amounts of space needed. Analysis of new schools built recently in New York State, for example, revealed variation in square footage per pupil of up to 50 per cent for elementary schools and even more for high schools. Schools in poorer districts tend to be underbuilt in relation to need and overbuilt in richer districts.

The New York State Education Department exerts some degree of control over building plans of school districts through the methods used to allocate state aid. It can be expected, therefore, that nationally wider variations can be found in pupil/space relationships in new schools.

It is evident that a significant opportunity exists to reduce the volume of new school construction by more accurately planning individual new schools. CMP estimates that the average new school could be built with 10 per cent less area, without sacrificing educational quality.

### Reducing The Cost Of New Construction

Further economies can be achieved by using design and construction methods that result in lower cost per square foot of space built, especially through use of a systems approach that incorporates the techniques of "systems building" and "fast tracking."

Under systems building, major building components - including structure and roof elements, ceiling and lighting, heating and air conditioning, partitions and cabinets - are designed on a modular basis, manufactured in factories and brought to the building site for final assembly. This method takes advantage of the inherent economies of mass production and replaces much of the expensive on-site labor with less expensive off-site labor.

The technique of fast tracking, which is particularly compatible with systems building, shortens the time between start of design and occupancy of the finished building by 25 per cent or more. In the traditional process, detailed design drawings are completed before contractors bid on the project and commence work. In fast tracking, as soon as overall layout drawings are approved, bids are taken on foundations and structure, and work begins. Meanwhile, the architects complete the final detailed design drawings. This telescoping of work steps has saved money by getting schools up faster, during a period when construction costs have been rising as much as 1 per cent per month.

The Educational Facilities Laboratory, which has spurred use of the systems approach to school building design and construction, estimates that, over the last six years, about 300 schools in the United States and Canada have been built using systems techniques, with cost savings averaging about 10 per cent compared to conventional building ones. In Florida, the systems approach has been applied to 50 school projects since 1967 and experience there is illustrative. In 1971, the average cost of Florida schools built by conventional methods was \$19.16 per square foot, compared to \$16.08 per square foot for systems-built schools - a reduction of 16 per cent. Moreover, according to a state education department official, the systems approach has provided superior schools.

It appears that the systems approach could be applied to construction of virtually all new schools. CMP concludes that it can reduce school building costs by an average of 10 per cent.

### Sharing The Cost Of New Schools

A further method for reducing capital outlays by school systems is in arranging for nonschool sources to pay for part of the costs of new schools. This has been done in some areas by sharing either part of the school site or part of the school facilities with nonschool users, who, in turn, pay a part of the cost.

Sharing school sites. The concept of site sharing, or air rights leasing, is potentially applicable in large cities where land is scarce and expensive. In New York City, an estimated 10 per cent of the new schools under construction, or planned, will be financed 100 per cent by sharing their sites with apartment houses or office buildings, built in air rights over the school. A public authority, the New York City Educational Construction Fund (ECF), was established to build schools under this arrangement. ECF buys land, erects school buildings and arranges for a developer to build in the air rights. The developer pays ECF for use of the air rights and also makes "tax equivalency" payments, equal to the taxes that would be paid on a similar commercial facility not built over a school. ECF uses this money to retire its bonds. As long as ECF income exceeds its debt service charges, the schools it builds can be considered as free to N. Y. C.

The site sharing, or air rights leasing, approach is difficult to implement and the extent to which it can be expanded in N. Y. C., and adopted in other large cities is clouded with uncertainty. CMP estimates very approximately that adoption of the concept among the nation's 15 largest cities could reduce annual capital outlays for new schools by about \$30 million during the 1970's.

Sharing school facilities. In the last few years, a number of new schools have been built as school-community centers. Certain parts of the building or complex are built essentially for school use, other areas are assigned for community use, and some facilities such as gymnasium, auditorium and cafeteria are used jointly. In the usual arrangement, financing is furnished by both the board of education and nonschool sources, such as city or county agencies, private foundations and the United States Department of Housing and Urban Development. Depending on the share of funds supplied by nonschool sources, the construction of such complexes can lessen needed capital outlays by school sources. CMP estimates that about 11 per cent of the cost of a typical

new school can be shifted to nonschool sources, if it is built as part of a school-community center, and that this offers potential for reducing capital outlays by approximately \$20 million annually during the 1970's.

\* \* \* \* \*

The combined effect of the foregoing measures would be as follows. The actual volume of new school construction would be reduced 19 per cent, and unit construction costs would be decreased 10 per cent, resulting in reduction in capital outlays for new schools from the projected level of more than \$4 billion to just under \$3 billion. About \$50 million of this amount could be absorbed by nonschool courses, leaving a balance of capital outlays at \$2,950 million - down more than \$1.1 billion from the projected level.

#### Reducing The Cost Of Financing

A reduction in capital outlays would decrease interest payments, since about 60 per cent of new school construction is financed by bond issues. Interest payments on debt incurred in prior years amounted to \$1.3 billion in 1970-71, according to USOE reports. CMP estimates that a reduction in capital outlays by the measures previously described would reduce first-year interest payments on new bond issues by about \$42 million. An estimated additional \$4 million in interest could be saved, if state education departments or other authorities took measures to have all school bonds rated "A." The resulting \$46 million first-year saving would be accumulated on a declining basis, as new bonds are issued each year, and after 12 years (assuming level capital outlays and interest rates) would amount to a decrease in annual net expenditures for interest of just under \$300 million.

#### SUMMARY OF POTENTIAL COST SAVINGS

As noted previously, the potential for reducing disbursements has been calculated in comparison with 1970-71 expenditures, except for capital outlays for new schools, for which potential savings were estimated on the basis of projected annual outlays during the 1970's.

The following table presents a summary of the potential savings that could be achieved through adoption of the proposals of this report:

<u>Expense Item</u>	<u>Cost Savings In Millions</u>
Instructional salaries	\$2,916
Employee retirement fund payments	198
Purchased supplies and equipment	505
Support services	405
Interest payments (first year)	46
Capital outlays for new schools	<u>1,117</u>
Total	\$5,187

Thus, a total potential saving of approximately \$5.2 million is envisioned. Although the figures are not strictly comparable, the potential saving represents 11.7 per cent of 1970-71 expenditures of \$44.4 billion.

As the following section describes, the measures proposed in this report would require time for implementation, and their effect would be to lessen the rise in school costs. Thus, if all the proposed measures were in full effect by say 1980, expenditures then would be 10-12 per cent less than if school spending continued in its present pattern.

#### IMPLEMENTATION CONSIDERATIONS

The measures proposed in this report are consistent with trends in sound educational practice and all are being used in some schools today. This section summarizes changes that would be involved in implementation, and governmental actions that would facilitate them.

The proposed changes in instructional methods would present the greatest challenge (as well as the greatest potential dollar savings). Teachers would need to be trained in the techniques of individualized instruction and team-teaching, under a differentiated staffing arrangement. A very large number of teacher aides would need to be recruited and trained. Teachers to be promoted to master and senior rank would need to be identified and trained in their new roles. In some districts, adoption of cost reduction measures would initially raise costs over current levels, because teachers promoted to master and senior rank would receive salary increases before the number of staff teachers could be decreased.

The differentiated staffing plan would require major revisions in contractual relationships and teacher salary schedules, and strong resistance could be expected from educational associations and unions.

Local and state educational laws, regulations and policies would need to be changed. The pace of school district consolidations would be stepped up, and additional cooperative purchasing groups would need to be formed. It would be necessary for districts to adopt more advanced management practices, and carry out analytical studies that initially would raise costs.

### Teacher Supply

Perhaps the most difficult obstacle is that the differentiated staffing plan would lessen the demand for teachers who are already in oversupply. The plan could be implemented on a phased basis over an eight-year period by adoption of the following measures:

- Elimination of reentry of former teachers, which currently provides about 2 per cent of the teacher force each year
- Increase in the annual teacher turnover rate from 8 to 12 per cent, by encouraging earlier retirement
- Decrease in number of new teachers hired to under 100,000 annually, down from the current level of about 180,000.

Adoption of these measures would result in a teacher force, in 1979, of 1,275,000 - the number that would be needed under the differentiated staffing plan, and a substantial decrease from the present figure of slightly over 2 million.

The differentiated staffing plan could then be maintained on a stable basis, by hiring approximately 127,500 new associate teachers each year, with a 10 per cent annual turnover rate for all teachers.

### State Level Actions

The fragmented responsibility for direction of the nation's schools among more than 17,000 relatively autonomous districts makes for difficulty in introducing reforms. Implementation of the proposals of this report would be greatly facilitated if states assume greater responsibility for financing of school operations, and concurrently introduce systematic cost-saving measures on a statewide basis.

Summarized below are actions that state education departments could introduce, which would lead to economies, and would be particularly feasible if states assume greater responsibility for school finance and a greater degree of control over local school operations.

1. State education departments should initiate changes in educational regulations that restrict cost-saving opportunities, and should work toward effecting needed changes in legislation. Adoption of economical differentiated staffing plans is inhibited in many states by overly restrictive regulations and statutes on such matters as teacher tenure requirements, allowable pupil/teacher ratios, percentage of budgets that must be devoted to professional salaries and permissible functions of teacher aides. Similarly, laws in some states inhibit adoption of measures that can reduce capital outlays, such as extended school year plans, use of new building materials and construction methods, joint ownership of school buildings with nonschool sources, and longer term leasing of school buildings.
2. States should consider means for providing grants to meet higher start-up costs incurred by districts that introduce economy measures. State aid programs might be revised to furnish extra aid to districts initiating differentiated staffing and other economy measures, which would be repaid in the form of lower aid allocations in subsequent years, when the economy measures have reduced costs.
3. Each state should examine means for lessening the costs to school districts of purchased supplies and equipment. The use of existing state contracts should be evaluated, and consideration given to increasing the number of items available under state contract. Analyses should be made of the advantages of forming cooperative purchasing groups to serve smaller districts, and measures taken to promote their formation.
4. Studies should be initiated of plant operations and maintenance practices. Operating manuals and standards should be prepared for use by local districts.
5. In many states, the cost of school facilities can be lowered by a combination of state level actions. Facilities divisions should be established in state education departments to review the building plans of school districts eligible for state aid. Facilities planning standards should be prepared, or updated, to reflect the current emphasis on open-plan schools. An agency should be created to promote the use of the systems building approach. Means should be investigated for attaining lower interest rates on school bonds, including state guarantees of district bonds or issuance of state bonds.

6. State education departments should establish staff groups that would give consulting services to school districts - especially smaller ones - which lack the resources to conduct analytical studies and to develop improved management procedures. These groups initially should conduct statewide cost studies to determine how economies can best be accomplished.

#### Federal Government Actions

Achievement of economies in education would require major changes in attitudes of parents, teachers and school administrators at local, state and federal levels. It appears that most innovations - team teaching, differentiated staffing, computer aided instruction, performance contracting and others - have been introduced on the basis of enrichment, with lesser attention given to cost considerations. It is suggested that the United States Office of Education encourage recognition, at all levels, of the critical need for continual improvement of educational quality within economic constraints imposed by the ability and willingness of society to support increased expenditures.

It is recommended that USOE launch a research program to evaluate and refine the differentiated staffing plans proposed in this report. USOE should then assist state and local education agencies in implementing differentiated staffing, by providing research documentation, implementation guidelines, staff training materials and technical consultation.

Similar studies should be undertaken to further evaluate other cost-saving measures proposed herein, and the findings disseminated to state and local educational agencies. Consideration should be given to specific federal programs that would aid local districts in implementing economy measures. For example, whether or not differentiated staffing is adopted, there will be an oversupply of teachers during this decade, and USOE should investigate means, by federal funding, which could be made available to encourage early retirement.

**THE PRESIDENT'S COMMISSION ON SCHOOL FINANCE**  
**ECONOMIES IN EDUCATION**  
**PART B**  
**UTILIZATION OF INSTRUCTIONAL PERSONNEL**

**December 1971**

THE PRESIDENT'S COMMISSION ON SCHOOL FINANCE

ECONOMIES IN EDUCATION

PART B

UTILIZATION OF INSTRUCTIONAL PERSONNEL

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## PART B

### I - INTRODUCTION

This part of this report, *Economies in Education*, is concerned with opportunities of public elementary and secondary schools for achieving economies by making more effective utilization of instructional personnel. It presents findings and conclusions resulting from a study of existing practices in the utilization of instructional personnel, and innovative practices now being introduced in some schools.

#### OBJECTIVES

The United States Office of Education (USOE) has estimated that net expenditures for public schools in the school year 1970-71 amounted to approximately \$44.4 billion. Of this, Cresap, McCormick and Paget Inc. (CMP) estimated that \$22.6 billion was expended for salaries of instructional personnel, including \$19.5 billion for classroom teachers, and \$3.1 billion for principals, supervisors, coordinators, librarians, counselors, paraprofessional teacher aides and other instructional personnel. An estimated additional \$1.5 billion went to retirement programs for instructional personnel.

The foregoing expenditures represent more than half of net educational costs, including capital outlays, and more than two thirds of "current expenditures" or annual operating expense of primary and secondary schools. If the nation's schools are to achieve substantial economies, consideration must be given to means for reducing expenditures for instructional salaries. It is not realistic or socially desirable to suggest that educational costs be reduced at the expense of teachers and principals by reducing their salary levels, or increasing workloads without compensating factors. Rather, continuing efforts should be made to provide for more effective utilization of instructional personnel.

The objective of this study has been to identify means by which this can be accomplished without sacrificing quality of education. Emphasis was placed on means which are consistent with basic trends in good educational practice, and that appear to be attainable within the existing structural form of education. It is possible to conceive innovations which would drastically reduce costs through radical restructuring, such as closing the schools and educating children by television and other technological methods. This report identifies opportunities for improved utilization of instructional personnel which, although they may be difficult to attain, are essentially compatible with the existing structure of education.

## METHODS OF STUDY

The findings and conclusions of this report are based on analysis of prior research, and on examination of innovative practices in pioneering school districts. The scope did not include conduct of original research. Major elements of the work were as follows.

- Interviews were held with various knowledgeable authorities, The United States Office of Education, National Education Association (NEA), state education departments and commissions, university schools of education, school consultants and performance contractors, and individual school districts.
- A literature search was conducted to identify pertinent research studies and descriptions of innovative personnel utilization programs.
- Data and projections on educational expenditures, numbers of students, staffing and salaries were obtained from the USOE and other sources.
- Detailed statistical analyses determined educational cost components for school districts in various size categories, and models were created to enable calculation of the effect on costs of proposed staffing innovations.
- Reference was made to prior studies made by CMP for individual school districts and state education agencies.

## ARRANGEMENT OF PART B

Following this introductory chapter, the remainder of Part B is divided into four additional chapters as follows:

- II - Pupil/Staff Ratios: Educational And Cost Implications - which discusses the impact on education effectiveness and costs of various ratios of pupils to instructional staff.
- III - Proposed Differentiated Staffing Plan - which presents staffing plans suited to schools of various sizes, and provides comparative cost data.

IV - Related Opportunities For Improving The Utilization Of Instructional Personnel - which describes additional means for achieving economies.

V - Summary Of Economies And Implementation Considerations - which reviews actions needed to implement the proposed measures.

## PART B

### II - PUPIL/STAFF RATIOS: EDUCATIONAL AND COST IMPLICATIONS

Along with teachers' salaries, the factor which has the greatest single effect on educational costs is the numerical ratio of pupils to teachers, or the ratio of pupils to the total instructional staff of principals, supervisors, teacher aides and other instructional personnel, as well as teachers.

#### PUPIL TO STAFF RATIOS

For the 1970-71 school year, the following ratios were estimated:

	<u>Ratio</u>
Pupil/teacher	22.3 to 1
Pupil/instructional staff	19.4 to 1

A 10 per cent change in the pupil/teacher ratio - achieved, for example, by changing the average class size by 10 per cent - would have raised or lowered total school costs by almost \$2 billion. Similarly, a 10 per cent change in pupil/staff ratios would have produced a change in total instructional staff salary costs of \$2.2 billion.

The question of pupil/staff ratios has long been important for parents, teachers, administrators, school board members and taxpayers. Typically, school administrators respond to forced reductions in operating budgets by eliminating teaching positions, increasing class sizes and dropping the less popular high school courses - all of which increase the pupil/staff ratio and reduce costs. Conversely, upward pressures on school budgets are exerted by the desire of teachers, administrators and parents for smaller classes.

Over the years, the trend in class size - and consequently in total number of pupils per teacher - has been downward. Data developed for the Commission by other consultants indicated that the overall pupil/teacher ratio declined from 26.6 in 1959 to 22.5 in 1970-71. (The latter is slightly higher than the 1970-71 ratio calculated by CMP, using different sources of data.)

The USOE forecasts continuing declines in the pupil/teacher ratio, as do other consultants to the Commission, who project a ratio in 1975-76 of 20.3 and a further decline by 1980-81 to 19.6.

## RESEARCH IN CLASS SIZE

Class size and pupil/staff ratios have been hotly debated and heavily researched for many years. Teachers and administrators generally prefer smaller classes, contending that the greater individual attention improves the learning process. While many carefully structured research studies have been carried out, no consistent finding has substantiated significant direct or inverse correlation between class size and achievement, as measured by performance of pupils in standardized tests. Most research has been done in classes ranging from approximately 10 to 35 pupils. It could be construed that class-size variations above or below these limits would have an impact on pupil achievement. However, since the studies examined dealt essentially with class sizes in the 10-to-35 pupil range, the impact of class size on pupil achievement was not discernable. A summary of these research findings is presented in Appendix B-1.

Although research has been unable to prove the assumed advantages of smaller classes, many educators contend that the development of skills and acquisition of knowledge is only one aspect of education, and that smaller classes enhance other aspects such as the emotional and intellectual growth of children. However, research also has failed to support these arguments, perhaps because such factors are difficult to quantify and measure.

As reported in 1964 by Howard Holland and Armand Galfo in *An Analysis Of Research Concerning Class Size*, some researchers have concluded that the ratio of pupils to total instructional staff is more important than the ratio of pupils to teachers, and that a teacher - supported by paraprofessional aides - can effectively teach large classes. The findings of NEA surveys and the existence of union contracts limiting class size indicate that the majority of teachers have opposed this view, and prefer smaller classes without paraprofessional support. However, with the increasing acceptance of the open-classroom concept, it appears that the attitudes of teachers may be softening.

## DIFFERENTIATED STAFFING

A new approach to the questions of optimum pupil/teacher and pupil/staff ratios is presented by the concept of differentiated staffing, an innovation now in use in a small but growing number of school districts in the nation. In this approach, classroom teachers are no longer distinguished only by the grade levels or subjects they teach; rather, different classifications of teachers are established, with each classification assigned different duties and degrees of responsibility. Typically, a differentiated teaching staff includes:

- Staff teachers, whose duties correspond roughly to those of today's conventional classroom teachers, but who employ innovative educational methods
- Associate teachers, or beginners who work under close supervision of experienced teachers
- Teacher aides and other paraprofessionals, who assist teachers in clerical and administrative tasks, and also in some instructional activities
- Senior teachers, who oversee and guide the work of staff and associate teachers, perform other supervisory functions, and also teach some classes
- Master teachers, who have teaching and administrative responsibilities at a particular school, but who also have districtwide responsibilities for coordination and curriculum planning.

Differentiated staffing is a natural extension of several interrelated innovations in educational practice, including team teaching, nongraded programs, the increased use of teacher aides, greater emphasis on individualized instruction, the growth of the open-classroom concept, greater use of educational technology and new educational media, such as programmed learning texts. Appendix B-2 describes the conceptual development of differentiated staffing and its relationship to the other evolving innovations.

Under this approach, the various grades of teachers are assigned different salary levels. For example, the following table shows salary ranges for different classifications of teachers under a differentiated staffing model which was designed by Dr. Dwight Allen, Dean of the School of Education at the University of Massachusetts, and installed in 1966 in schools in Temple City, California:

<u>Teacher Classification</u>	<u>Salary Range</u>
Associate (B. A. or intern)	\$ 6, 500 - \$ 9, 000
Staff (B. A. and certificate)	7, 600 - 11, 000
Senior (M. S. or equivalent)	14, 000 - 17, 500
Master (doctorate or equivalent)	15, 000 - 25, 000

The original motivation for development of differentiated staffing was not to reduce costs but to provide for more individualized instruction and to make optimum use of staff talents and interests. Thus, implementation of the plan at Temple City resulted initially in staff salary costs in excess of those under the prior conventional plan; however, as experience was gained the plan was modified and made more efficient through better staff utilization. The district superintendent reported that it is now equivalent in cost to a conventional staffing arrangement.

It is possible to design differentiated staffing plans that reduce the cost of instruction in comparison with conventional staffing. For example, the Walnut Hills Elementary School, Cherry Creek Schools, Denver, Colorado, installed such a plan that provided for both a reduced pupil/staff ratio and a reduced expenditure in total instructional salaries. Exhibit II-1, which follows, compares the traditional staffing arrangement with the differentiated staffing plan. It was developed by the Walnut Hills teachers themselves. They allocated their resources in a way which provides six additional positions, and also resulted in a cost reduction of 22 per cent.

Differentiated staffing is still a relatively new concept in education and has been implemented fully in only a limited number of the nation's schools. However, CMP concludes that it is essentially sound, that it is consistent with basic trends in education, and that it offers a means of maintaining and improving the quality of education. Furthermore, it offers an opportunity to provide for better utilization of instructional staff and attendant control of educational costs.

If means must be found to restrict the rate of increase of educational costs, specifically the increase in instructional salary costs, CMP concludes that the most promising avenue is differentiated staffing.

The following chapter proposes staffing models which, in comparison with present staffing, would increase the number of instructional positions in relation to the number of pupils and also would offer potential for reduction in total instructional salary costs. The models were developed by educators after evaluation of existing school districts with differentiated staffing, and examination of prior research analyses.

**WALNUT HILLS ELEMENTARY SCHOOL  
DIFFERENTIATED STAFFING MODEL**

(ENROLLMENT: 375-450)

TRADITIONAL			DIFFERENTIATED			
STAFF	NUMBER	SALARY		STAFF	NUMBER	SALARY
		AVERAGE	TOTAL			
Classroom Teacher	18	\$ 8,119	\$146,142	Team Leader	1	\$ 10,000
Resource Teacher	1	8,119	8,119	Teacher	1	8,000
Physical Education Teacher	1	8,119	8,119	Teacher	1	7,000
Music Teacher	1	8,119	8,119	Beginner Teacher	1	6,300
Teacher Aides	3	-	5,000	Intern	1	1,500
<b>TOTAL</b>	<b>24</b>	<b>\$32,476</b>	<b>\$175,499</b>	Intern	1	3,000
				5-Hour Teacher Aide	1	1,575
				Student Teacher	1	-
				High School Student	1	-
				Subtotal	9	\$ 37,375
				Teams	x3	x3
				Subtotal	27	\$112,125
				Resource Teacher	1	8,119
				Physical Education Teacher	1	8,119
				Music Teacher	1	8,119
				<b>TOTAL</b>	<b>30</b>	<b>\$136,482</b>

Adult/Student Ratio: 1/19

PART B  
EXHIBIT II-1

Adult/Student Ratio: 1/15

Savings: \$39,017 or 22%

## PART B

### III - PROPOSED DIFFERENTIATED STAFFING PLAN

Model differentiated staffing plans for elementary and secondary schools are described in this chapter. Alternative versions are presented to accommodate schools of different sizes. The model plans are proposed as suitable for an average or typical school of each size, although conditions in a particular school district might demand higher or lower staffing levels than those suggested.

#### MODEL ELEMENTARY SCHOOL PLAN

Exhibit III-1, which follows, presents a staffing plan for a model elementary school with an enrollment of 531 pupils. The school programs would have the following characteristics:

- Emphasis on individualized study and pacing, with a variety of instructional groupings
- High degree of collaboration among staff members
- Ready access by pupils to many staff members for assistance
- An open-plan physical plant, with instructional areas clustered for team and group teaching
- Greater use of instructional technology, and a well-equipped learning center replacing the conventional library.

Under the proposed plan, tenured staff teachers and nontenured associate teachers would have grade-level responsibilities and would serve full time as classroom teachers. Each staff teacher would have certain areas of particular capability: for example, one would be trained as a speech correctionist responsible for testing and training students with speech problems.

Senior teachers would spend from 50 to 60 per cent of their time as classroom teachers, and the balance in such activities as supervising staff and associate teachers, conducting in-service training programs and applying new learning and teaching methods and strategies. Master teachers would devote

**DIFFERENTIATED STAFFING PLAN FOR  
MODEL ELEMENTARY SCHOOL (K-6) OF 531 STUDENTS**

**A - BY CATEGORY**

POSITION	TOTAL	PRIMARY LEVEL (K-3)	INTERMEDIATE LEVEL (4-6)	MUSIC	ART	PHYSICAL EDUCATION	MEDIA (LIBRARY)
Principal	1						
Administrator	0.5						
Master Teacher	2	1	1				
Senior Teacher	2	1	1				
Staff Teacher	8	3	2	1		1	1
Associate Teacher	3	1	1		1		
Teacher Aide	15	6	5	1	1	1	1
<b>TOTAL</b>	<b>31.5</b>						

**B - TOTAL INSTRUCTIONAL STAFF**

POSITION	NUMBER	RATIOS
Teacher	15	Pupil/Teacher 35.4/1
Professional	16.5	Pupil/Professional 32.2/1
<b>TOTAL</b>	<b>31.5</b>	Pupil/Staff 16.9/1

PART B  
EXHIBIT III-1

from 30 to 40 per cent of their time to classroom teaching, would carry out some supervisory functions, and would also have districtwide responsibilities for curriculum planning in particular subject areas.

The teaching staff would be supported by an equal number of paraprofessional teacher aides who, in addition to assisting the teachers by performing clerical tasks, would be trained to assist in the instructional process, in keeping with the open-classroom, individualized-instruction approach.

As at present, the principal would serve as the educational leader of the school, with responsibility for schedule coordination, utilization of facilities and deployment of resources. He would conduct regular planning and evaluation sessions with master and senior teachers. To maintain and strengthen his skills, the principal would also devote some time to classroom teaching, serving as a model teacher for other staff members.

Bruce Caldwell, Director of Secondary Education of the Temple City, California schools offers the following description of the principal of a differentiated staff: "He remains a catalyst and leader, a proposer rather than a reactor. His power lies in his persuasiveness and ability, as opposed to his position in the district hierarchy."

The administrator would serve as the building manager, in charge of noninstructional personnel, budgeting, transportation, food service, and requisitioning of equipment and supplies. He could also be responsible for attendance activities and student discipline. However, in some schools, students' needs may dictate that the principal perform some of these tasks and that the administrator be a certified educational specialist, such as a school psychologist, researcher or community relations coordinator. The model school shown would have a half-time administrator who either would be on staff at two schools, or would serve as a part-time administrative intern while pursuing graduate school studies.

Although not shown in the proposed staffing plan, the school staff could also include volunteer teacher aides and nonpaid student interns. The differentiated staffing approach readily accommodates the participation of volunteers.

The foregoing is presented as a plan for an average elementary school; local conditions may dictate variations in the mix of positions, or higher or lower staffing levels. For example, an inner-city school might require more than one teacher aide for each teacher, to provide greater individualized instructional opportunities for educationally disadvantaged children.

## MODEL SECONDARY SCHOOL PLAN

A proposed staffing model for a typical comprehensive secondary school is presented in Exhibit III-2. A counseling staff, in addition to teachers and administrators, is included in this plan which is suitable for a school with any combination of grades 7 through 12. The distribution of teachers among subject areas is illustrative; it would vary according to the kind of school. For example, in a purely academic high school the number of positions assigned to vocational education would be reduced; conversely, this category would be strengthened in a vocationally oriented high school. As with the primary school model, the overall number of positions in relation to enrollment would vary according to particular needs.

In comparison with conventional school-staffing plans, both of the preceding differentiated staffing models would provide for a decrease in the ratio of pupils to total instructional staff - that is, in relation to the number of pupils, the instructional staff would be larger than in a conventional school. However, the ratio of pupils to teachers would be increased, with the decline in the number of teachers offset by the differentiation of their roles, by the increased number of teacher aides and by the use of the individualized instruction - open-classroom approach.

## PLANS FOR MODEL SCHOOLS OF VARIOUS SIZES

For purposes of illustration and cost projection, differentiated staffing plans were developed for six sizes of elementary schools and five sizes of high schools. School sizes were selected to approximate the actual distribution of schools in the nation by size, and also to enable the creation of model school districts, as described later.

Exhibit III-3 presents the proposed differentiated staffing plan for each of the six model elementary schools and five model secondary schools. The lower part of the exhibit summarizes the following for each model school:

- Total number of teachers
- Total number of instructional staff members
- Resulting pupil/teacher ratio (that ranges between 35.4 and 36.9)
- Resulting pupil/staff ratio (that ranges between 16.1 and 17.3).

DIFFERENTIATED STAFFING PLAN FOR MODEL COMPREHENSIVE  
SECONDARY SCHOOL OF 1,224 STUDENTS

A - BY SUBJECT

POSITION	TOTAL	MATHEMATICS- SCIENCE	ENGLISH- SPEECH	SOCIAL STUDIES	FOREIGN LANGUAGES	FINE ARTS	VOCATIONAL EDUCATION (a)	PHYSICAL EDUCATION (b)	MEDIA (LIBRARY)
Principal	1								
Administrator	1								
Senior Counselor	1								
Staff Counselor	3								
Master Teacher	6	1	1	1	1	1			
Senior Teacher	4	1.5	0.5					1	1
Staff Teacher	16	4.5	3	2		1	2.5	2	1
Associate Teacher	8	1	1	2	1		2	1	
Teacher Aide	34	8	5.5	5	2	2	5.5	4	2
<b>TOTAL</b>	<b>74</b>								

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PART B  
EXHIBIT III-2

B - TOTAL INSTRUCTIONAL STAFF

POSITION	NUMBER	RATIOS	
		Pupil/Teacher	Pupil/Professional
Teacher	34	36.0/1	
Professional	40		30.6/1
<b>TOTAL</b>	<b>74</b>		<b>18.3/1</b>

(a) Includes business, home economics and industrial arts.  
(b) Includes health and driver education.

DIFFERENTIATED STAFFING PLANS FOR SCHOOLS OF MODEL SIZES

POSITION	NUMBER OF POSITIONS IN ELEMENTARY SCHOOLS WITH:										NUMBER OF POSITIONS IN SECONDARY SCHOOLS WITH:				
	177 PUPILS	359 PUPILS	531 PUPILS	706 PUPILS	1,064 PUPILS	1,484 PUPILS	391 PUPILS	612 PUPILS	847 PUPILS	1,234 PUPILS	2,142 PUPILS	AVERAGE SALARY			
Principal	-	-	1	1	1	1	1	1	1	1	1				
Administrator	1	1	1/2	1	2	3/2	-	-	1	1	2/2				
Master Teacher	-	1	2	3	4	6	2	3	4	6	8				
Senior Teacher	1	2	2	3	4	6	1	2	3	4	6				
Staff Teacher	3	5	6	12	16	24	6	8	11	16	29				
Associate Teacher	1	2	3	4	6	9	2	4	5/2	8	14/2				
Senior Counselor	-	-	-	-	-	-	-	-	-	1	1				
Staff Counselor	-	-	-	-	-	-	1	2	2	3	6				
Teacher Aide	5	10	15	22	30	47	11	17	23.5	34	59.5				
<b>TOTALS FOR EACH SCHOOL</b>															
Number Of Teachers	5	10	15	22	30	47	11	17	23.5	34	59.5				
Number Of Staff	11	21	31.5	46	63	96.5	24	37	52	78	129.5				
Pupil/Teacher Ratio	35.4	35.5	35.4	34.3	35.5	35.8	35.5	34.0	34.9	34.0	35.0				
Pupil/Staff Ratio	16.1	17.0	14.9	17.3	14.9	17.1	14.3	14.3	14.7	14.5	14.5				
SALARY COST	\$72,968	\$148,116	\$224,819	\$304,712	\$444,458	\$664,227	\$168,796	\$244,052	\$378,431	\$539,864	\$914,879				

PART 3  
EXHIBIT III-3

Exhibit III-3 also presents the total instructional salary cost for each model school, which is based on the estimated average salary for each position, as indicated.

### INSTRUCTIONAL SALARIES

As a basis for estimating salaries for associate and staff teachers, an analysis was made of survey data provided by the Commission, which indicates the present salaries of classroom teachers, according to age and experience. These data were applied against the calculated age distributions of associate and staff teachers that would occur under the proposed differentiated staffing plan, then the resulting average salaries were determined.

The proposed average salaries for senior and master teachers would provide for a reasonable differential among the different levels of teachers. As explained later, the overall distribution of teachers by level would be as follows:

<u>Teacher Classification</u>	<u>Per Cent Of Total</u>
Master	13%
Senior	14
Staff	51
Associate	22

Applying these percentages to the proposed average salaries would result in an overall average salary for all teachers of \$9,463, which is equal to that of all teachers in the 1970-71 school year. Thus, the proposed differentiated staffing plan would be based on the same average teacher salary that exists currently.

On the basis of USOE data, CMP estimates that present salaries for principals and assistant principals combined are \$13,297. Under the proposed differentiated staffing plan, suggested average salaries for principals are \$16,000, and for administrators \$13,000.

Salaries for senior counselors are estimated at \$11,300, the same level as that for senior teachers, and for staff counselors, who would be expected to have more experience, at a little over the average salary for staff teachers.

Salaries for teacher aides are \$4,000 - which CMP estimates to be the current national average level.

**DIFFERENTIATED  
STAFFING PLAN FOR  
MODEL SCHOOL DISTRICTS**

Following development of differentiated staffing plans for model schools, the plan was applied to school districts of various sizes.

In 1970-71, the nation had a total of 17,498 operating school districts. For purposes of analysis, the USOE provides data on school districts in each of six size categories, as measured by pupil enrollment. The following table presents these six, along with the number of districts in each category, in 1970-71:

<u>District Size Category (Pupil Enrollment)</u>	<u>Number Of Operating Districts, 1970-71</u>
Over 25,000	191
10,000 - 24,999	557
5,000 - 9,999	1,104
2,500 - 4,999	2,018
300 - 2,999	7,834
Under 300	<u>5,794</u>
Total	17,498

Detailed analyses were made of districts according to size category, in order that the proposed differentiated staffing plans could be developed for the typical district in each size category. Exhibit III-4 presents 1970-71 costs and enrollment data for districts in each of the six categories, which are interpreted as follows.

- In 1970-71, the nation had 191 school districts enrolling more than 25,000 pupils.
- Collectively, these districts enrolled 13.8 million students, or an average of about 72,000 pupils per district.
- Collectively, they expended \$7.5 billion for instructional salary costs, or an average of \$39.1 million per district.

Similar data are provided for each of the other five district categories.

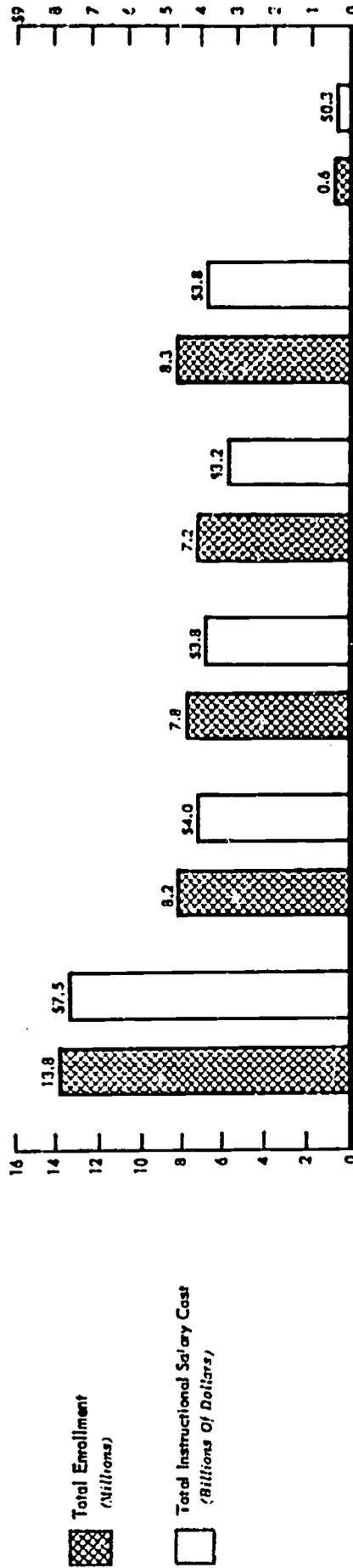
**ENROLLMENT AND SALARY DATA ON SCHOOL DISTRICTS, BY SIZE CATEGORY**  
(1970-71)

SIZE OF DISTRICT BY NUMBER OF PUPILS

	OVER 25,000	10,000 TO 24,999	5,000 TO 9,999	2,500 TO 4,999	300 TO 2,499	UNDER 300
Number Of Districts	191	557	1,104	2,018	7,834	5,774
Enrollment	72,000	15,000	7,000	3,500	1,000	100
Instructional Salary Cost (Millions Of Dollars)	\$39.10	\$7.10	\$3.50	\$1.60	\$0.50	\$0.04

A - Per Average District

B - All Districts



PART B  
EXHIBIT III-4

Note: Totals may not add because of rounding.

## CREATION OF MODEL SCHOOL DISTRICT

Six different model school districts were then created - one for each of the size ranges - by assigning the appropriate number of model schools of each size to each model district. Statistical analyses were used to create model districts, which have a total enrollment approximately equal to the average district in each size category. Exhibit III-5 presents the number of model schools of each size in each of the six districts.

Thus, the model 5,000 to 9,999 pupil district has four 355-pupil elementary schools, five 531-pupil elementary schools, two 867-pupil secondary schools (junior high) and one 1,224-pupil secondary school (senior high). The resulting distribution of schools by size approximates the national distribution of actual schools by size.

## POTENTIAL COST SAVINGS THROUGH DIFFERENTIATED STAFFING

Following creation of the model districts, it was possible to calculate the total instructional salary costs that would occur under the proposed differentiated staffing plans. These were adjusted to provide for the following:

- The higher average salary costs of large districts, and lower salary costs of small districts
- A cost allowance for central district-office positions, for each district
- An adjustment to compensate for slight differences in size between the model district and the actual average district in each size range.

Exhibit III-6 compares present instructional salary costs with those that would occur under the proposed differentiated staffing plan. Salient points of this exhibit are as follows.

- The differentiated staffing plan is not applicable to small school districts with total enrollments under 300.

MODEL DISTRICTS BY SIZE OF ENROLLMENT, AND  
NUMBERS OF SCHOOLS IN EACH

PART B  
EXHIBIT III-5

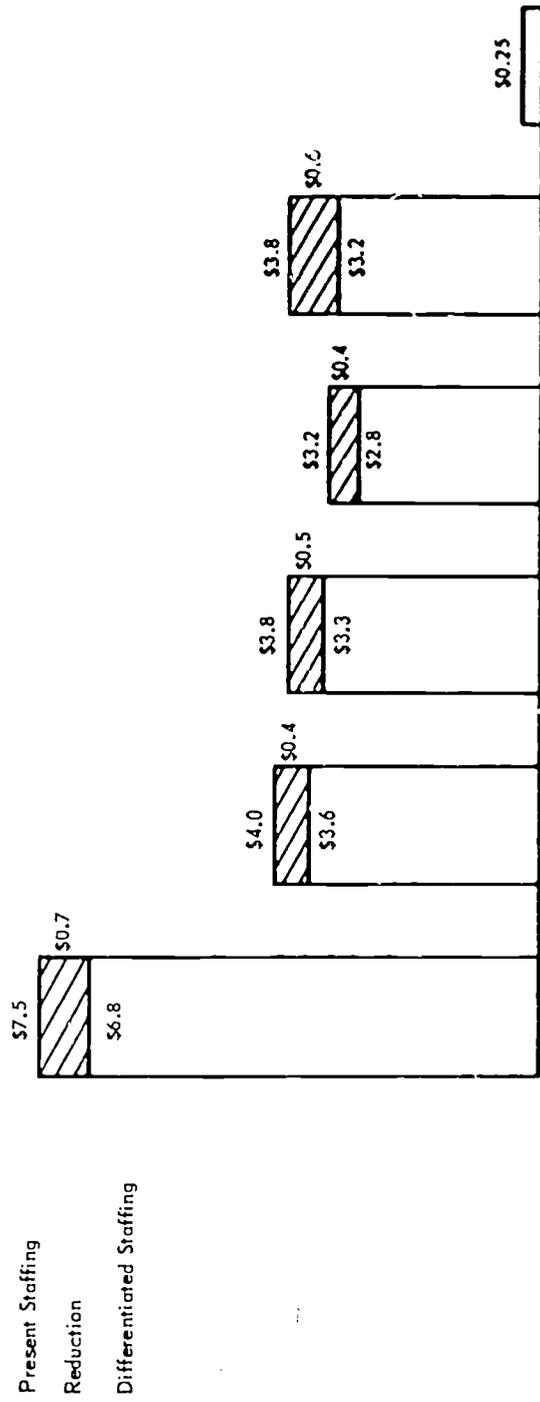
SCHOOL ENROLLMENT	NUMBERS OF SCHOOLS IN DISTRICTS ENROLLING					
	25,000 AND OVER	10,000 TO 24,999	5,000 TO 9,999	2,500 TO 4,999	300 TO 2,499	UNDER 300
<b>ELEMENTARY</b>						
80						1
177	9	5		2		
355	7	4	4	2	2	
531	25	7	5	2		
798	15	2				
1,064	9	1				
1,684	2					
Subtotal	67	19	9	6	2	1
<b>SECONDARY</b>						
391					1	
612				1		
867	3	3	2	1		
1,224	10	1	1			
2,142	7	1				
Subtotal	20	5	3	2	1	
<b>TOTAL</b>	87	24	12	8	3	1

**CALCULATED COST SAVINGS FOR INSTRUCTIONAL STAFF,  
THROUGH DIFFERENTIAL STAFFING, BY DISTRICT ENROLLMENT SIZE**

(BASED ON 1970-71 ENROLLMENT AND EXPENDITURES)

STAFFING	SIZE OF DISTRICT BY NUMBER OF PUPILS					
	OVER 25,000	10,000 TO 24,999	5,000 TO 9,999	2,500 TO 4,999	300 TO 2,499	UNDER 300
Number Of Districts	191	557	1,104	2,018	7,531	5,794
			<b>A - Per Average District (Thousands)</b>			
Present	\$39,059	\$7,123	\$3,466	\$1,602	\$ 491	\$ 43
Differentiated	35,431	6,348	3,040	1,387	406	43
Reduction	\$ 3,628	\$ 775	\$ 426	\$ 215	\$ 65	\$ -

**B - All Districts  
(Billions)**



(3) Differentiated staffing plan not applicable.

- For the typical school district in all of the other size categories, the proposed differentiated staffing plan would significantly reduce instructional salary costs, ranging from \$89,000 in the typical 300 to 2,499 pupil district, and up to \$3.9 million in the typical district with more than 25,000 pupils.

If implemented fully on a national basis, in 1970-71, the differentiated staffing plans would have made possible a reduction in instructional salary costs of \$2.6 billion, or 12 per cent.

#### DISTRICT-OFFICE STAFFING

In 1970-71, the nation's schools employed a total of 28,500 instructional supervisors, in addition to principals and assistant principals, according to estimates developed by CMP on the basis of USOE reports. Most occupy positions at the district-office level, with titles such as supervisor of elementary education, director of social studies, and supervisor of curriculum development.

Under the proposed differentiated staffing plan, certain functions now performed at the district-office level would be transferred to the school level and would be carried out by master and senior teachers. This arrangement, supplemented by other efficiencies described in the following chapter, would permit a reduction in district-office staffs. It is estimated that, under the proposed plan, one district-level supervisor would be needed for approximately 3,000 pupils; the total number of supervisory positions, other than principals and assistant principals, would thus be reduced 50 per cent - from 28,500 to 14,250. Accordingly, the foregoing cost estimates include salary expenditures for supervisors in district offices at 50 per cent of the total 1970-71 salary expenditures for supervisors.

## PART B

### IV - RELATED OPPORTUNITIES FOR IMPROVING THE UTILIZATION OF INSTRUCTIONAL PERSONNEL

This chapter offers further opportunities by which schools can improve the utilization of instructional personnel. Some of the proposals relate directly to differentiated staffing, while others are applicable to schools with either differentiated or conventional staffing.

#### CURRICULUM DEVELOPMENT

Substantial sums are expended each year by school districts in developing and revising curriculums. Larger districts usually employ at least one full-time curriculum specialist at the district-office level, whose title might be director of curriculum, curriculum coordinator or supervisor of curriculum; very large districts have sizable staffs to carry out this function. In many districts, development of curriculum is a major part-time assignment of department heads and grade-level coordinators. Often, in the summer months, selected teachers are paid to serve on curriculum development projects.

A typical pattern is to provide one full-time-equivalent curriculum specialist for each 2,500 pupils, at an estimated average annual salary of \$12,000. On the basis of 1970-71 total enrollment in public elementary and secondary schools of almost 46 million pupils, the staff cost to develop and to modify curriculum thus exceeds \$220 million. It is to be noted that this sum is included in the total 1970-71 disbursement of \$22.6 billion for instructional salaries.

This expenditure can be justified to the extent that it represents effective effort to meet the changing educational needs of children, or to reflect improvements in the learning process and instructional methods. However, a great deal of energy is expended by school districts in recreating, in minute detail, curricular materials and programs for which a multitude of good designs and materials already exist.

There are a number of clearing house services available that provide curriculum information to school districts. Among these are Curriculum Advisory Service, International Clearing House on Science and Math, and the Learning Directory. The last, for example, indexes more than 200,000 items of instructional materials presented in some 600,000 entries under 225,000 different topics. It describes available curricular and instructional materials, including course plans, textbooks, filmstrips, workbooks and teaching aid kits, and enables the teacher or supervisor to quickly identify desirable materials. Westinghouse Learning Corporation created this reference in developing project PLAN, a computer-managed program of individualized instruction.

Universities and colleges also offer instructional curriculum and services to school districts. For instance, the Laboratory for Education Development at Indiana University is developing curriculum packages which are self-contained teaching kits with instructions on use of the material. Kits for use by practitioners at all levels of education are being prepared for social studies, art, science education, Spanish, French, algebra, reading and others. A typical kit would include a course-organization guide, daily lesson plans, tests and other evaluative materials and various instructional aids, such as filmstrips, tapes and demonstration materials.

According to John Horvat of the School of Education at Indiana University:

"... the Laboratory for Education Development is attempting to bridge the gap between the research in education and actual practice. It is interested in inventing new forms of educational practice which will solve significant problems, or clusters of problems in the operation of schools."

In addition to the services offered by universities, many commercial publishers have developed excellent integrated curriculum packages, which include teacher guides, lesson plans, pupil workbooks, filmstrips and educational TV tapes.

Under the proposed differentiated staffing plan, curriculum planning would be carried out by master teachers at the school level, with assistance and coordination provided in larger districts by supervisors at the district level. It is recommended that all personnel concerned with curriculum become more familiar with curriculum-guidance services now available, and that much greater use be made of packaged learning materials already in existence. Here, the USOE could assist by sponsoring definitive research and collecting and disseminating information on program and curriculum design. This would be an appropriate project for the proposed National Institute of Education.

## SUBJECT- AND GRADE- LEVEL COORDINATION

In districts with more than one secondary school, some arrangement is usually provided to coordinate each subject area; district offices are staffed with positions bearing titles such as head of the language department, chairmen of the social studies, coordinator of mathematics, and other descriptions. At the elementary level, similar efforts are made to coordinate programs among schools by grade level, and district offices contain such positions as elementary school supervisor, primary supervisor, intermediate school coordinator, and other titles.

Based on data provided by the USOE, CMP estimates that in 1970-71 the nation's school districts employed about 30,000 instructional supervisors, at an average annual salary of over \$13,000, for an estimated total salary cost of \$394 million. (This is in addition to the salary total of \$1.3 billion paid to approximately 100,000 principals and assistant principals, and the nearly \$1 billion in salary payments to more than 100,000 guidance counselors, librarians, psychometrists and other "nonsupervisory instructional personnel.")

These district-level supervisory positions must of course interact closely with principals and teachers at the school level. In analyzing the organization and operations of many school districts through the years, CMP often has found it difficult not only to isolate the real functions carried out by some district-level supervisory positions but also to justify them. It appears that many such positions are created initially in response to a specific need - for example, to introduce a new program to all schools in the district - but the positions tend to remain in existence after the program has been successfully introduced - or abandoned.

### Decentralization Trend

There is a pronounced trend in some districts to reduce the number of district-level supervisory positions and put responsibility for grade-level and subject-area coordination "back in the building" - by assigning it to principals and other personnel at the school level. Needs for one-time assistance in introducing new programs are met by engaging part-time consultants from universities; articulation and coordination are carried out by committees comprised of representatives from district schools.

This existing trend would be facilitated by adoption of the proposed differentiated staffing plan, which would give senior and master teachers responsibilities for planning and coordination. Principals and assistant principals would participate, as they do now, in grade-level and subject-area coordination; the overall effect would be reducing the number of district-level positions responsible for these activities.

As noted previously, by reducing the number of district-level positions engaged in curriculum planning and subject-area and grade-level supervision, approximately only one district-level supervisor would be needed for each 3,000 pupils. Thus, a 50 per cent reduction in the number of supervisory positions could be made, which would result nationally in a cost reduction of almost \$200 million.

#### SUBSTITUTE TEACHING ARRANGEMENTS

Engaging substitute teachers is a costly process for the nation's schools. During 1970-71, classroom teachers numbered about two million. With an absentee rate at about 5 per cent - approximately nine school days per teacher per year - this results in a national total of nearly 18 million "substitute teacher days" per year. At an average rate of about \$25 daily, the annual national cost is estimated at \$450 million, a significant element in total teachers' salary costs of \$12.5 million. Moreover, costs are likely to increase, as teacher associations bargain for increased sick leave, personal leave and higher daily rates.

A substitute - called in at the last moment, unfamiliar with the regular teacher's lesson plan and the students - is clearly at a disadvantage and can do little more than serve as a caretaker until the regular teacher returns. Thus, the educational value of the \$450 million annual expenditure for substitute teaching becomes questionable.

The effectiveness of substitute teaching was researched by Dr. Martin N. Olson, research associate with the Institute of Administrative Research, Teachers' College, Columbia University. In a report titled, "Should School Districts Save Money On Substitutes," (I. A. R. Research Bulletin, Vol. 10, No. 3), Dr. Olson referred to the abysmal performance of substitutes, and concluded that "Substitute teachers act as no more than babysitters... Either substitute teaching must be improved or alternate, less expensive methods of handling teacher absence should be initiated."

### Administrators Serve As Substitutes

Some districts have developed new staffing approaches that can increase the effectiveness and reduce the cost of substitute teaching. In the school system of Madison, Wisconsin, each of some 140 administrators - principals, coordinators, supervisors and others - serves three days per year as a substitute. The primary purpose of the plan is to "bring administrators back to the nitty-gritty of teaching" and enable them to carry out their administrative duties more effectively by improving their rapport with teachers and students. The plan also saves money. Madison pays \$27 per day for substitutes; the yearly savings thus will be more than \$11,000. Large districts would of course save more. In Chicago, for example, which has about 2,000 full-time administrators and pays \$40 per day for substitutes, the estimated yearly savings would be more than \$240,000.

In the entire country, there are about 130,000 administrators, including principals and vice principals. Adoption nationally of the Madison plan would result in the saving of nearly \$10 million.

Much larger savings would be realized by adoption of the proposed differentiated staffing plan, under which the need for substitutes would be virtually eliminated. Teacher absences would be accommodated by assigning groups of students to teacher aides and student teachers, or by pupils serving as tutors who would be in turn supervised by senior and master teachers. This would fulfill, in some states, the statutory requirement that instruction be initiated only by certificated personnel.

### PEER-GROUP AND CROSS-AGE TUTORS

The fluid, individualized-instructional approach, which would be utilized under the proposed differentiated staffing plan, lends itself readily to the use of part-time and volunteer instructional aides. Depending on local circumstances these might include parents, student teachers serving as interns and the students themselves.

The increased use of students as tutors appears particularly promising. Working with two elementary schools, the University of Michigan's Institute for Social Research is researching "cross-age interaction" and developing a program for cross-age tutoring. Under this program, the sixth-graders were assigned as academic assistants in the first four grades. They were given special training in relating to younger children, and in teaching content material. To offset possible negative attitudes of sixth-graders toward working with younger children, the researchers recruited several seventh graders,

with high status among their peers and experience in working as helpers, who conveyed the benefits of the helping relationship to the sixth graders. The ability of the older children to communicate with younger children, coupled with their other services, greatly enriched the educational experience of both groups. Most of the older students were enthusiastic about the program, especially the low achievers from low-status families, who not only showed an improvement in their own desire to learn, but also in their relations to authoritative personnel of the school.

Numerous opportunities for cross-age tutorial interaction are available, especially in nongraded elementary schools; but few schools appear to be using it regularly.

Other authorities also have pointed out the value of peer-group tutors. The child who excels in a particular subject has the opportunity to gain competence and a sense of social responsibility by tutoring a slower student. In turn, the slower student gains encouragement, understanding and academic assistance from a person who is not socially removed by a large gap in age and authority. The learning benefits achieved by the tutors affirm that teaching is a valuable developmental experience. Peer tutors often gain as much and sometimes more in academic learning than the students they assist. When students are used as peer instructors, aptitude heterogeneity within the classroom may be transformed from a teaching handicap to an educational asset.

It is not suggested that student tutors or other volunteer instructional aides be used in place of salaried teacher aides, but rather that the volunteers serve in a supplementary role. Therefore, no instructional cost savings are estimated through the use of volunteer aides. However, their use could reduce or eliminate additional salary costs in districts that may require above average staffing levels, as proposed in the preceding chapter.

#### SENIOR OPTION PLAN

A practical method for improving the utilization of instructional personnel and reducing costs is suggested by the Senior Option Plan now in use in some high schools in Deerfield, Highland Park, and Winnetka, Illinois, and Duval County, Florida.

Here, participating senior students spend one semester in independent study, research or relevant work experience, rather than in the conventional school setting. Nor does the program involve a reduction in graduation requirements; it is offered to seniors who have earned sufficient credits in

seven semesters. As explained by Superintendent William Cornog of New Trier High Schools, Winnetka, "By the 8th semester, many highly motivated seniors have completed all requirements and seek productive educational experience beyond the traditional school programs. "

At Deerfield High School, about 100 seniors participate in the program. Their activities include serving as teacher and nurse aides in nearby elementary schools, working in area industries, taking some classes and engaging in independent study at the school and attending post-secondary institutions.

Deerfield employs only one full-time teacher to direct the 100 students in the plan; the Duval County schools report a similar ratio. If this plan were implemented nationally, the savings in instructional salaries could be substantial. Under the proposed differentiated staffing plan, the average cost of instructional salaries per secondary pupil would be approximately \$440. For students enrolled in the plan, a three-times greater pupil/staff ratio could be used, which would result in a cost reduction of about \$147 per pupil, per semester. With high school seniors representing about 6 per cent of total enrollment, and if half participated in the plan for one semester of their senior year, the resulting reduction in instructional salary costs would be \$203 million - on the basis of 1970-71 enrollments.

The plan would have other benefits as well. Some of the students - particularly those planning careers in education - would serve as teacher aides within the system. Participating students would not occupy space in classrooms and this would ease pressures for physical plant expansion, and tend to reduce plant maintenance and operating costs.

The Senior Option Plan illustrates the kind of savings that could be achieved in education through relatively conservative restructuring of the education program. Still greater savings could be accomplished by more radical restructuring, such as the proposal to abolish the 12th grade and add a year of preschool education, and the "school-without-walls" concept of Philadelphia's Parkway school in which students spend most of their time in independent study.

## DRIVER EDUCATION

Today, driver education is an accepted course of study in secondary schools. Of the nation's 25,000 high schools, it was estimated by the National Safety Council that more than half, or 13,200 schools, provided driver education to almost 2.3 million pupils in the 1969-70 school year. These programs tend to be offered in the larger schools. George R. Babigian, a director of the Association of School Business Officials, estimated that driver education is available now to about 65 per cent of all eligible students, a proportion that is increasing.

Three basic methods of driver education are used, as described below, and in greater detail in Appendix B-3.

### Traditional Method

This method provides equal proportions of classroom instruction and laboratory or "in-car" instruction. In the classroom phase, one instructor teaches a class of about 30-to-36 students. In the laboratory phase, one instructor using one car works with a group of about four students who take turns driving under his guidance.

As explained in Appendix B-3, it can be calculated that the average national cost of providing one semester of driver education to one student under the traditional method is about \$108, of which 97 per cent is represented by teacher's' salary costs.

Cost estimates are based on the assumption that vehicles are donated free of charge - the prevailing practice - but allowances are provided for insurance costs, maintenance and fuel, and the cost of a dual-control system.

### Multiple Vehicle Method

This method employs a classroom phase equivalent to that of the conventional method but includes, in the laboratory phase, a combination of traditional in-car experience and driving practice in a specially paved area. One instructor, standing in the area, can simultaneously instruct 6-to-12 students, each in a car. This reduces the number of teachers required. Vehicle expense is increased but the net effect is a per-student cost estimated at \$95, per semester.

### Simulator Method

The third method includes, in its laboratory phase, a combination of traditional in-car experience and experience in machines that simulate driving experience. The simulator method delivers what many educators and vehicle safety experts consider the highest quality of driver training. This method is also the least costly - provided that the simulator machines can be used by groups of at least 350 students per semester - because the number of teachers required is less than that for the traditional and multiple vehicle methods. Estimated average per student cost is \$76 per semester, as explained in Appendix B-3.

### Cost Savings Potential

Based on data provided by the National Safety Council, it is estimated that about 84 per cent of students enrolled in driver-education programs are trained by the traditional method, 3 per cent by the multiple-vehicle method and 13 per cent by the simulator method. Applying these percentages to the total number of students receiving driver training - 2.3 million - and to the foregoing per-pupil costs, it is calculated that the annual cost of driver education in 1970-71 was about \$236 million. Had all schools utilized the simulator method, the cost would have been about \$174 million, a reduction of \$62 million, or more than 25 per cent.

Thus, it is recommended that all school districts consider the cost savings potential in adopting the simulator method. In small districts, this would require joining with other nearby districts in the purchase of simulator machines; in some states it would also require changes in statutes or regulations.

### INSTRUCTIONAL TECHNOLOGY

An examination was made of instructional technology to estimate its potential as a means of making more effective use of instructional personnel and reducing educational costs. Findings are summarized in this section and reviewed in more detail in Appendix B-4.

Other consultants to the Commission, who were assigned to study the cost implications of educational technology in depth, have concluded that - despite widespread interest and experimentation with computer-aided instruction, computer-managed education, programmed learning, educational television and similar innovations - insufficient cost data have been collected and analyzed to enable realistic comparison of the costs and effectiveness of instructional technology. This report confirms this view.

It is evident that computers, television and other automated instructional devices could reduce costs only by decreasing the required number of instructional personnel. To date, instructional technology has been used primarily to supplement human instruction rather than to supplant part of it; little hard data have been generated that permit comparisons of the relative costs, and the effectiveness of human and automated instructional modes. The low per-pupil costs and apparent effectiveness of such programs as Sesame Street and the PLATO (Programmed Logic for Automatic Operations) computer-aided instruction system suggest, however, that radical instructional models could be created that would reflect lower costs per pupil than at present.

This report has emphasized that, the most promising means for improving the utilization of instructional personnel, and thereby reducing costs, is through nationwide adoption of differentiated staffing with attendant emphasis on individualized instruction. As noted previously, this approach would be most effective when used in conjunction with a full array of instructional computers, television tapes, and learning carrels. The proposed differentiated staffing approach would function best when coupled with an automated "individually prescribed instruction" approach, such as the Westinghouse Learning Corporation PLAN method in which the computer continuously monitors the progress of each pupil and prescribes succeeding steps of study.

It is to be noted, however, that the proposed differentiated staffing approach does not necessarily require extensive use of educational technology. The British elementary schools are using an individualized instructional approach, akin to that proposed for the differentiated staffing plan, with reportedly significant success and without extensive use of computers and television. Similarly, performance contractors successfully employ an individualized instruction approach with pupil/teacher ratios comparable to those proposed under the differentiated staffing plan, and without extensive reliance on educational hardware.

Thus, it appears that instructional technology alone will not result directly in cost savings, but that it can contribute to cost savings when related to differentiated staffing.

#### PERFORMANCE CONTRACTING

Recently, a number of private organizations have been commissioned by school districts to assume responsibility for specific teaching-learning programs, most such arrangements having been funded by grants from the United States Office of Economic Opportunity. The firm contracts to raise

the learning achievement levels of pupils by specified amounts. It is paid only for those pupils who attain the specified levels of competence, as measured by performance on achievement tests. The firm provides instructional materials and may supply teachers, or alternately may train the school's existing teachers in its methods, which usually rely heavily on individualized instruction, and the use of paraprofessionals.

The performance contracting approach was reviewed in terms of its potential for reducing costs of instruction. Appendix B-5 describes the experience of a number of districts with such contracts, and presents some cost data.

Preliminary evidence indicates that performance contracting holds promise as a means for improving educational effectiveness, but the use of outside contractors does not appear feasible to CMP as a means for reducing educational costs on a large scale throughout the country. Rather, it is suggested that performance contracting could be adapted by school systems without outside contractors. A few school systems, in fact, have initiated "internal" performance contracts with their own instructional staffs, under which staff compensation is related to pupil performance.

Comparative cost data on performance contracting at this stage are not conclusive. The contractor responsible for one of the most extensive projects, the Banneker school in Gary, Indiana, is being paid at a per-pupil cost rate equivalent to that of the traditional method, but it is uncertain as to whether this could be replicated in a large number of schools.

An internal performance contract appears to be highly compatible with differentiated staffing; in this sense, performance contracting could be a factor in leading to large-scale instructional cost reduction. The instructional mode at Banneker is quite similar to that proposed under the CMP differentiated staffing plan. Students are arranged in nongraded groups, according to ability rather than age. Teachers work in teams, and pupils work individually, each proceeding at his own pace. The number of teachers at Banneker was reduced from 34 to 24; they serve 840 students, providing a pupil/teacher ratio of 35:1, equivalent to that proposed under differentiated staffing. The reduction in teachers was accommodated by engaging 28 paraprofessionals at \$4,000 per year, a ratio of paraprofessionals to teachers slightly higher than the average 1-to-1 ratio suggested by CMP, but consistent with the greater need for individualized instruction of an inner-city school, such as Banneker.

It is concluded that performance contracting through outside contractors does not appear to be a feasible means of effecting large-scale educational economies, but that internal performance contracting can be an efficacious element in a differentiated staffing arrangement which would provide significant cost reduction.

## PART B

### V - SUMMARY OF ECONOMIES AND IMPLEMENTATION CONSIDERATIONS

This chapter summarizes the potential economies which would be achieved through adoption of the described proposals, and considers aspects of implementation.

#### SUMMARY OF ECONOMIES

As noted previously, costs of the proposed methods for improving utilization of instructional personnel were calculated on the basis of 1970-71 data; these are compared below with the estimated 1970-71 costs.

- Adoption of the proposed differentiated staffing plan on a nationwide basis offers a potential for reduction in instructional salaries by \$2,651 million.
- The foregoing savings figure incorporates cost reductions achieved also through more efficient substitute-teaching arrangements, and reduction in district-office supervisory positions.
- Adoption of the Senior Option Plan, in conjunction with differentiated staffing, would provide an additional reduction in instructional salary costs of \$203 million.
- Adoption by all schools that offer driver education by the simulator method of instruction would, under either traditional or differentiated staffing, further reduce instructional costs \$62 million.

Potential savings in instructional salary costs, then, total \$2,916 million, about 13 per cent of actual salary expenditures during 1970-71.

#### SAVINGS IN RETIREMENT PAYMENTS

Reduction in instructional salary costs would permit school districts to make corresponding reductions in payments to employee retirement funds, which represent about 80 per cent of the school-budget category, "fixed charges," or an estimated \$1,840 million during 1970-71. Of this, about 83 per cent, or \$1,528 million, was made on behalf of teachers and other instructional personnel. Adoption of the CMP proposals would reduce this sum by 12.9 per cent, resulting in a reduction in retirement fund payments of \$198 million.

The total potential savings, which could be achieved through implementation of the proposed programs are thus estimated at \$3,114 million.

#### IMPLEMENTATION CONSIDERATIONS

Various impediments would need to be overcome to implement the proposed programs and achieve the projected savings. Perhaps the most critical is the natural resistance of individuals and organizations to change. Although all of the suggested proposals have been used successfully in some schools, their nationwide adoption would require large-scale acceptance of new approaches, and massive training of existing teachers in using the techniques of individualized instruction in an ungraded, open-classroom environment.

New teachers would also need to be trained in the new techniques, and this would necessitate revision in curriculums and methods in college and university schools of education. A very large number of paraprofessionals would need to be recruited and trained.

In many school districts, adoption of the plan would result initially in higher costs, as salary increases are granted to teachers promoted to the senior and master levels, before the excess number of remaining teachers is reduced. Teacher associations and unions can be expected to resist strongly the proposals, which may require contractual changes in tenure arrangements, class size and salary schedules. The traditional school salary schedule, which fixes compensation on the basis of years of experience and educational degree attained, would be replaced by a schedule that rewards teachers who are promoted to the senior and master levels. The salary range for staff teachers would be relatively narrow, and most desirably increases within it would be based on demonstrated accomplishment rather than on years of service.

Adoption of the plan would also require substantial revisions and reinterpretations in such matters as the following:

- State and local educational policies
- Regulations and statutes regarding certification requirements of substitute teachers
- Eligibility of senior option students under state-aid formulas
- Driver education requirements
- Use of approved textbooks.

## TEACHER SUPPLY

The most difficult obstacle to large-scale adoption of differentiated staffing is the further reduction of the number of teachers needed at a time when teachers are in oversupply. Probably, the proposed program could be implemented only on a phased basis, over a period of time. The following is an analysis of the factors that would be involved in gradually adopting the proposed plan over the next eight years.

For 1979, the USOE projects total public-school enrollment of 45.6 million pupils. At an overall average pupil/teacher ratio of 35.8 to 1, differentiated staffing would require 1,275,000 teachers in 1979, substantially fewer than the 2,076,000 teachers in service during 1971. The needed teachers in 1979 could be attained by the following measures:

- Elimination of reentry of former teachers into the system, which currently provides about 2 per cent of the teacher force each year
- Increase of the annual teacher-turnover rate from the current level of 8 per cent to 12 per cent
- Reduction in new teachers hired, to 97,000 annually, from the current level of approximately 180,000.

Once the number of teachers needed has been attained, the pool could be maintained on a stable basis, with an annual average attrition rate of 10 per cent, and the hiring of approximately 127,500 new associates each year. The required distribution of teachers by grade would be as follows:

<u>Teacher Grade</u>	<u>Per Cent Of All Teachers</u>	<u>Number Of Teachers</u>
Associate	22%	280,500
Staff	51	650,250
Senior	14	178,500
Master	<u>13</u>	<u>165,750</u>
Total	100%	1,275,000

Teachers would enter the system as associates. After two years, about two thirds of those still in the system would be promoted to staff teachers; the remainder would be promoted after three years. Annual salary increases averaging 5 per cent would be awarded the associates.

After several years as staff teachers, some would be further promoted each year to seniors or masters. Advancement would not be automatic but based on demonstrated capability. Many would remain at the staff level throughout their careers. Of the total pool of 650,000 staff teachers, 10 per cent would retire each year; about 5 per cent would advance to senior or master teacher rank to replace those who have retired in these brackets, and those who have been promoted to principals and district supervisors.

The proposed system would be characterized by stepped-up turnover and promotion, with emphasis on teachers attuned to new educational methods and philosophies.

The following section discusses governmental action which would facilitate implementation of the proposed programs.

#### SUGGESTED MEASURES TO FACILITATE IMPLEMENTATION

These proposals would be carried out at the local level by individual school districts. However, because of the magnitude of the change that would be involved, strong support would be required from the Federal and state governments.

Implementation would be facilitated if state governments were to assume much greater responsibility for school financing and resultant influence over school-district staffing, which current trends indicate may not be unlikely. In any event, adoption of the proposals described here would require a major commitment on the part of Federal and state governments. The following are suggested for consideration.

##### Federal Actions

1. USOE should undertake a research program to evaluate and refine these differentiated staffing proposals. This would include sponsorship of research efforts to design, develop and test alternate differentiated staffing plans that provide for individualized instruction in an open-classroom situation, with appropriate use of team teaching, nongraded sections, instructional technological developments and performance contracts with school staff members.

The research should be oriented toward determining the relative educational effectiveness of differentiated staffing models in comparison with traditional staffing plans. The emphasis should be on evaluating models that would reduce instructional salary costs, as described in this report.

If the conclusions expressed in this report are valid, the foregoing research program would result in the identification of a series of differentiated staffing models suited to different kinds of schools with different kinds of pupils - inner city, suburban, rural, high income, low income and others.

USOE should then assist state and local educational agencies in implementing differentiated staffing plans, by providing research documentation, implementation guidelines, staff-training materials and technical consultation.

2. USOE should undertake a program to assist state and local educational agencies to use effectively available curriculum plans and instructional materials. This should include a research evaluation of those now available, identification of the additional materials which could be developed to meet the needs of the varied schools and pupils, and a review of the scope and use of the present informational clearinghouse service. It is suggested that this would be a valuable project for the National Institute of Education.

3. The USOE should encourage state and local educational agencies to seek additional means for achieving economies by sponsoring research studies and disseminating the results in areas such as the following:

- Substitute teaching arrangements
- Senior option plans and other arrangements for recognizing and formalizing the value of extramural learning
- Driver-training programs.

4. The Federal government should provide funding to encourage voluntary early retirement of teachers. Whether or not differentiated staffing is adopted, there will be an oversupply of teachers in the decade of the 1970's; means should be encouraged that will make room in the school system for younger teachers who are trained in new methods, and attuned to new educational philosophies. Commission staff members have conceived a plan, which should be seriously considered, under which the Federal government would fund a portion of the compensation paid to teachers who retire early.

#### State Education Agencies

1. State departments and boards of education should exert leadership in changing state policies, regulations and statutes which inhibit or prevent adoption by local school districts of differentiated staffing and other instructional cost-reduction measures.

In some states, laws pertaining to teacher tenure are barriers to conversion from traditional to differentiated staffing - revision should be initiated. States should at least follow New York's lead and expand the probationary teaching period to five years, before the award of tenure.

States that base financial-aid formulas on average daily attendance should change to those based on average daily membership. This would permit school districts to use, without financial penalty, innovative approaches that allow students to spend entire semesters on assignments away from school, such as senior option programs.

States such as Louisiana and California should revise statutes that establish fixed ratios or percentages pertaining to staffing and salaries. For example, Louisiana law stipulates that the pupil/instructional staff ratio must not drop below 25:1; California law requires that 55 per cent of a school district's budget must be designated for professional salaries. Such regulations could preclude maximum effective utilization of teacher aides, and new technological instructional systems.

Laws in other states restrict the use of teacher aides. For instance, Illinois law cites that noncertified personnel (teacher aides) may assist in instruction under the immediate supervision of a certified teacher and perform activities assigned under direct supervision of a certified teacher, but may not initiate instruction or be assigned to any class period when an assigned certified teacher is not present.

Although differentiated staffing programs could function successfully in spite of these and similar regulations, the laws should be modified to ensure a smoother and more efficacious operation.

2. Adoption of differentiated staffing by a local school district may result initially in higher salary costs, followed by subsequent yearly reductions and a long-term cost reduction. State education agencies, in partnership with the Federal government, should consider grants or other means to aid school districts in meeting the higher start-up costs. For example, programs might be developed in which school districts that introduce differentiated staffing would be granted extra state aid for two or three years, which would be "paid back" in the form of lower per-pupil allotments in subsequent years - when the differentiated staffing plan has begun to reduce per-pupil expenditures.

3. State education departments should establish or designate staff groups charged with responsibility for aiding local school districts in testing and

installing differentiated staffing plans and other cost-saving measures. Functions of these staff groups would include:

- Disseminating finds of USOE and other research studies to school districts, and cooperating with the Office in the conduct of such research.
- Providing consulting assistance to school districts, which would include conducting analyses of present staffing arrangements and costs, suggesting differentiated staffing plans appropriate to school and pupil needs, projecting cost and personnel implications of adoption of new plans, and counseling on methods for obtaining Federal and state start-up grants.

4. State agencies should evaluate the impact of differentiated staffing programs on teacher association relationships and contractual agreements. Resolution of these matters will undoubtedly prove to be a major impediment in the implementation of cost-reduction measures and will require patient and determined effort on the part of state agencies.

THE PRESIDENT'S COMMISSION ON SCHOOL FINANCE

ECONOMIES IN EDUCATION

PART C

PURCHASING AND SUPPORT SERVICES

THE PRESIDENT'S COMMISSION ON SCHOOL FINANCE

ECONOMIES IN EDUCATION

PART C

PURCHASING AND SUPPORT SERVICES

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## PART C

### I - INTRODUCTION

Net expenditures for schools in 1970-71 were estimated by the United States Office of Education at \$44.4 billion. Of this, Cresap, McCormick and Paget Inc. estimates that \$6.3 billion was expended for certain major support services, as follows:

<u>Services</u>	<u>Expenditures</u> (Billions)
Operation of plant	\$2.9
Maintenance of plant	1.1
Pupil transportation services	1.4
Health services	0.3
Food services, net	0.5

Of this total, an estimated \$4.1 billion was used for salary payments to district employees, fees to maintenance and transportation contractors and other miscellaneous purposes.

The remaining \$2.2 billion bought supplies and equipment, including maintenance and operating supplies, food service equipment, buses and gasoline and other items associated with support services. Also, schools bought \$2.8 billion in supplies and equipment that were used for instruction and other purposes. Thus, total purchases amounted to \$5.0 billion.

The foregoing represent net expenditures for support services and purchased supplies and equipment. Besides, school districts made expenditures for food and salaries of food service workers, which were reimbursed by receipts from lunch sales. These reimbursed expenditures are discussed separately in this section.

Methods used to derive the foregoing are described in Appendix C-1, included in a supplemental volume to this report.

## OBJECTIVES AND METHODS OF STUDY

This section is concerned with means by which school districts can achieve economies in:

- The purchase of supplies and equipment that amounted to \$5.0 billion in 1970-71
- The delivery of support services that cost \$4.1 billion in 1970-71, exclusive of the component for purchasing.

Attention was focused on the use of business management techniques that enable school districts to reduce costs while providing an equivalent or improved level of service.

The study included the following major steps:

- Detailed analyses of school costs were made, utilizing data on expenditures furnished by USOE and other sources.
- Interviews were held with knowledgeable individuals, including representatives of school districts, state education departments, USOE, the Association of School Business Officers, National Association of Purchasing Management, and school and institutional publications.
- Research and management studies pertaining to school business and administration matters were identified and analyzed, including prior work of CMP with individual school districts.

## ARRANGEMENT OF PART C

This part of the report includes the following chapters, which succeed this Introduction.

- II - Purchasing Of Supplies And Equipment - which identifies means for reducing the cost of items bought by school districts
- III - Delivery Of Support Services - which reviews methods for more efficiently utilizing support service personnel
- IV - Summary Of Potential Reduction In Costs Of Purchasing And Support Services - which estimates the dollar volume of savings that could be achieved nationally through adoption of the proposed measures.

## PART C

### II - PURCHASING OF SUPPLIES AND EQUIPMENT

This chapter reviews opportunities to achieve economies in purchasing, through use of management techniques that provide for procurement of needed items, in correct amounts and at favorable prices.

#### SCHOOL PURCHASING EXPENDITURES 1970-71

CMP estimates that school purchases of supplies and equipment in 1970-71 amounted to \$5.0 billion, not including land and buildings, contracted services or food and milk. This figure was derived by examining each of the categories in which USOE reports school expenditures, and by estimating the percentage of each disbursement that is used for purchasing supplies and equipment. This was achieved, as explained in Appendix C-1, by analysis of USOE data and budgets of representative school districts.

Exhibit II-1, which follows, presents, for each budget category, total expenditures, percentage used for purchases and resulting dollar volume of supplies and equipment procured.

Overall, approximately 11 per cent of the total school dollar goes for purchases of supplies and equipment.

Exhibit II-1 does not include expenditures for food, contracted services or new buildings, which are discussed elsewhere in this report.

Typical items purchased for each of the budget categories are:

- Instruction - textbooks, library books, workbooks, pencils, paper, chalk and other instructional supplies, projectors, desks, chairs, laboratory apparatus and other instructional equipment
- Operation of plant - tools, cleaning supplies and equipment
- Maintenance of plant - trucks, building supplies
- Pupil transportation services - buses, tires, maintenance equipment, gasoline, oil and other transportation supplies

PART C  
EXHIBIT II-1

TOTAL EXPENDITURES AND PURCHASES BY  
SCHOOL BUDGET CATEGORY

<u>Area</u>	<u>Total Expenditures</u> (Millions)	<u>Per Cent Used For Purchases</u>	<u>Amount Of Purchases</u> (Millions)
Total Instruction	<u>\$25,088</u>	7%	<u>\$1,715</u>
Support Services			
Operation of plant	\$ 2,931	41%	\$1,213
Maintenance of plant	1,145	12	136
Pupil transportation services	1,436	21	306
Health services	299	3	10
Net food services	<u>529</u>	100	<u>529</u>
Total	\$ 6,340		\$2,194
Other Operating Expenses			
Administration and Miscellaneous	\$ 2,726	2%	\$ 68
Current expenditures for other programs	1,573	11	172
Fixed charges	2,300	-	-
Interest on debt	<u>1,336</u>	-	<u>-</u>
Total	<u>\$ 6,765</u>		<u>\$ 379</u>
Total Capital Outlays	<u>\$ 5,061</u>	17%	<u>\$ 860</u>
Grand Total	<u>\$44,424</u>		<u>\$5,009</u>

- Health services - nurses' supplies, first-aid equipment
- Food services, net - cooking and food service equipment and supplies (no food or milk)
- Administration and miscellaneous - office supplies, business machines, desks and other office equipment
- Current expenditures for other programs - various instructional and office items used in operation of summer schools, adult education programs and community service activities
- Capital outlays - major equipment items financed through proceeds of bond sales, especially those installed when new schools are constructed.

The opportunity to reduce costs through improvements in purchasing techniques varies among the different kinds of items purchased. Accordingly, total purchasing expenditures were analyzed to develop estimates of the expenditures for each category of item. As explained in Appendix C-1, this was accomplished by studying budgets of representative school districts to determine typical spending patterns.

Exhibit II-2, which follows, presents the resulting estimates of total national expenditures for the various types of items purchased.

The opportunity to effect economies in purchasing is also a function of school district size. The USOE provides data on expenditures by school districts in each of six size categories, as measured by total enrollment. These data were analyzed, and estimates were made of purchasing expenditures by school districts in each size category.

Exhibit II-3, which follows, shows for each of the six categories, the total expenditures for all districts, the percentage of national purchases represented by the size category, the number of districts in the size category and the resultant estimated expenditures for the average district in each size category.

#### OPPORTUNITIES FOR ACHIEVING ECONOMIES IN PURCHASING

The major opportunity for increasing the efficiency of school purchasing is in centralizing responsibility for buying supplies and equipment in professionally managed purchasing departments which buy in large volume and utilize

PART C  
EXHIBIT II-2

TOTAL NATIONAL EXPENDITURES  
FOR VARIOUS ITEMS PURCHASED  
1970-71

(Millions Of Dollars)

	<u>Estimated</u> <u>Expenditures(a)</u>
Supply Items	
Office	\$ 56
Instructional	819
Health	9
Operations and maintenance	357
Food service	359
Fuel	355
Subtotal	<u>\$1,956</u>
Equipment Items	
Office	\$ 28
Instructional	664
Health	2
Operations and maintenance	221
Food service	353
Subtotal	<u>\$1,268</u>
Transportation Supplies, Equipment, Buses	<u>\$ 398</u>
Textbooks And Library Books	<u>\$ 813</u>
Utilities	<u>\$ 574</u>
Total	<u><u>\$5,009</u></u>

(a) Totals may not add because figures have  
been rounded to the nearest million.

PART C  
EXHIBIT II-3

PURCHASING EXPENDITURES BY  
SIZE OF SCHOOL DISTRICT  
1970-71

<u>District Size In</u> <u>Total Enrollment</u>	<u>Total Purchases By</u> <u>All Districts</u>		<u>Number Of</u> <u>Districts</u>	<u>Purchases</u> <u>Per Average</u> <u>District</u> (000)
	<u>Millions Of</u> <u>Dollars</u>	<u>Per Cent</u> <u>Of National</u> <u>Purchases</u>		
Over 25,000	\$1,628	33%	191	\$8,510
10,000 to 24,999	844	17	557	1,512
5,000 to 9,999	849	17	1,104	766
2,500 to 4,999	724	14	2,018	358
300 to 2,499	903	18	7,834	115
Under 300	<u>61</u>	1	<u>5,794</u>	11
All Districts	\$5,009	100%	17,498	\$ 480

efficient procurement techniques. Small-scale purchasing operations - such as those in small districts or in individual schools which do not buy centrally - purchase in small quantities and are unable to take advantage of the lower prices available to larger volume buyers. Nor can the small operation afford to engage professional purchasing managers, and economically justify the use of techniques, equipment and facilities that reduce costs in large procurement programs.

As district size increases, opportunities for effecting purchasing economies increase, and the most modern and efficient purchasing operations observed in the course of this study were in large consolidated school districts.

Districts with enrollments of 5,000 or more, although comprising less than 11 per cent of all districts, account for two thirds of total school purchases, and are large enough to afford professionally managed purchasing departments and more advanced purchasing techniques. The typical district with 5,000 enrollment makes annual purchases of more than \$500,000 - sufficient to justify use of professional purchasing management and techniques which would be more than repaid in resulting savings.

Conclusions from the foregoing are as follows:

- Small districts can make significant economies in purchasing by entering into cooperative purchasing arrangements with neighboring school districts and jointly establishing a professionally managed central purchasing unit serving about 5,000 students or more.
- Larger districts, if they have not already done so, should centralize responsibility for purchasing for all member schools, at the district level.
- Very large districts, or cooperatives formed by a number of smaller and intermediate size districts, can achieve economies through the adoption of more advanced techniques now in use in some pioneering school districts.

#### Extent Of Use Of Effective Purchasing Systems

The experience of school districts which have instituted centralized, professional purchasing programs indicates that purchasing costs can be reduced in a range of 10 per cent to 25 per cent or more, depending on the adequacy of the prior program, the kind of new program installed and local conditions. On the basis of direct observation of a number of school districts,

review of research studies and the experience of representative purchasing authorities and state school officials, it appears that the majority of the nation's school districts are not taking full advantage of the savings that can be gained through installation of well-managed centralized purchasing programs which incorporate effective purchasing practices.

Recent studies of school district purchasing in New York and Massachusetts reveal major opportunities for improvement. The limited use of sound purchasing practice in two states generally regarded as relatively advanced suggest that significant opportunities exist on a nationwide basis for achieving economies in purchasing.

#### Survey Of New York State School Districts

The study of school districts in New York State was conducted by Dr. Marion Pasnik of the New York City Board of Education and reported in the December 1970 issue of School Management Magazine. Some key findings follow:

- Fifty-eight per cent of responding districts had not developed standardized purchasing policies.
- Half of the governing boards of education did not prescribe the purchasing procedures to be used.
- Very few districts had developed purchasing manuals that spell out approved procurement policies and procedures.
- Only about one third of the districts regularly obtain evaluation from staff users, on the quality of items purchased.
- Few districts used competitive bidding to the maximum feasible extent; for example, only one sixth of the districts purchased insurance on the basis of competitive bids.
- Half the districts had not analyzed paper-work processes to improve efficiency and reduce costs. The majority had not studied monetary losses due to errors in paper-work processing, or established forms control programs.
- Quantity of items received was almost always checked against the amount ordered, but only 25 per cent of the districts evaluated items received against order specifications. Fewer than 30 per cent made quality checks of goods received.

- Only one third of the districts evaluated vendors on the basis of their assistance in improving purchasing procedures. Twenty four per cent examined vendors for their contribution to improved purchasing schedules.
- Only half the districts were able to pay invoices in 21-30 days, of which only 16 per cent were able to pay in less than 10 days. Only 23 per cent have a special provision for taking advantage of cash discounts, when they occur.

#### Survey Of Massachusetts Districts

The study of school districts in Massachusetts, which was conducted by the Massachusetts Business Task Force for School Management, revealed similar opportunities for improvement in purchasing procedures and resultant cost reduction. This study reported the following regarding the typical school district in Massachusetts:

- Formal purchasing policies have not been developed; a purchasing manual has not been prepared.
- Responsibilities of purchasing department employees are not clearly defined.
- Supply lists, procedures and equipment needs are not standardized.
- Purchasing committees, which would determine district purchasing needs, establish product specifications and evaluate items, are not in use.
- Competitive bidding laws are not current and do not reflect current costs of materials.
- Purchasing cycles are not planned and developed.
- Records of product usage, needed to determine optimum purchase quantities, are not maintained adequately.
- Even the larger school districts in Massachusetts are not using, or planning to use, computers to operate the purchasing system more efficiently.

- There is insufficient communication between purchasing and "user" personnel concerning selection of items to be purchased, quantities and other significant matters.

### CHARACTERISTICS OF EFFECTIVE CENTRALIZED PURCHASING PROGRAMS

The degree of complexity or sophistication of the purchasing program appropriate for a district or a cooperative purchasing group depends on such factors as the size of the district, annual volume of purchases and number of individual schools involved. However, certain elements are essential to all well-managed centralized purchasing program techniques.

#### Standardization Of Product Specifications

An essential feature of centralized purchasing is the development of standard specifications for all items used in quantity by the various member schools or districts. These standards set forth the quality and characteristics of items to be purchased and, as an example, in the case of pencils, would specify shape, round or ridged, quality grades, lengths, lead hardness and colors.

The sets of standard specifications should be developed by committees, which include "user" representatives from selected schools or member districts, and central purchasing and financial personnel. They should meet periodically to evaluate the performance of items in use and develop new or modified specifications as indicated.

The objective of standardization is to enable volume purchasing and therefore at more favorable prices. An effective standardization program further reduces costs by avoiding the purchase of costly items of higher than needed quality.

#### Control Of Purchases And Usage

An important element in all purchasing operations, for the small as well as the larger centralized program, is the purchase of correct items in appropriate amounts. Funds are wasted by both overbuying, which results in product obsolescence, and by poor control of item usage, which results in waste. In well-managed purchasing operations analyses are made of usage rates of each item, to determine needed annual volume, and controls are established to

prevent over-usage. In more advanced systems, studies are made to determine the "economic order quantity" which will result in the lowest total cost of acquisition, taking into account the price paid, cost of issuing purchase orders and warehousing and inventory-carrying costs.

### Consolidation Of Purchase Orders

The essence of centralized purchasing is the grouping of requisitions from individual consuming units - schools or departments - into consolidated purchase orders. This practice enables the district to take advantage of quantity discounts and also to reduce administrative costs. Grouping of requisitions is particularly appropriate for items that are used repeatedly, for which usage rates can be estimated in advance.

### Maximum Use Of Competitive Or Negotiated Bids

In effective purchasing programs, all possible items are purchased after competitive bidding by prospective vendors, or alternatively, on the basis of contracts negotiated with selected vendors after careful review. The practice of issuing purchase orders to a particular supplier without prior submission of competitive quotations or negotiation is avoided in well-managed programs, except for small orders where it is known that the selected vendor provides favorable prices and terms. The use of competitive or negotiated bidding procedures tends to increase the number of vendors considered, improves the value of items purchased and provides a contractual means for assuring compliance with quality and delivery requirements.

### Analysis Of Vendor Pricing Structures

A critical factor in consolidating purchase orders and evaluating competitive bids is the vendor pricing and discount structure. For example, many items purchased by school boards are subject to "complete award discounts" - the vendor grants a discount if the full order set forth in the request for bid is awarded. This is shown in the following example:

<u>Item</u>	<u>Total Bid Price</u>	<u>Complete Award Discount</u>	<u>Net Bid Price</u>
Office Supplies	\$8,022.65	13.7%	\$6,923.55
Nursing Supplies	3,910.02	-	3,910.02
General School Supplies (Part I)	1,441.39	11.3	1,278.15
General School Supplies (Part II)	5,680.25	20.0	4,544.20

The complete award discounts in the foregoing example range from 0 to 20 per cent, which indicates the desirability of consolidating requisitions into fewer and larger purchase orders. Pricing and discount schedules vary by item, and continued professional analysis is necessary to determine the most economical methods of ordering. For example, nursing and custodial supplies normally are not subject to complete award discounts but are granted volume discounts. These items tend to vary significantly in price and quality with the result that in a bid request, nurses and custodians often specify brands desired, with no allowable substitutions. Any given vendor is unlikely to carry all specified brands on a bid request, and accordingly, nursing and custodial items result in many split orders which earn lesser discounts. In an efficient, centralized purchasing operation, analysis will be made to decide whether revisions can be made in the brands specified, in order that the district may earn larger discounts.

Some items purchased by school districts are subject to cash discounts, if vendor invoices are paid within 10 days or other specified periods. School districts generally have sluggish disbursement procedures, very often requiring approval by a board of education which meets only monthly, and as a result, advantage is not taken of an opportunity to earn additional price reductions. Experienced vendors may quote higher base prices to the school district with a record of slow payment, and even the granting of a volume discount against the higher base price still results in a higher net price to the district.

For instance, in 1970, the President of the New York City Board of Education, while endeavoring to initiate faster payment practices, announced that vendors tended to quote prices up to 18 per cent above normal to the slow-paying N. Y. C. Board in order to recover the interest costs involved in financing accounts receivable. Besides, he observed, many vendors are discouraged from bidding by the Board's slow payment practices. Unless restricted by statute, the efficient purchasing department arranges for prompt payment.

#### Planned Purchasing Cycles

Well-managed purchasing programs use "planned purchasing cycles" that provide for requisitioning, ordering and delivery of purchased items at specified dates throughout the school year. For example, individual schools may furnish the purchasing department with supply lists by March 1, textbook lists by April 1, magazine lists by April 15, and library-book lists by October 1, etc. The purchasing department will solicit bids from approved vendors at specified times throughout the year. For instance, bids for professional books, ice cream and general supplies and equipment may be advertised in July, electrical and plumbing supplies in February, etc. Contracts are drawn up with selected vendors that specify delivery dates and other terms.

The use of planned purchasing cycles offers many advantages. The purchasing administrative workload is distributed more evenly over the course of the year. Peak load problems in the receipt of purchased items are avoided. Vendors can anticipate orders - a factor in making for more favorable prices - and schedule deliveries in advance, which helps avoid shipping delays and stock shortages.

### Centralized Receiving And Warehousing

The desirability of maintaining a centralized receiving and warehouse facility is a complex question which is dependent on a number of factors, including annual volume of purchases, extent to which annual contracts are used, delivery and pricing terms negotiated with vendors, availability of space in individual schools for maintaining stocks and geographical size of the district. Normally, a central warehouse enables the district to buy many items at lower prices, because vendors need not make frequent small deliveries to individual schools using the items. Moreover, the unified control made possible by a central facility helps ensure prompt deliveries by vendors, better adherence to specifications, obtaining of cash discounts for prompt payment and control of stock.

Decisions on centralized warehousing should be made following detailed analysis of the relative costs and advantages, and determination of usage rates, items to be stocked, and appropriate stock levels. Inventoried items should be lower-cost supplies used in large volume. For example, the procedure of the Dade County school system - which has unusually advanced school management programs - calls for stocking the following categories of supply items, which range in price from \$0.12 to \$32: general instructional, industrial arts, homemaking, physical education, first aid and custodial.

Items used infrequently, and those costing more than \$32 are not stocked but listed in a catalog of approved items prepared by the district. The catalog lists 44 different categories of nonstocked items, each containing up to 258 items. These are mostly costly equipment, such as office machines, laboratory apparatus and home economics and industrial arts equipment. Also included are infrequently used supply items, such as science supplies and music, supplies some of which cost as little as \$0.15.

Normally, centralized warehousing is most suitable for large school districts with professionally managed purchasing operations. Depending on circumstances, certain of the price advantages gained through warehousing can also be obtained through the use of vendor contracts that provide for

periodic deliveries of supplies direct to using schools. An assured volume of business to the vendor may result in favorable prices, despite the extra cost incurred by the vendor in delivering separately to many schools incurred in direct delivery. An effective method for implementing this approach is "systems contracting" which is described in detail later in this report.

The relative costs of various alternative methods of receiving shipments and carrying stocks should be analyzed, and a system developed which provides for maintaining needed levels of stocks at the lowest overall costs, taking into account costs of carrying inventories and the cost of purchasing administration, as well as the actual cost of items purchased.

#### Employment Of Professional Purchasing Personnel

Administration of the foregoing activities requires that the purchasing function be carried out by a centralized professional purchasing staff, which would include an experienced purchasing manager, and staff buyers and clerks as needed by the volume of work. In smaller districts, the position of purchasing manager may be a part-time responsibility of the business manager, who should be skilled in the techniques of efficient procurement. Further responsibilities of the central purchasing staff are to:

- Maintain continuous contact with present and prospective vendors, in order to negotiate most favorable pricing and contractual terms, expedite disposition of claims, obtain and disseminate latest information on new products, expedite shipments and arrange for the best shipping procedures.
- Analyze vendor price structures, to obtain the most favorable terms. Develop and recommend procedures for paying invoices promptly to take advantage of available cash discounts.
- Under the direction of the superintendent and school board, develop a written manual that spells out purchasing policies and procedures, setting forth responsibilities and limits of authority for all positions involved in the procurement process.
- Establish procedures to maintain ongoing records of product usage which are needed to determine proper order quantities and to efficiently control stock levels.

## COST SAVINGS IN LARGE PURCHASING PROGRAMS

The foregoing elements should be incorporated in all centralized procurement programs that serve student populations of about 5,000 or more. The techniques will be more fully implemented in larger systems that can achieve a higher volume of savings, and can also afford a larger number of skilled personnel and greater investments in warehousing, transportation, and data processing facilities and equipment.

The recommended techniques in two large school systems is described in the following paragraphs.

### Dade County, Florida

The schools in this district, which includes Miami and surrounding suburban communities, are consolidated into a countywide system with enrollment of approximately 250,000 students. One of the largest school districts in the nation, it is regarded as having one of the most successful cooperative purchasing departments which reportedly saves the district millions of dollars annually, in the cost of items purchased.

For each category of products, a purchasing committee is established which includes users of the product category, representatives of the budget department and purchasing personnel assigned to deal with the particular product line under examination. The committees evaluate items to be purchased, develop specifications and appraise items after purchase. District personnel report that this approach assures procurement of items that meet required quality standards, expedites the procurement process and speeds receipt of needed items.

The district employs a competitive bidding procedure for all possible items. Typically, a one-year contract is issued, which provides for purchase of a specified quantity of the items at a specified price, over the twelve-month period. Shipments are made periodically throughout the year, on issuance of instructions by the district. This system provides a number of advantages besides that of obtaining low prices from vendors because of the assured yearly volume. Contracts are issued on a scheduled basis through the year making possible an even, predictable purchasing cycle. Arrangements are made to maintain inventories of high-volume items in vendors' warehouses, with shipments made on an as-needed basis, reducing district warehouse requirements and inventory carrying costs.

The Dade County system is based on accurate data on item usage developed by the district, and on systematic control of contracts, shipments and warehouse stocks. Other consequences of the system are efficient warehousing, and on-time payment of vendors' invoices with attendant savings through maximum use of available cash discounts.

The system provides for consolidation of purchase orders, which reduces administrative costs. A recent study indicated that the Dade County district, which has twice as many students as any other county in Florida, issued only about 35,000 purchase orders in a recent year. By contrast another consolidated county school district in Florida, with one eighth as many students, issued approximately the same number of purchase orders in one year.

Continuing efforts are being made to improve and refine the existing purchasing system in Dade County. At the time of this study, investigations were being made of the cost savings that could be achieved through computerized inventory administration, and systematizing vehicular delivery routes for warehouse supplies. The computerized inventory control system would include development of programs to determine optimal reorder points and "economic order quantities" - the quantity of an item to be purchased, which will result in the lowest "cost of acquisition," taking into account not only the unit price of the item, but also the cost of issuing the purchase order, warehousing the items and maintaining inventories.

The chief business manager for the Dade County School System estimates that, as a result of purchasing on a countywide basis using the systematic procedures and practices described here, the overall purchasing expenditures are 20 to 25 per cent less than in a decentralized system in which each municipality would do its own purchasing.

#### Duval County, Florida

This district, which includes Jacksonville and surrounding suburbs, has a consolidated school system of approximately 119,000 students. While the purchasing program utilized by the Duval County schools is not as advanced as that of Dade County, it does employ modern cost-reducing techniques and is being developed into an advanced procurement system.

Purchasing procedures are clear and well organized. Committees have been established, to estimate demand for individual items, and to specify needed quality standards. Purchase orders are consolidated wherever possible.

Large items are shipped by vendors directly to schools. Small, high turnover items, after demand estimates are made, are warehoused by the district and delivered to the school systematically as needed, which results in more economical use of warehouse space. The district is currently developing valid usage data, as a means to improve inventory control.

The purchasing director estimates that if each school purchased independently, the overall cost of procurement - including both the cost of items purchased and administration of the purchasing function - would be more than 20 per cent greater. As with Dade County, this estimate is based on observations and general experience of the purchasing official concerned.

#### SYSTEMS CONTRACTING

This section describes an innovative method of purchasing consumable supplies, which was developed in industry and which has application to centralized school purchasing programs. Elements of this approach, known as "systems contracting" are incorporated in the purchasing programs at Dade County and other districts with advanced programs. Systems contracting furnishes a framework for implementing the efficient purchasing procedures suggested in the previous chapter.

Under this approach, recognition is given to the fact that the true cost of purchasing includes not only the actual price paid for the items procured, but also the following:

- Cost of administering the purchasing department, including salaries, share of central office overhead, paperwork costs in processing requisitions, issuing purchase orders and maintaining records.
- Cost of the time of nonpurchasing personnel who participate in purchasing decisions, serve on purchasing committees, provide data on item usage, and evaluate products.
- Cost of maintaining inventories, including record-keeping, warehouse space, intra-district transportation, salaries of receiving clerks and stockmen, and losses due to over-ordering from product obsolescence, waste and spoilage.
- Cost of capital used to finance inventories if the district engages in short-term borrowing.

The systems contracting approach seeks to minimize the overall cost of procuring supplies, including the direct prices paid to vendors. Approximately 40 per cent of the school purchasing dollar is expended for supply items - most of them low in unit cost - including instructional and office supplies, and operations and maintenance supplies. Systems contracting is a means for simplifying the procurement of low-cost supply items and also standardized equipment.

In this approach, the purchasing department negotiates contracts with selected vendors who maintain certain stock levels in their own warehouses. Requisitioners in each using department are empowered to order directly from the vendor. The purchasing department itself is no longer involved in the day-to-day requisitioning and ordering of routine items, which lessens paperwork, may permit reductions in clerical staff, and frees the time of purchasing personnel for improving the procurement of more costly items, such as textbooks and capital equipment.

The systems contracting approach functions essentially as follows.

- Purchasing committees are appointed, composed of purchasing personnel, budget or financial personnel and representatives of using departments or schools.
- The committees determine usage rates of items to be purchased for the forthcoming school year, agree to standardize the items to be used, and establish item specifications.
- The purchasing department surveys prospective vendors, and decides which are capable of supplying the desired items and maintaining needed stock levels in their warehouses.
- Based on competitive bidding or negotiation, contracts - usually for one year - are drawn up with selected vendors. Contracts cover such elements as price terms, vendor service requirements, termination arrangements, exchange and return privileges and item delivery points.
- Each vendor then furnishes catalog lists of items available under contract, for distribution to each user or requisitioner. The user then requisitions, directly from the vendors, needed items against his budget allowance.

A typical ordering procedure is as follows.

- The requisitioner completes a four-copy requisition-order form, retains one copy and sends three copies to the vendor.
- The vendor transforms the document into a purchase order. He prices each item, based on the agreed-upon catalog cost. The vendor retains copy number 2.
- Copies 1 and 3 serve as shipping papers and are forwarded with the supplies to the delivery point, which may be an individual school or the district warehouse.
- The receiving department verifies receipt of the shipment and directs the supplies to the original requisitioner, accompanied by copy number 3.
- The receiving authority signs copy number 1 and forwards it to the accounting department, which makes periodic payments.

Items are usually shipped directly by the vendor to the school that requisitioned the order, rather than to a district warehouse - at more favorable prices, however, than the school could have achieved as an independent non-contract purchaser. Certain items may still be stocked in the central district warehouse, in which case the requisition would emanate from the district purchasing department.

#### Implementation Of Systems Contracting Approach

Some form of systems contracting is generally applicable to centralized professionally managed school purchasing operations. As with most innovative approaches, however, some problems can be expected in implementation. A common initial one is obtaining accurate data on item usage, so that firm commitments can be made to vendors. Thus, it is usually desirable to initiate systems contracting on relatively simple item categories, such as office and custodial supplies, and other readily available supplies. As experience is gained the systems contracting approach should be extended to the majority of supply items used by the district.

Adoption of systems contracting is facilitated if the district has satisfactory relationships with reliable vendors, without which the system would be unsuccessful. The vendors selected must be capable of carrying a large number of the items needed and must be able to make deliveries on short notice.

Sometimes, after a contract is signed the district may learn that some items can be purchased elsewhere at a lower price. Here, the district must recognize that price is only one component of total purchasing cost, for the system will not work if vendors are changed each time a lower price becomes available. Naturally, consideration would be given to the alternate vendor when preparing subsequent contracts.

The systems contracting approach requires that all requisitioners order against the contracts and not buy independently from nonparticipating vendors. Such "leakage" problems can be avoided by proper personnel orientation when the system is initiated and by appropriate budgetary controls.

A high degree of mutual trust between district and vendors is required for successful operation of the system. Some purchasing personnel fear that vendors will become complacent and fail to provide good service. The experience of corporations has been that, because an assured volume of business is highly desirable, many vendors will compete for initial contracts and the successful ones will exercise great effort to retain these contracts in ensuing years.

A major advantage of systems contracting is that, by virtue of good advance planning, the vendor can anticipate the volume of orders and maintain the needed levels of inventories and can thereby fill orders quickly and completely. Nevertheless, occasional vendor "stockouts" may occur, particularly during the startup period, when both school district and vendors are adjusting to the system. The following procedure is typical for accommodating stockouts.

If a requisitioner orders 15 units of an item from a vendor who has only 10 available, the vendor would contact the requisitioner immediately, notifying him of the stockout and asking if 10 items would be sufficient. If the requisitioner needs the additional five items immediately, the vendor would make up a new three-part requisition and include all the information given on the original. To control this new requisition, and to relate it to the partial order that is being processed, the original requisition number is used but -a-1 suffix is added which alerts the accounting department that the order has been authorized by the original number. The suffix also gives a ready means of evaluating vendor performance.

### Savings Potential

It was estimated by an official of NAPM that corporations with well-developed systems contracting programs have reduced the cost of purchasing consumable supplies by about 20 per cent, through lower prices and savings in administrative expense, warehouse space, inventory shrinkages, and inventory carrying costs.

It appears that comparable savings could be made by school districts adopting this approach. However, school accounting systems customarily do not consider the cost of capital used to finance inventories as an expense item. NAPM estimates that, in industry, this factor is responsible for about 2 percentage points of the total 20 per cent savings brought about by systems contracting. Accordingly, the potential savings by school districts would be somewhat less than in industry, and are judged to be in the range of 15 to 20 per cent.

### COOPERATIVE PURCHASING ARRANGEMENTS

This section describes the implications of entering into cooperative purchasing arrangements, which represents a primary opportunity for smaller school districts for purchasing cost reduction.

Several possible alternative cooperative arrangements are:

- A number of small districts may join together to form a cooperative purchasing group, while otherwise maintaining the autonomy of individual districts.
- When a number of small districts are consolidated into a single larger district, a centralized purchasing operation may be established in the new district office.
- A larger district may establish a central purchasing unit to serve not only its own schools but nearby small districts as well.

As noted previously, the opportunity for savings through cooperative buying is not limited to combinations of small school districts. One of the nation's most ambitious cooperative purchasing programs, reported in School Management Magazine, is being developed in the Washington, D. C. area by the Council of Governments, which includes 24 separate jurisdictions in the District of Columbia and nearby sections of Virginia and Maryland. The cooperative has identified various items for which substantial cost savings can be made by cooperative volume buying. For example, the annual cost of fuel for the districts involved would be reduced by \$250,000.

Similar opportunities were found in a study made a few years ago of 17 suburban school districts in Chicago, which cooperated in the purchase of art, duplicating and instructional supplies. The districts jointly purchased 967 different items at an annual cost of approximately \$116,000. A control group

was set up, consisting of three districts that purchased the same items independently. It was found that the cooperative purchasing arrangement resulted in savings of \$10,100, or 8 per cent, in comparison with costs to the control group. Also, the cooperative arrangement reduced time spent on purchasing matters and freed some personnel for other business.

Some school districts work out cooperative buying arrangements with nonschool governmental units, as well as with other school districts. For example, School Management Magazine reports that the Fairfax, Virginia, county office and school district recently entered into a joint furniture contract for \$500,000. The purchase was large enough to permit direct buying from the manufacturer, thereby making a substantial cost reduction. Florida's state education department representatives report that, in Brevard County, the consolidated county school district and the county governmental unit buy items jointly and maintain a joint warehouse facility, which provides significant savings.

Cooperative purchasing groups normally are established on a voluntary basis, with member districts retaining the option to purchase through the cooperative or directly from vendors. Initially, the cooperative groups may purchase only certain high volume items, such as fuel oil, but as experience is gained, the successful group will establish specifications for an increasing number of items and absorb more and more of the purchasing of its member districts.

In her 1968 study of cooperative purchasing arrangements among school districts in New York State, Dr. Marion Pasnik found that most cooperative groups in the state were made up of districts in the 2,000 to 5,000 enrollment range, and that these groups also tended to be the most successful. Generally, these groups had succeeded in reaching agreement among their member districts on the items to be purchased jointly; most of the members purchased large volume items through the group rather than independently by direct negotiation with vendors. Each member district assumed its full share of the joint costs, and the arrangements resulted in generally lower prices and less time spent by district administrators in detailed clerical work.

In a 1969 doctoral dissertation, Guidelines for Cooperative Purchasing Procedures for Public School Districts in the United States, Claude E. Hardin analyzed ten cooperative arrangements throughout the country. Besides the advantages noted by Dr. Pasnik, Mr. Hardin observed that cooperative purchasing arrangements facilitated the sharing of ideas and discussion of mutual problems, permitted school districts to borrow standard items from one another, assured school consolidations and demanded better inventory control and long-range planning. Mr. Hardin further noted that the arrangement made possible the following:

- Combined the best purchasing practices of each member school district
- Assisted in identifying the quality of supplies and equipment sufficient for the needs of the users
- Caused member districts to become expert in certain areas of purchasing
- Provided for uniform testing of products
- Encouraged wider use of school supplies of a varied nature
- Promoted better standardization and specification development
- Resulted in continuous price analysis of items
- Strengthened relationships in other activities between school districts.

#### Difficulties In Cooperative Purchasing

Although it offers significant opportunity for cost reduction, the cooperative arrangement can be difficult to establish and implement. The problems center on the loss of autonomy implicit in the arrangement. It is necessary for the participating districts to agree on the particular brands and grades of items to be purchased, in order to buy a high volume at low cost. This involves changing brands used by some districts, and upsetting long-established vendor relationships. Existing vendor contracts with different expiration dates may require a phasing into the joint purchase of some items. Other disadvantages reported by members of cooperative purchasing groups are:

- Only one quality level is established for each item
- Small local vendors tend to be eliminated
- Personal attention to member districts and service from vendor salesmen is diminished
- Users have less influence on purchasing decisions.

Depending on the systems established, and the warehouse arrangements the cooperative method may also result in storage problems, delayed deliveries for some districts, lags in forwarding purchase orders to vendors, and delays in paying invoices, which should not occur in a well-planned system.

Successful cooperative groups have overcome these difficulties - or at least have found that the advantages outweigh the disadvantages. Key requirements for success are a spirit of cooperation among the participating districts, willingness to compromise and appointment of a chief administrator who can diplomatically resolve differences among the member districts.

### Considerations In Forming Cooperative Groups

The desirability of entering a cooperative arrangement depends on a variety of factors, including the size of prospective member districts, their geographical dispersion, annual purchase volumes and relationship to vendor pricing structures and commonality of interest. The chief factor is volume and some larger districts, which have considered cooperative arrangements, have found that their existing volume of major items is sufficient to gain the lowest vendor prices. Thus, they would benefit little by entering a cooperative group.

Decisions to form cooperative groups should be based on prior careful study of the factors involved, which would include:

- Analysis of usage of major items by each prospective member district
- Determination of prices that would be paid under cooperative purchasing, and resultant savings to member districts
- Study of logistics to resolve who will deliver what to which points, when and to where
- Firming staff needs; warehouse, receiving, and delivery requirements and resultant costs
- Appraisal of requisite policies, systems and procedures; data processing equipment requirements, if any
- Projections of future needs based on enrollment forecasts; investigation of effects of different procurement requirements that may result from variations among prospective member districts in student characteristics, population density and wealth.

In some areas, state or local statutes inhibit the formation of cooperative purchasing arrangements. Thus, their development would require passage of legislation or other legal arrangements. Some authorities believe that it is most practical to form cooperative groups with school districts that are already members of a common governmental unit, such as a county. This arrangement minimizes the number of governmental jurisdictions involved and has the advantage of the existing leadership structure. There are, however, successful cooperative arrangements that cross jurisdictional boundaries, especially where legal statutes do not block such action. For example, three widely separated county school districts in Florida - St. John's, Seminole and St. Lucie - are developing cooperative arrangements for the purchase of food services. The opportunity for cooperative arrangements across county or city jurisdictions exists, and is practiced, where legislative action has made it possible.

#### STATE CONTRACTS

Another means by which the smaller school district can participate in volume purchasing is the state contract approach, under which the state education department negotiates contracts with vendors, through which individual districts can purchase. A definitive evaluation was not made of such contracts, but it appears that their use could be increased. In New York State, for example, Dr. Pasnik found that state contracts were seldom used by local school districts, although when they were used resulted in lower prices, and also a reduction in the time spent by local school administrators in advertising for bids and negotiating with vendors.

In some states the usefulness of this approach is limited by the restricted number of items for which state contracts have been established. This has partly resulted from pressures on state legislatures by vendor representatives who would prefer to keep business on a local basis.

The cost reduction to the district through the use of state contracts depends on a variety of factors, including its volume of purchases, degree of suitability of the items covered in the contract, and proximity of the district to the vendor selected by the state. School districts far removed from the state vendor may be able to buy more cheaply from local vendors, despite the loss of the volume discount.

State governments may have an opportunity to reduce prices of some capital equipment items by forming a "market" for items built to standard specifications approved by the state. For example, a few combines of school districts have engaged architects to design standardized building components to be used in the construction of all new schools in the member districts. The

combined purchases are large enough to constitute a "market" interest to manufacturers, which will contract to produce the specially designed items. This principle could be extended to the state level. Some states have at least considered the idea of having several standard school buses designed and built under state contract which, because of volume, could be purchased at lower cost by local districts.

### IMPLEMENTATION CONSIDERATIONS

Establishment of the most efficient purchasing programs by school districts will require complex analyses of product usage rates, vendor pricing structures, alternate warehouse and delivery arrangements, feasibility of cooperatives and savings through expansion in state contracts. Smaller school districts lack the resources to carry out such analyses, and implementation of the proposals of this chapter will need action by state education departments in: conducting studies of purchasing costs and alternatives; broadening the use of state contracts, where indicated; exercising leadership in forming cooperative purchasing groups; and providing consulting assistance to individual school districts. The following are recommended courses of action that should be initiated or expanded:

1. Each state education department should conduct a detailed study of school purchasing costs in its state, to accumulate data on which further decisions would be based. It is suggested that a representative sample of school districts be studied, including city, suburban and rural ones, and those with varying levels of expenditures per student. Data would be developed from each district for elements, such as:

- Prices paid for comparable items
- Variations in discounts according to volume, use of contracts, centralized versus individual school deliveries, and complete order awards
- Extent of use of state contracts and comparative prices
- Participation in cooperative purchasing groups and their effects
- Purchasing methods employed
- Extent of use of professional management.

2. Using the findings of the foregoing study, the state department should decide the extent to which school purchasing costs would be reduced by increased use of state contracts. Appropriate action should then be initiated to assure that full advantage is taken by local school districts. This might include: initiating changes in statutory restrictions, and revising procedures to make it easier for local districts to buy through state contracts; developing new product specifications, working with vendors, and negotiating additional contracts; educating all local districts on the advantages of purchasing through state contracts; and providing incentives for the use of state contracts by making appropriate adjustments in state aid formulas and procedures.

3. As indicated by the study findings, the state department should draw up a master plan for the development of cooperative purchasing groups throughout the state, and should take action to encourage their formulation and growth.

4. The extent to which school districts throughout the state have established centralized purchasing departments in the district office should be firmed, and advisory action taken to extend their use to the fullest extent feasible.

5. To carry out the foregoing, the state department should establish an internal purchasing advisory division, staffed with knowledgeable purchasing personnel experienced in industry or in school districts with advanced purchasing programs. This division should also have responsibility for working with school districts throughout the state in a consulting capacity, to assist in establishing efficient centralized purchasing departments that utilize the cost-saving practices described in this report.

## PART C

### III - DELIVERY OF SUPPORT SERVICES

This chapter is concerned with economies in the delivery of support services, for which 1970-71 net expenditures - exclusive of the purchasing components - are estimated as follows:

	<u>Billions Of Dollars</u>
Operation of plant	\$1.7
Maintenance of plant	1.0
Pupil transportation services	1.1
Health services	<u>0.3</u>
Total	\$4.1

Of the foregoing total, it is estimated that just under \$3 billion was used for salary payments to school support service personnel - custodians, engineers, carpenters, bus drivers, nurses, and others - with most of the balance used to engage maintenance and transportation contractors. Additional reimbursed expenditures for food services were also incurred and are described in this chapter.

The previous chapter reviewed means for reducing the cost of purchasing supplies and equipment used for support service and other functions, and this is judged to be the primary opportunity to achieve economies in support service functions.

In this chapter, other more limited opportunities for savings are reviewed which depend basically on improvement in the use of support services personnel, the major element of cost.

Usually, improvement is brought about by applying good standard business management practices, which are reviewed briefly in this chapter, along with some suggested innovative approaches to management of support service functions.

The size of the district also affects opportunities for improved use of personnel and resultant economies. The chief potential for savings is in lessening the number of staff positions needed, which is more difficult for the small district composed of small schools than for the larger district. For instance, a new staff program, which reduces the need for custodians by 20 per cent will be useful to the larger school, which has five or more custodians, but of little value to the small school with only one custodian.

A related factor is that the implementation of many cost-saving measures requires detailed analysis and professional management which may not be economically justifiable in the small district. Costs per pupil for the support service functions described in this chapter, exclusive of the purchases component, are about \$90. Thus, the district with only 2,000 to 3,000 enrolment will spend less than \$300,000 annually. If the potential for cost reduction is limited, the district cannot economically allocate thousands of dollars to introduce cost-reduction techniques.

By contrast, the district with 25,000 or more total enrollment will spend upwards of \$2 million on support service functions, and more for purchasing, and can afford to invest in management techniques and professional personnel which will be more than returned by resulting cost savings. Very large districts are developing computer-based programs and other advanced techniques to better manage support services. A good example is the Dade County School System, several of whose programs are used as examples in this chapter.

## OPERATION OF PLANT

The school plant operation functions are cleaning of buildings, care of grounds, operation of mechanical equipment, and minor maintenance and repair work performed by custodians and operating engineers.

Total expenditures for operation of school plant are estimated by CMP at \$1.7 billion in 1970-71, exclusive of supplies and equipment purchases. Virtually all of this amount was used for salaries of custodians, engineers and other operating personnel. The best opportunity for economy, therefore, is in more effective use of staff personnel.

### Determining Custodial Needs

A key requirement is the use of systematic methods for deciding the number of custodians needed to clean school buildings and perform minor maintenance and repairs. The New York State Education Department, for instance, has developed staff procedures established by a set of formulas that relate the

number of custodians needed to three building factors: area, enrollment and number of "teaching stations" (classrooms plus the "classroom equivalents" of gymnasiums, shops, music rooms, etc.). Separate formulas are used for five different types of elementary and secondary schools, as described in Appendix C-4 which explains the research and survey methods used to develop the procedure.

It can be used both to determine custodial requirements for new buildings, and to evaluate existing programs. For example, application of the formulas to a Long Island school district revealed the following:

<u>School</u>	<u>Number of Custodians</u>	
	<u>Employed</u>	<u>Needed By Formula</u>
High School	14	13.7
Middle Elementary	13	10.5
Primary A	5	3.0
Primary B	5	4.2
Primary C	5	3.2
Primary D	5	4.0
Primary E	5	3.2
Total	52	41.8

Each school was overstaffed, according to the formulas, and further analysis revealed that operating costs per pupil for the district were 50 per cent over the state average. Nevertheless, the buildings were not well cleaned, primarily because the custodian force worked days. The district began its cleaning after school hours, which permitted a 15 per cent reduction in the custodial force and resulted in better work.

The foregoing school district followed a customary practice of assigning an arbitrary number of custodians, especially to each of its five primary schools. The statewide survey conducted in developing the New York State procedure revealed wide variations among districts in the number of custodians employed in relation to need, which indicates the opportunity for many districts to reduce costs.

#### Systematized Management Procedures

Under well-managed operating programs, responsibilities of custodians are spelled out in detail, including procedures to be followed in cleaning and

routine maintenance, frequency with which each operation is to be performed and required standards of cleanliness. They should be set forth in an operating manual for the guidance of the custodial staff. State education departments should assist school districts, particularly smaller ones with limited resources, by developing recommended cleaning standards and preparing custodial manuals.

The following are characteristic of well-managed plant operations programs:

- Regular building inspections by the principal and head custodian, to assure that quality standards are being met
- Clear-cut assignment of responsibility to individual custodians for specific buildings and grounds areas
- Systematic personnel management procedures that forecast staff needs and define job descriptions.

#### Practice In Large Districts

Large school districts with substantial plant operating budgets have an opportunity to develop more sophisticated techniques. For example, the Dade County School System is developing computer-based systems to determine custodial requirements and to forecast staff needs. Some of its other practices which illustrate the use of systematic management practices are as follows:

- A formal custodians' orientation and training program is given, following state-approved guidelines.
- Custodial procedures are set forth in a written manual.
- Custodial staffs are assigned on the basis of systematic analysis of building areas, enrollments and application of standards. Staff needs are forecast in advance.
- Utilities consumption is closely monitored by the district utilities supervisor who specifies appropriate economy procedures, such as reducing the level of air-conditioning on cool days.
- Approved landscape configurations are specified, to both fulfill esthetic needs and permit easy grounds maintenance.

## MAINTENANCE OF PLANT

Plant maintenance is closely related to plant operations, since custodians regularly discharge minor repair functions as well as cleaning of buildings, especially in smaller schools and districts. Maintenance, as discussed in this section, is concerned with more extensive repair and remodeling programs performed by carpenters, painters, electricians and other skilled workers.

Separately, USOE reports expenditures for plant operations and plant maintenance; CMP estimates that, in 1970-71, total maintenance expenditures were just over \$1 billion, exclusive of purchases of maintenance supplies and equipment. Of this, approximately \$470 million was used for salaries of maintenance personnel, with most of the balance paid to maintenance contractors, to carry out repair and remodeling projects not included in capital budgets.

The opportunities for accomplishing economies in the maintenance of existing buildings are in improving the use of maintenance staff personnel and in determining whether projects can be performed most economically by the district staff, or by outside contractors.

Good staff utilization is achieved through application of effective management procedures, such as the following:

- Systematic analyses and projections are made, to determine the number and type of staff personnel justified by work volume
- Comparative cost analyses are made of particular functions, such as plumbing, and of individual projects, to determine whether the work can most economically be performed by district staff personnel or outside contractors
- A preventive maintenance program is developed to provide for better care of buildings and machinery, and to equalize staff workloads. Detailed schedules are prepared, which specify frequency of equipment inspection, cleaning, lubrication and parts replacement
- Projects are managed through a systematic procedure that utilizes work-request forms, preparation of estimates for larger jobs, issuance of work order forms, scheduling of projects and staff

- Policies are established that define the size and kind of maintenance projects to be done by (a) custodial staff, (b) maintenance staff, and (c) outside contractors. Over-control of small jobs is avoided (preparation of drawings and cost estimates, elaborate approval procedures), which slows work and raises costs.

### Effective Practice In Large Districts

The Dade County School System illustrates the application of effective maintenance management practices in large school districts. Computer-based programs are being developed to control work orders, schedule projects and project staff needs. A well-defined preventive maintenance program is in use. Maintenance project committees, consisting of industrial engineers, and systems and cost analysts, evaluate maintenance and decide how costs can be saved. Typical recent projects have been:

- The district's painting program, which was done on a six-year cycle by outside contractors for \$750,000, was analyzed and findings revealed that the work could be done more economically by district staff.
- Travel time of maintenance personnel was analyzed, and this led to a decision to build two decentralized maintenance depots at a cost of \$120,000, each of which has increased effective work time up to 20 per cent.
- Following analysis of communications and staff schedules, two-way radios were installed in 20 maintenance vehicles at \$125 each, resulting in faster response to emergencies, better scheduling of work crews and improved overall staff utilization.

### PUPIL TRANSPORTATION SERVICES

According to the United States Department of Transportation, 19 million or about 42 per cent of all elementary and secondary school students are regular passengers in the nation's fleet of 245,000 school vehicles. Of the 17,500 operating school districts in the country, about 15,000 provide transportation services, at a cost of approximately \$1.1 billion in 1970-71, exclusive of purchases of supplies, buses and other equipment.

Almost half the \$1.1 billion expenditure was for salary payments to district bus drivers and other transportation personnel. Most of the balance is represented by payments to transportation contractors that furnish about 30 per cent of all school bus service.

#### Owned Versus Contracted Services

The relative costs and merits of district-owned buses and contracted services are a debatable issue and are dependent on district size and local conditions. Districts should conduct analyses to determine if the relative costs of using contracted services are commensurate with the advantages. The Dade County School System concluded, after careful study, that the contracting of services would be substantially more costly than ownership. The Massachusetts Advisory Council on Education conducted a detailed study among school districts of comparative costs of owned vehicles and contracted services, and concluded that statewide transportation costs would be reduced about 9 per cent, if all districts owned their vehicles. Currently, only 10 per cent own their own buses. The study also concluded that savings could be realized by extending contracts from three to five years, which would reduce annual depreciation costs.

#### Routing And Scheduling

A definite means of achieving economies in transportation operations is by developing the most efficient bus routes and thereby reducing gasoline costs, maintenance expense and, most important, the number of vehicles and drivers required. Manual routing is tedious and imperfect, and a typical procedure when student populations change is to add new routes, without restudy and adjustment of existing routes.

The International Business Machines Corporation has developed a computer-based program for determining the most efficient school bus routes. Utilizing the technique of "network analysis," the program takes into consideration street and highway configuration, pick-up locations, numbers of students to be served and other relevant factors and prints out the most efficient routes and schedules. The system was used in Horseheads, New York, and reduced the number of buses needed from 90 to 76, decreased the number of drivers proportionately, and overall operating costs by \$60,000, or 12 per cent in the first year of use.

Improved communications can also bring about better equipment use. The Norwalk-LaMirada school district in Los Angeles installed two-way radios in buses serving 5,500 pupils. The resulting economies significantly outweighed the cost of the radios. There are tighter schedules and, as a result, it was found that fewer buses are needed to maintain the level of service.

Other methods for improving routes and resultant equipment utilization are the staggering of school schedules, which is common, and the minimization of pick-up locations, whereby pupils walk to central locations. Many school systems could profitably adopt these practices.

### Management Controls

Efficient operation of school transportation programs requires firm control procedures. Some large districts maintain computerized records of use of gasoline, oil, tires and parts, to decide when preventive maintenance checks are due, and when vehicle operating costs are excessive and replacement is indicated. The Dade County district, which transports 35,000 children daily in 230 buses, keeps charts that show the number of buses on the road at half-hour intervals through the day. These data are analyzed regularly to level-out bus use.

### HEALTH SERVICES

Expenditures for student health services - including a variety of nursing, dental and medical services - amounted to an estimated \$289 million in 1970-71. The major component of this amount was \$256 million in salary payments to full- and part-time medical professionals.

The largest single expense item is salary payments to school nurses. The latest available data indicate that, in 1968, about one third of all school districts (6,070) employed 17,000 full-time and 1,700 part-time school nurses. At an estimated average annual salary of \$9,000, total salary payments to school nurses thus amount to approximately \$160 million.

Tasks carried out by school nurses vary among districts, but generally include testing pupil vision and hearing, weighing and measuring students, maintaining health records, arranging appointments for clinics, administering occasional first aid and arranging for sick children to be taken home. In a recent study by the Massachusetts Advisory Council on Education it was concluded that school nurses in that state spend the greatest portion of their time on clerical activities, and that the nurse function could be performed at the individual school level, by clerical personnel with some first-aid training. Other states have come to similar conclusions.

### Methods For Reducing School Nurse Costs

Districts with nurses in individual schools should consider the alternative of maintaining a staff of one to several nurses at the district office level. The district staff would coordinate district health activities, administer student physical examinations and mass inoculations, arrange for physicians' services and oversee record-keeping and administration.

A second alternative, in use in many districts, is to abolish the school nurse program entirely and contract with the local board of health for nurse services. For example, some years ago Dade County schools abolished about 100 school nurse positions and now employ the full-time equivalent of 12 public health nurses.

### Physicians' Services

Some districts employ physicians and dentists on a part-time basis; others pay for service as needed. The Massachusetts school study concluded that the latter would generally be more economical. Since the level of medical service given by school districts varies greatly, as do medical fee structures, it is suggested that school districts evaluate the relative costs and merits of the two alternate methods.

### FOOD SERVICES

Delivery of food services includes purchasing food, supplies and food service equipment; preparing and serving food; and planning menus, directing and scheduling food service personnel and maintaining cost and operational controls.

Net expenditures for food services in 1970-71 are estimated at \$529 million. This represents the "loss" on food service operations by school districts - the difference between total gross costs of providing food services and income from sale of lunches. CMP estimates that purchases of food service equipment and nonfood supply items were approximately equal to net expenditures, and accordingly, in this report, the amount of \$529 million is assigned to purchases of those items, as discussed in Chapter II, Part C.

The United States Department of Agriculture (USDA) reports expenditures in 1970 for the nation's school lunch program of \$1,011 million for food, and \$702 million for labor. These two amounts total \$1,712 billion, which represent reimbursed expenditures that are not included in the total net school expenditure of \$44.4 billion. (USDA reports additional disbursements for the school lunch program of \$230 million, which are included by CMP in the food service net expenditure total of \$529 million.)

Means for reducing \$1.7 billion in reimbursed expenditures for school lunch programs follow.

## Variations In Food Service Programs

School food service programs vary widely - from the small school with no facilities to the large city or suburban high school with a fully equipped kitchen and large cafeteria offering a wide selection. Most schools that offer food service have their own kitchens, but some districts maintain central kitchens that supply packaged lunches to individual schools. Other districts use outside catering services. Food purchasing practices also vary: some districts purchase independently, others enter into cooperative arrangements with nearby districts, or participate in joint buying with other governmental units.

### Central Kitchens

Over the past 10 years, a number of districts throughout the country have developed various kinds of centralized kitchen arrangements. A review of comparative costs indicates that this appears to be the most promising means for reducing the cost of food service while maintaining nutritional standards. Under the most economical arrangement, a centralized kitchen - located in a school or in a separate facility - prepares and packages, each morning, a pre-determined number of refrigerated lunches which are distributed to schools where they are heated in a small facility and served to children in a lunch-room or in classrooms. Meals are served on disposable trays that are discarded after use.

This arrangement offers the following advantages over the customary school kitchen-cafeteria arrangement:

- Only about one tenth the space requirement is needed in the individual schools.
- Duplication of costly food preparation equipment at many locations is avoided.
- Labor costs are reduced sharply by eliminating the need for cooks, service personnel and clean-up crews at the school level.
- Food is purchased in volume by the central kitchen, resulting in cost discounts and better control of inventories.
- Food portions are carefully controlled, which reduces costs and assures meeting of nutritional standards.
- The centralized operation makes possible tight management control procedures, testing of foods, cost analyses of alternate methods, and close accounting for receipts and expenses.

Cost advantage of the central kitchen serving prepackaged lunches increases with the size of the operation, as indicated in analyses presented in an unpublished study by the University of Chicago Center for Urban Studies.

This analysis compared the operating and capital costs of three sizes of model kitchens engaged in preparing packaged lunches: one with a daily capacity of 1,000 lunches, which is assumed to be located in the one school it supplies; and two central kitchens with a capacity of 3,000 and 5,000 lunches per day, respectively.

The cost per lunch prepared in the small kitchen was calculated at \$0.53, which includes \$0.33 for food, \$0.17 for labor, and \$0.03 for other miscellaneous expenses. Unit cost of lunches prepared in the 3,000-lunch kitchen is \$0.47 with the primary saving resulting from a \$0.05 decrease in labor costs. The cost per lunch prepared in the 5,000-unit kitchen is \$0.44 - an 18 per cent reduction in comparison with the small kitchen.

Calculation of capital costs for the kitchens showed similar savings. The cost to create capacity for producing one lunch per day were as follows:

<u>Lunch Kitchen Capacity</u>	<u>Cost Per Day</u>
1,000	\$46.80
3,000	34.67
5,000	24.94

Thus, the larger kitchens decrease capital requirements significantly, despite the need to include a component for trucks to transport the lunches.

### School District Experience

Discussions with a sampling of six school lunch directors with experience in both centralized kitchens and in-school kitchens revealed the following:

- Five directors believed the centralized-prepackaged lunch program was the most economical they had used, with estimated costs per lunch of about \$0.42. One director believed costs were higher and had dropped the program.
- In two of the schools, lunches were served in classrooms with no difficulties.
- Four of the six directors believed the prepackaged program was not suitable for high schools, where students prefer a wider choice of foods.
- All believed that a district-managed program was less expensive than the use of outside catering contractors.

### Large District Experience

The centralized kitchen arrangement is particularly well suited to large school districts, as indicated in the following two examples. The New York City school system has developed a number of central kitchens for preparation of packaged lunches, and estimates that the system lessens labor costs about 40 per cent in comparison with conventional food service programs. The Dade County School System - since its consolidation as a countywide district in 1962 - has eliminated many of the kitchens formerly maintained in individual schools, and now supplies 40 of its schools from large kitchens in other schools. Close management controls are used, including standarization of menus and uniform recipes, careful portion control, and productivity evaluations. Food is purchased in bulk under contracts and the chief business manager estimates that this reduces food costs in a range of 10 to 20 per cent.

### Implementation Considerations

Achievement of economies in support services would require that school districts carry out comparative cost studies, and adopt more effective management practices and control procedures. State education departments could assist by making staff personnel available to assist local districts and by developing statewide standards for plant operations and other support service functions. The New York State Education Department, for example, maintains a consulting staff to assist local districts in conducting studies and developing improved management procedures, and as noted previously, also publishes guidelines on such matters as custodial staffing needs. States without such local-assistance programs could aid their school districts by providing them.

## PART C

### IV - SUMMARY OF POTENTIAL REDUCTION IN COSTS OF PURCHASING AND SUPPORT SERVICES

This chapter presents national estimates of the potential for reducing costs through adoption of the management practices described in the preceding chapters. The leading savings opportunity is in purchasing, which is described in the first section of this chapter, while the more limited potential for reduction of support services expenditures is reviewed later.

#### POTENTIAL REDUCTION IN PURCHASING EXPENDITURES

As noted in Chapter II, the potential for savings varies among the categories of supply and equipment items purchased by schools. Estimates of 1970-71 purchasing volume for each category of items are shown in the following table:

	<u>Total Purchases, 1970-71</u> (Millions)
Supply Items	\$1,956
Equipment Items	1,268
Transportation Supplies and Equipment	398
Textbooks and Library Books	813
Utilities	<u>574</u>
Total	\$5,009

The following presents estimates of achievable savings in the purchase of each category, based on the overall difference between the cost of procuring items by a typical school district using common purchasing practices, and the lower cost that could be achieved by adoption of the purchasing techniques recommended in this report.

#### Supply Items

This category includes supplies for office, instruction, health, operations and maintenance, food service, and for fuel, all of which amounted to \$1,956 million in purchases in 1970-71, or 39 per cent of total school purchases.

Cost savings potential depends on a variety of factors, including vendor discount structure for the particular items, existing purchasing practice and new purchasing techniques to be employed. The following is a summary of reported and estimated savings achieved in the procurement of various categories of supply items.

A comprehensive study of 70 school districts in Massachusetts by the Massachusetts Business Task Force for School Management revealed that districts with more efficient purchasing programs paid significantly less for similar items than the higher cost districts. The following price differentials were noted:

<u>Supplies</u>	<u>Per Cent Differential</u>
Office, including mimeograph paper, spirit duplicating paper, file folders	13.60%
Maintenance, including liquid floor cleaner, floor wax, fluorescent bulbs	24.18
Instructional	16.20

An analysis of bids received by a Long Island school district disclosed the following vendor discounts, which are offered for award to a single vendor of the complete advertised bid, and for prompt payment of invoices:

<u>Supplies</u>	<u>Per Cent Discounts</u>
Office, including carbon paper, typewriter cleaner, envelopes, paper clips, 146 other items	13.7%
Instructional, including pencils, composition books, 77 others	11.0
Instructional, including workbooks, educational toys, 867 others	20.0
Instructional, including forms, sponges, envelopes, pegboards	8.9
Instructional paper	18.4
Kindergarten	16.6
Blackboard	6.4

- Eight school libraries in Massachusetts, which formed a library consortium, reduced the cost of procuring instructional films and tapes by 75 per cent.

- A group of Chicago area districts, buying cooperatively, decreased the cost of instructional supplies by 8 per cent.
- Officials of NAPM estimate that the use of the systems contracting approach can lessen the cost of buying school supply items in a range of 15 to 20 per cent.
- A procurement official of the New York City Board of Education, who studied purchasing practices in New York State school districts, estimates that the use of good purchasing practices would reduce overall purchasing costs for the typical school district by about 10 per cent.
- Dade County's chief business manager estimates that the overall cost of purchases for its consolidated school district is 20 to 25 per cent lower than the districts, which compose the unified system, were separate and purchased individually. The purchasing director for the Duval County school system made a similar estimate of savings.
- The schools of Bergen County, New Jersey, have entered into a cooperative purchasing arrangement and a study indicates that if they make maximum purchases cooperatively, the savings will amount to \$500,000 per year, or an estimated 10 to 15 per cent of overall purchasing costs.

On the basis of evaluation of estimated and actual savings, CMP concludes that a reasonable potential exists in the typical school district, to reduce the cost of purchasing supply items by 15 per cent, through adoption of the most effective purchasing practices. This would be achieved through a combination of the procedures described in this chapter, and would result from buying in large volume, taking advantage of the most favorable vendor price terms, procuring items of the needed quality and quantity, minimizing warehouse and delivery costs, and reducing the cost of paperwork and purchasing administration.

Potential for savings will vary among districts, with the greatest in districts with fragmented, weakly managed procurement programs.

### Equipment

Purchases of equipment items for office, instruction, health, operations and maintenance, and food services are estimated at \$1,268 billion in 1970-71, or 25 per cent of total school purchases.

For various reasons, it is more difficult to quantify potential costs savings in equipment purchases than in supply items, but it appears that the potential savings are less. Equipment purchases are intermittent, rather than continuous. Vendor price structures tend to be less formalized than for supplies and they vary greatly with the type of equipment, vendor's location and vendor's willingness to negotiate special price arrangements.

However, school districts find that expenses for equipment as well as for supplies can be decreased by centralizing purchasing responsibility in professionally managed departments that employ efficient procurement techniques.

School districts have a particular opportunity to reduce outlays by better identifying needs and defining specifications for equipment to be purchased. It appears that substantial sums are wasted by purchasing the wrong kind of equipment; for example, data processing equipment of the wrong capacity or capability, and instructional apparatus that is not geared to the needs of students or the interests and capabilities of teachers.

Adoption of the systems contracting approach - although it is applicable primarily to the purchase of high-volume consumable items and lower-cost equipment items - can affect expenditures for more expensive equipment, by releasing the time of purchasing personnel to devote more time to the items with a higher unit cost.

Overall, it is estimated that the savings potential in the purchase of equipment items is about two thirds that of supply items, or 10 per cent.

#### Transportation Supplies, Buses, Equipment

Total 1971 disbursements by schools for items related to pupil transportation - gasoline, oil and other supplies, and buses, tires and other equipment - are estimated at \$398 million. School districts vary widely in the transportation arrangements they provide: some buy and maintain their own buses, while others engage outside contractors to provide pupil transportation. Because of the lack of common patterns, it was not feasible to estimate accurately the allocation of total transportation expenses among supplies, buses and equipment. However, an approximate estimate, made by examining the budgets of a sampling of selected school districts, is that purchases of transportation supplies amount to \$224 million, buses, \$145 million and other transportation equipment, \$29 million. It is calculated that a savings in the price of buses of about 5 per cent could be achieved by establishing statewide standards and contracts, and that savings of 10 and 15 per cent, respectively, could be made in other transportation equipment and in supplies. On this basis, an overall savings potential of 11 per cent exists in the purchase of transportation equipment.

### Textbooks And Library Books

Laws in many states forbid the sale of textbooks and library books at higher prices to small school districts, than those charged to larger districts. As a result, the prices paid for books appear to be quite uniform and not subject to discounts through improvements in procurement practices. Some economies can be achieved, however, by purchasing paperback books where feasible, by better controlling the quantities purchased, and by better management of the administrative process by which books are selected, requisitioned, ordered, shipped, inventoried and delivered to schools. It is estimated that the overall cost could be reduced 5 per cent through adoption of the most effective purchasing practices.

### Utilities

In 1970-71, schools spent an estimated \$574 million for utility services, including electric power, gas and water. Minor opportunities for reducing these costs are in decreasing the volume of utility services consumed, through improvement in plant maintenance and operations procedures; but because the price structure is relatively inflexible, no cost saving through improvement in purchasing practices is estimated.

### Overall Potential Savings

Exhibit IV-1, which follows, summarizes the overall economies in purchasing, which could be achieved by adopting the efficient practices described in this report.

### Cost Savings In Relation To District Size

As noted previously, it is estimated that an enrollment of about 5,000 pupils provides a base for establishment of an efficient, professionally managed centralized purchasing program. Opportunities for increased efficiency grow with district size. The most effective purchasing departments noted in this study were those serving very large numbers of students.

For purposes of summarizing opportunities to achieve potential savings, the nation's school districts were divided in three categories, by pupil enrollment levels as follows: more than 25,000, 5,000 to 25,000, and under 5,000.

Each of these categories accounts for about a third of total school purchases, as shown in the following table:

POTENTIAL ECONOMIES IN PURCHASING  
1970-71

<u>Purchase</u>	<u>Estimated Amount</u> (Millions)	<u>Estimated Per Cent Cost Savings</u>	<u>Potential Cost Savings</u> (Millions)
Supply Items	\$1,956	15%	\$293
Equipment Items	1,268	10	127
Transportation Supplies Buses And Equipment	398	11	44
Textbooks And Library Books	813	5	41
Utilities	<u>574</u>	-	<u>-</u>
Total	\$5,009	(a)	\$505

(a) Cost savings as percentage of total purchases:  
10 per cent.

<u>District Enrollment</u>	<u>Number Of Districts</u>	<u>Annual Purchases (Millions)</u>	<u>Per Cent Of Total Purchases</u>
Over 25,000	191	\$1,628	33%
5,000 to 24,999	1,661	1,693	34
Under 5,000	<u>15,646</u>	<u>1,688</u>	<u>33</u>
Total	17,498	\$5,009	100%

Purchases by district size category were estimated on the basis of current expenditures rather than total enrollments. The smaller districts - although they account for a third of all purchases - have more than a third of all pupils, indicating that average purchases per pupil are less for smaller districts than for larger districts. This does not result from more efficient purchasing by smaller districts, as noted throughout this chapter, but rather it is concluded that smaller districts on the average provide a lower level of service per pupil.

Districts in the 5,000 to 24,999 enrollment category have a prime opportunity to reduce purchasing expenditures through adoption of the recommendations of this chapter. Districts enrolling more than 25,000 have further opportunities through installation of large-scale sophisticated purchasing systems, although some large districts such as Dade County have already implemented such systems. The nation's small districts with enrollments under 5,000 have the greatest potential for improvement in purchasing, through consolidation into larger districts and formation of cooperative purchasing groups, although there is a limit to the extent to which this can be accomplished because of geographical dispersion of some small districts in rural areas.

On an overall national basis, it is estimated that a potential exists for reduction of school purchases of 10 per cent, which would result in savings of just over one-half billion dollars.

#### POTENTIAL REDUCTION IN SUPPORT SERVICES EXPENDITURES

Expenditures for plant operations and maintenance, pupil transportation and health services amounted to \$4.1 billion, exclusive of purchases. Of this, salary costs were just under \$3 billion, and about \$1 billion of the balance was paid to maintenance and transportation contractors for services.

The chief opportunity for economies is in reducing salary costs through more efficient use of personnel. Accurate estimate of potential savings is difficult because of wide variation among school districts in existing practices. Cost comparisons among districts on a per-pupil basis are not necessarily indicative of savings opportunities, as they may result from different levels of service provided rather than from inherently more efficient operations. For example, some districts save in health services programs by not offering any program at all, and in other districts a low per-pupil cost for plant operations is achieved by the tolerance of poorly cleaned buildings, not through good management.

As noted previously, the potential for savings is a function of district size and improvements in personnel utilization are more difficult to achieve in smaller districts that have small staffs and only limited resources to apply to operational cost/efficiency studies and professional management techniques.

On balance, it is judged that the average school district could improve the utilization of its support services personnel by about 5 per cent. Some districts could make substantially greater savings, others lack the potential for improvement, and still others are already operating very efficiently. Indications of potential for improvement presented in Chapter III are summarized as follows:

- Variations in plant operating costs in New York State school districts amount to more than 50 per cent. Application of custodial staffing formulas to a typical high-cost district demonstrated that custodial salary costs, a major component of plant operating costs, could be reduced 15 per cent, and service improved through changed operating procedures.
- Available work time of certain Dade County school maintenance staff members was increased 20 per cent by establishment of maintenance shops closer to school locations.
- The Horseheads school district decreased the number of bus drivers needed by approximately 15 per cent, through the use of computerized bus routing and scheduling.
- Districts that maintain nurses in individual schools could save at least 50 per cent, by providing nursing service at the district office level. The Dade County schools reduced nursing costs by more than 50 per cent, by eliminating school nurses and contracting for these with local public health services.

Overall, it is judged that 5 per cent represents a reasonable estimate of the savings that could be achieved in salary costs of support services personnel which, in 1970-71, amounted to just under \$3 billion. On a national basis, this would result in savings of approximately \$150 million.

Further savings in support services could be made through cost analysis of the use of contracted services in comparison with the use of district staff. For instance, the Massachusetts Advisory Council on Education found that using physicians on an as-needed basis would be more economical for school districts in that state than the employment of physicians on a full- or part-time basis. Conversely, the Massachusetts study concluded that pupil transportation costs throughout the state would be reduced 9 per cent if districts owned their own buses. Dade County also found, on analysis, that bus ownership was substantially less expensive and further that, as a large district, it could perform most maintenance projects more economically with staff personnel.

Expenditures for contracted services, most of which were for plant maintenance and pupil transportation, amounted to about \$1 billion in 1970-71. It is estimated that these could be reduced 5 per cent, which would provide a saving of \$50 million.

Thus, it is calculated that an opportunity exists on a national basis to achieve potential savings in support service expenditures of \$200 million. Additional savings which can be achieved in food services are summarized in the following paragraphs.

POTENTIAL REDUCTION IN  
REIMBURSED EXPENDITURES  
FOR FOOD SERVICES

USDA estimates, as noted previously, that the food and labor cost components of the school lunch program in 1970 amounted to \$1.7 billion. These are reimbursed expenditures. A minor component of total school lunch program costs was assigned by CMP to net food service costs.

Data presented previously indicate that this \$1.7 billion disbursement for food and labor could be decreased substantially by adoption of central kitchens, an arrangement not in common use today. The following were noted:

- The chief business officer of the Dade County schools estimates that high volume purchasing of food results in savings of about 10 per cent.

- The New York City school system estimates savings in labor of 40 per cent through centralized kitchens serving prepackaged lunches.
- Five of six food service directors contacted reported significant savings through use of prepackaged lunches. Cost per lunch was estimated at about \$0.42, which appears to be significantly below the national average.
- A study for the University of Chicago projected that costs for a prepackaged lunch prepared in a kitchen with daily capacity of 5,000 lunches would be 18 per cent less than in a kitchen of 1,000-lunch capacity. (It is to be noted that the 1,000-lunch kitchen would also prepare prepackaged lunches and would thus show lower costs than the typical school kitchen serving conventional food.)

It appears reasonable to conclude that school districts with sufficient volume to justify central kitchens could reduce total reimbursed food service costs by at least 15 per cent through adoption of centralized kitchens that serve prepackaged lunches. It is further estimated that this procedure would be most feasible for districts with enrollments of 2,500 or more. These districts, which number 3,870, account for slightly over 80 per cent of all school expenditures, and thus their reimbursed food service expenses are estimated at \$1,371 million. A 15 per cent reduction in this cost would amount to a saving of \$205 million annually.

If it is assumed that receipts from sale of school lunches would continue at the present levels, the effect of reducing food and labor costs would be to decrease the loss for food operations - or net food service expenditures - estimated at \$529 million in 1970-71. Thus, adoption of central kitchens presents an opportunity to reduce net expenditures by \$205 million.

**TOTAL POTENTIAL  
REDUCTION IN NET  
EXPENDITURES**

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Potential savings described in this section are summarized as follows:

	<u>Millions Of Dollars</u>
Purchasing of supplies and equipment	\$505
Food services, net	205
Operations and maintenance, pupil transportation, health services	200

Thus, it is estimated that a potential exists for reducing net expenditures by \$910 billion through improvements in the management of purchasing and support service functions.

THE PRESIDENT'S COMMISSION ON SCHOOL FINANCE

ECONOMIES IN EDUCATION

PART D

CONSTRUCTION AND UTILIZATION  
OF SCHOOL FACILITIES

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ECONOMIES IN EDUCATION

PART D

CONSTRUCTION AND UTILIZATION  
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## PART D

### I - INTRODUCTION

This part of the report, *Economies In Education*, proposes means by which capital outlays for new school construction can be reduced. The United States Office of Education (USOE) has projected that, for the next several years, the nation's school districts will make annual capital expenditures of \$4.9 billion, in terms of 1969-70 constant dollars. This includes those for school buildings, land and some items of equipment. It does not include charges for interest and repayment of principal on debt incurred in prior years. Monies for capital outlays will be allocated from current revenues, proceeds of bond sales and from reserves.

Recently, expenditures for land and buildings have represented approximately 83 per cent of total capital outlays, the remainder being applied to purchases of equipment. Continuation of this ratio would result in a projected annual expenditure during the early 1970's of about \$4.1 billion for school land and buildings.

#### OBJECTIVES AND METHODS OF STUDY

The purpose of the portion of the study described is to identify ways in which this projected annual expenditure can be reduced, without sacrificing the quality of educational facilities and programs. In carrying out the study, information for analysis was obtained from a variety of sources, as follows:

- Interviews were held with various knowledgeable authorities, including representatives of USOE, a state education department and state study commission, individual school districts, architects, real estate management firms, and a public authority.
- Pertinent literature relating to school construction, financing and utilization was identified and analyzed.
- From USOE and other sources, statistical data on school construction were obtained, and analyzed in detail.
- A particularly valuable source of information was the Educational Facilities Laboratory, a pioneer in developing and publicizing innovative methods for improving school facilities and reducing their cost. EFL further supplied data through personal interviews with its staff members and consultants.

## PROJECTIONS OF SCHOOL CONSTRUCTION

Dollar projections of capital outlays by USOE can be related to forecasts of school construction in terms of the number of rooms furnished in the new schools built.

USOE estimates that, for the next several years, school construction programs will supply 70,000 additional classrooms each year, which is based on actual school construction during the 1960's. In that period, the number of new rooms provided annually tended to increase in approximation with the following formula which was derived by USOE:

Number of rooms built =  $67,312 + 269T$ , where T is the number of years after 1960-61. Exhibit I-1, which follows, plots this equation from 1960 to 1969, together with the 70,000 projection for annual classroom construction during the 1970's.

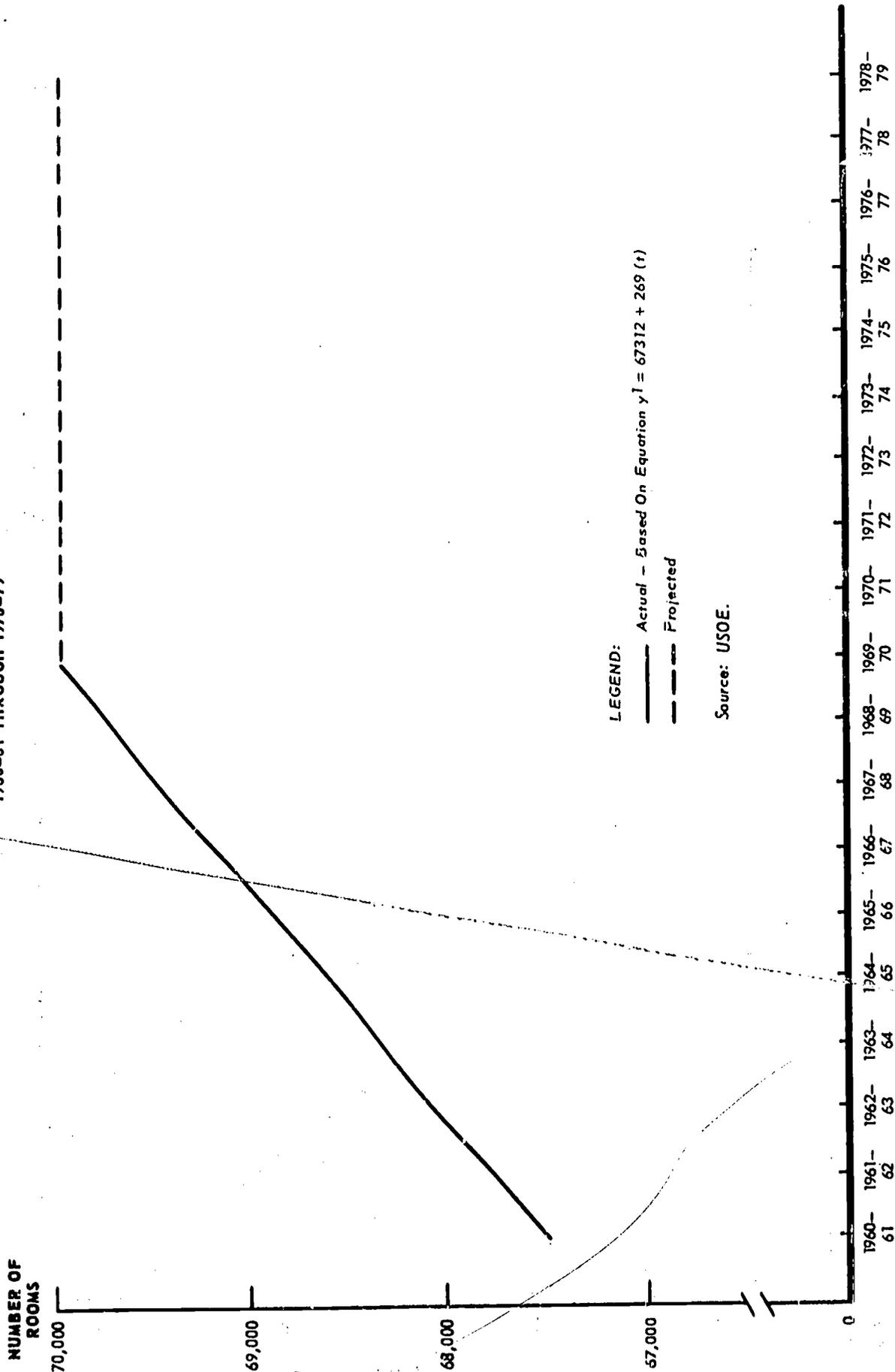
During the 1960's, primary and secondary public school total enrollments increased annually by about 1 million, as Exhibit I-2 shows. It also includes a USOE projection of enrollments through 1978. A portion of the new construction in the 1960's was provided to accommodate enrollment increases. The overall average ratio between pupils and rooms is about 28 to 1; on this basis, it can be calculated that about 36,000 of the new rooms built in each year of the 1960's were needed to house growing overall enrollments.

USOE estimates that of the total rooms built annually in the 1960's about 20,000 replaced rooms in abandoned buildings. The remaining 14,000 rooms, about 20 per cent of the total, have alleviated existing overcrowding, accommodated population shifts between areas and met the need for new programs.

Exhibit I-2 indicates that school enrollments are projected to hold level in the early part of the 1970's and then will decline slightly. Thus, on an overall national basis no new rooms will be needed to house a larger number of students. USOE anticipates that about 20,000 new rooms will continue to be needed annually to replace those in abandoned and outmoded buildings, and that an additional 50,000 rooms will be afforded for population shifts, existing overcrowding and new educational programs. The following table summarizes the reasons for actual room construction in the 1960's and projected construction in the 1970's:

# ANNUAL CLASSROOM CONSTRUCTION IN PUBLIC SCHOOL SYSTEMS

1960-61 THROUGH 1978-79

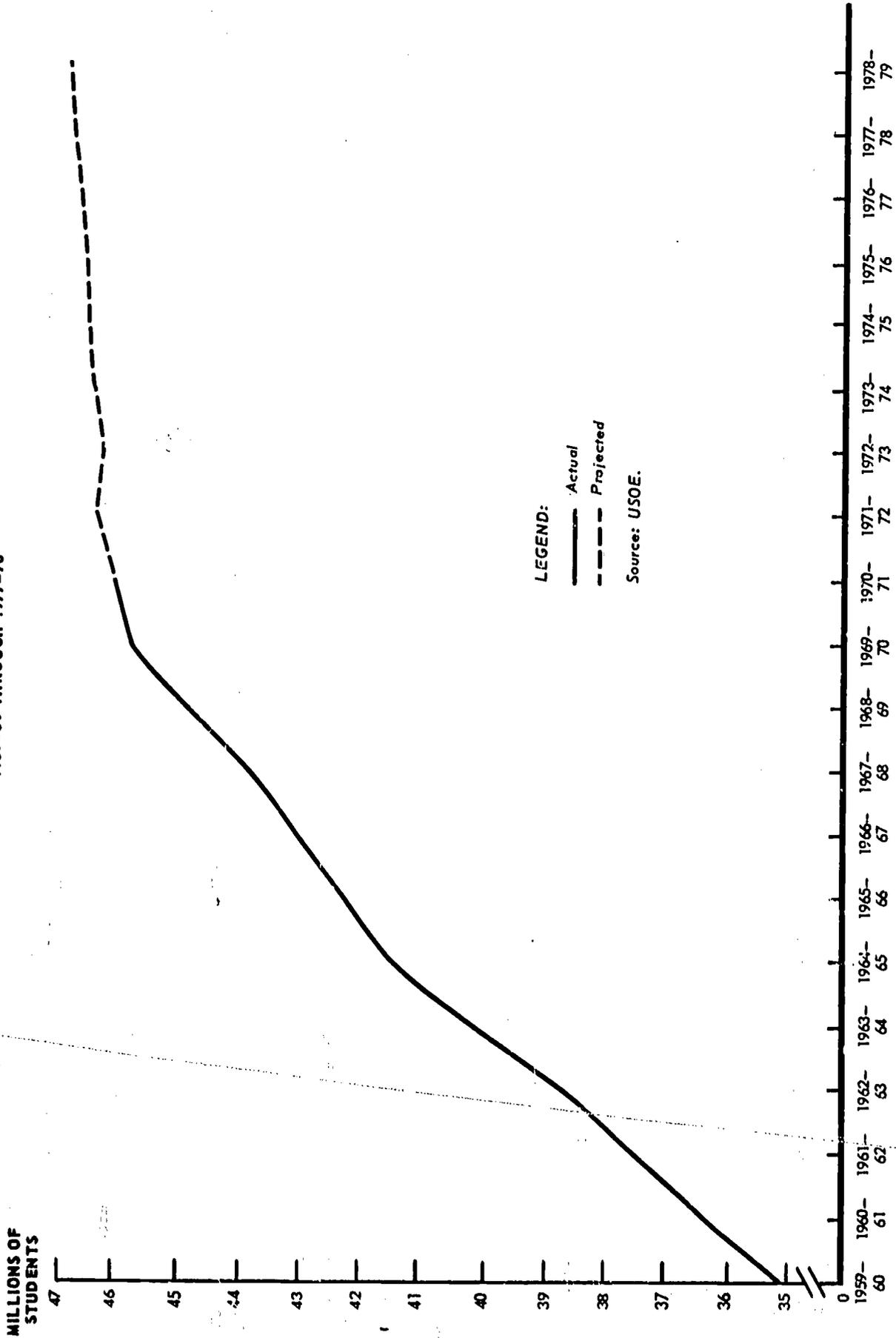


PART D  
EXHIBIT I-1

PART D  
EXHIBIT I-2

PUBLIC SCHOOL ENROLLMENT, GRADES K-12

1959-60 THROUGH 1977-78



LEGEND:

— Actual

- - - Projected

Source: USOE.

MILLIONS OF STUDENTS

<u>Purpose Of Room Construction</u>	<u>Annual Construction Of Classrooms</u>	
	<u>1960's</u>	<u>1970's</u>
To provide for overall increased enrollment	36,000	-
To provide replacement for abandoned rooms	20,000	20,000
To relieve migratory problems, to provide for new programs and to reduce pupil/room ratios	<u>14,000</u>	<u>50,000</u>
Total	70,000	70,000

In summary, USOE projects that in the 1970's school districts will annually construct new buildings containing 70,000 instruction rooms, and that it will cost about \$4.1 billion.

#### ARRANGEMENT OF PART D

The subjects, described in the Introduction of this section, are discussed in detail under the following chapter headings:

- II - Avoiding The Need For New Construction - reviews methods for increasing the effective capacity of the existing school plant
- III - Reducing The Volume Of New Construction - discusses means for planning new schools for more efficient use
- IV - Reducing The Cost Of New Construction - describes techniques for building new schools more economically
- V - Sharing The Cost Of New Schools - describes means for obtaining part of the capital funds for new schools from nonschool sources
- VI - Summary Of Potential Reduction In Capital Outlays - estimates overall potential savings in capital expenditures for new schools
- VII - Reducing The Cost Of Financing - discusses means for reducing financing charges.

## PART D

### II - AVOIDING THE NEED FOR NEW CONSTRUCTION

New construction can be avoided and dollars can be saved if ways can be found to make fuller use of existing facilities. One method, which is beginning to gain acceptance, is the extended school year (ESY), discussed here in detail. A later section reviews other methods for improving the use of present school facilities, including improvement in room scheduling, and remodeling of facilities.

#### EXTENDING THE SCHOOL YEAR

The normal school year in the United States is 180 days or 36 weeks. Schools are virtually unused during Christmas holidays, Spring vacations and the 10 to 12 week summer vacation. If the schools were in session 48 weeks per year, with 75 per cent of the students in attendance at any one time, the result would be an immediate increase in school capacity of 25 to 33 per cent.

#### Possible Approaches

Many approaches to rescheduling the school year, to achieve this objective, have been devised although none has achieved full endorsement of teachers and parents.

The staggered quarter program, with mandatory assignment, retains a three-month recess for each student, with one quarter of the students on vacation each quarter. This program is generally unacceptable to parents, particularly in those states that have severe winters.

The four-quarter program, with voluntary attendance during the summer, does not release space because attendance is usually for enrichment, or to make up for failed courses.

The 12-4 or the 9-3 rotational plans, with mandatory assignment, divide the pupils into four groups, as in the staggered quarter plan, with one quarter on vacation at all times. In the 12-4 plan the student attends school 12 weeks and is on vacation 4 weeks, while in the 9-3 plan (45-15 as it is sometimes called), the cycle is 9 weeks of school and 3 weeks of vacation. These programs are superior to the staggered quarter plan, according to some educators,

because the long summer vacation during which students tended to retrogress educationally is replaced with a series of shorter vacations. However, careful scheduling is required to ensure that children in the same family have the same vacation schedules. Moreover, these plans cause problems in interscholastic athletics, other extra curricular activities, and in programs such as Little League baseball.

Other approaches include the accelerated programs, which require a longer school year (usually 210 days) based on the trimester or the quadrimester, and various enrichment programs. Although not designed primarily to release space, these programs may have the effect of increasing school plant capacity by 5 to 10 per cent.

#### Space Savings Potential Of ESY

The approaches cited have been tried at one time or another, although the objectives have not always been to increase the capacity of the school plant. For the purposes of this report, the primary question is: "Will a rescheduled school year plan release space and save money?" It is the conclusion of the New York State Education Department, as reported in the publication, *The Impact of a Rescheduled School Year*, p. 44, March 1970, that: "The answer to this question can be a positive yes, but it must be understood that different approaches or design variations release different amounts of classroom space and dollars. How much space is released and when depends upon the nature of the plan selected and the readiness of the local school district to implement it."

Dr. George I. Thomas, formerly of the N. Y. State Education Department is perhaps the foremost advocate of ESY. He states that the plan can be applied to any school with two or more rooms and that it will release space of up to 33 per cent. He points out that to secure this result the system must include mandatory assignment of pupils to groups, to equalize teacher loads; also the plan should be established on a districtwide basis, to spread the cost of necessary curriculum revisions and planning. Dr. Thomas summarizes the impact of ESY in numerous common situations such as the following:

- In a school system facing growing enrollment, new construction can be completely avoided until enrollment grows more than 25 per cent, at which time a more reduced building program would be needed.
- In a school system desiring to reduce class size, additional rooms needed to eliminate overcrowded classes could be provided without new construction.

- In a school system requiring resource centers, open classrooms or other new learning areas. Some of the space released by adoption of ESY could be arranged to modernize facilities, at less than the cost of new construction.

#### Experience Of Valley View District

One of the districts pioneering in ESY is Valley View District Number '96 in Lockport, Illinois, which adopted a 45-15 plan in June 1970, to accommodate enrollment growth. According to the district business manager, the plan immediately increased the capacity of six elementary schools, which use traditional curriculum and teaching methods, by a full 33 per cent. The 180 existing classrooms achieved the equivalent of 240 classrooms. At the junior high school, the increase in capacity was 26 per cent - somewhat less than in the elementary schools, because of the nature of the curriculum and manner in which rooms are scheduled and used.

The community has accepted the continuous plan and, in July 1972, it also will be adopted by the high school. However, because of its rapid population growth, Lockport still needs more capacity than that provided by ESY, and is planning to build additional schools. These, too, will operate on the extended basis and accordingly will be about one third smaller than would be required on a traditional schedule. Details of the Valley View plan are described in Appendix D-1.

#### Interest In ESY

In 1965, only a few school districts had adopted ESY. By 1971, about 100 districts had adopted it in one form or another and, according to a report in the Wall Street Journal of September 14, 1971, at least 1,000 additional districts were studying the feasibility of the plan. If school districts reach their debt limits, or see their school bond issues defeated, the concept of the extended school year will become more attractive than new construction to an increasing number.

If the plan were adopted by all school districts that need more room, the savings in construction costs in the present decade would be enormous. Only a small fraction of districts would need to build new schools, namely those whose projected enrollment growth is more than 25 to 33 per cent, those with a very high proportion of outmoded buildings, and the new districts formed by consolidating small districts that have small schools. However, because extended school year plans require revisions in educational philosophy curriculum and family living patterns, it is not likely that most districts requiring additional capacity will elect the extended plan; accordingly, the full space-saving potential of ESY could not be achieved in the 1970's.

## OTHER METHODS FOR INCREASING SCHOOL CAPACITY

The effective capacity of a school depends on the extent to which its facilities are utilized. Theoretically, if a new elementary school is planned, and if precise enrollment is established, the school could be planned virtually for full use. In practice, however, this ideal cannot be met because the number of pupils per grade varies from year to year. Moreover, class sizes have been reduced, and classrooms in older schools designed for 30 or more now may be filled only two thirds. Also, educational methods change, and the traditional "egg-crate" school may be poorly suited to the open classroom style of instruction.

Facilities utilization is more complex in secondary schools, where students move from room to room after each period. Here, the problem becomes one of scheduling rooms as well as seats, for maximum use.

In both elementary and secondary schools, the balance of facilities is an ongoing problem. A school may have adequate capacity in its library, auditorium, gymnasiums, offices and food service areas, but may lack a sufficient number of classrooms of the needed sizes. Or, the lunchroom or any other special-purpose facility may be too small.

School districts confronted with the need to provide more room, or a better balance of facilities, should conduct a thorough study of the extent to which present facilities are being utilized, before making plans to build new schools. The greatest gains are possible by adoption of ESY, or by using double sessions, an expedient that meets great community resistance and is not recommended, except as a temporary stopgap measure.

### Room Scheduling By Computer

According to Educational Facilities Laboratory, in the typical high school an average of 80 per cent of the rooms are in use at a given time, and 80 per cent of their seats are filled. This results in an average overall utilization rate for student places of 64 per cent. Using conventional manual scheduling techniques it is difficult to devise room and class schedules that would improve this rate. For a large school, manual scheduling of teachers, students and rooms, is a complex, detailed task. Unfortunately, much of the work cannot be delegated to clerks because administrative judgment is necessary to pursue the trial and error strategy the task demands. Thus, the preparation of manual schedules is largely the effort of the principal or assistant principal, who seldom has the time to test enough alternatives to reach an optimum schedule.

Scheduling is an even more complex problem in the school adopting innovative programs. School Scheduling by Computer - The Story of GASP (Generalized Academic Simulation Programs), an EFL publication, describes the problem in the following manner:

"If schedule construction is a formidable task in the conventional school that changes little from year to year, it looms like a monster to the principal of a school embarked on educational innovation. Consider the potential scheduling difficulties in team-teaching, for instance. Or in nongraded plans where individual students progress at their own rate through the school. Or in the redistribution of standard classes into large, medium or small groups. Or in provision for independent study and honors work or wide ranging electives. Or in the strict application of ability grouping, subject by subject. Or in such innovations in the school day as modular scheduling or flexible periods."

As more and more high schools move toward individualized instruction and innovative programs, the scheduling job will become more complex, and room utilization rates will tend to decline further.

Some schools are now using computers to schedule classes and thereby improve space use. Because of its high speed, the computer can test a very large number of alternative schedules and then design a schedule that not only meets the school's needs, but also provides for maximum use of rooms and seats. A number of computer programs are now available, including GASP, CLASS (Class Load and Student Scheduling) and S<sup>4</sup> (Stanford School Scheduling System). They are being used to schedule many colleges and universities, some innovative and conventional high schools and a few elementary schools. The schedules have been consistently more efficient than those prepared manually.

The value of computerized scheduling was dramatically demonstrated at the planned Meramec Junior College in St. Louis County. The master plan, which specified the number and kind of rooms needed to serve a 4,500 student body, was simulated by a GASP program. The resulting schedule indicated that 22 planned rooms were not necessary, and that utilization of the remaining rooms would be 85 per cent, with 89 per cent occupancy of the available seats in each classroom. This rate is significantly better than that of the typical high school, even though colleges are generally more difficult to schedule efficiently.

#### Extended School Day

Space shortages often can be eliminated or alleviated by extending the school day for a period or two. Some schools still close down for the lunch hour, although both classroom and lunchroom capacity is increased by staggering student and teacher lunch periods, and keeping classrooms in use through the entire day.

Despite the general undesirability of double sessions, certain circumstances may make it feasible to operate schools at other than usual hours. For instance, a high school in Las Vegas, Nevada, starts its second session at 4 p. m. Since some parents work evenings, the later school session allows them to spend more time, earlier in the day, with their children. Similar school schedules would prove helpful to students who wish to take on daytime jobs.

### Remodeling Of Space

Generally, per-square-foot costs for extensive alterations are about 50 per cent of new construction costs. Since many older schools have oversized classrooms built to accommodate large classes, an economical solution to space needs may be remodeling. This is especially appropriate for schools planning for the open-classroom approach. For example, the Eastridge School, in the Cherry Creek School District of Colorado, converted 12 "egg crate" classrooms into four learning areas at a cost of only \$31,000. The new flexible facility accommodates 100 additional children, at a cost per pupil therefore of only \$310 - a small fraction of the per-pupil costs for new construction.

### Rental Of Nearby Facilities

Space needs of schools serving growing student populations may sometimes be met economically by leasing and converting supplementary space in nearby buildings. In the case of an entire school, leasing is usually more expensive than building; however, if only some supplementary balancing space is required to ease shortages and increase the effective capacity of an existing school, it may be more economical to lease. Depending on circumstances and administrators' ingenuity, it may also be possible to utilize free space in nearby churches or other facilities.

Portable leased classrooms are further alternatives for additional space, to bring facilities into balance. However, since their costs may be high, the school system contemplating such a move should carefully check into the expenditures that would be involved.

### School Regrading And Rezoning

Population shifts within communities and among age groups often result in overcrowding in schools in larger districts, and underutilization of others. CMP has found that many school districts do not take full advantage of opportunities to improve utilization by rezoning students and regrading schools, if needed. This should be done in accordance with a master facilities plan, as described in the following chapter.

## PART D

### III - REDUCING THE VOLUME OF NEW CONSTRUCTION

The previous chapter described means for avoiding new school construction by making fuller use of existing school facilities. This chapter discusses a closely related subject: reducing the volume of new construction by planning for optimum utilization of the new schools, thereby reducing their size.

To accomplish these related objectives effectively, each school district should develop a comprehensive facilities plan, as follows.

- A forecast is made of expected enrollment by grade level for 5, 10 and 15 years forward.
- Instructional programs and curriculums are examined. Anticipated changes in instructional methods that will affect facilities needs are taken into account, such as a decision to adopt the open classroom approach.
- Based on forecast enrollment and planned educational programs, future facilities needs are determined, such as types, amounts and location of space and when it will be needed.
- Existing facilities are evaluated to decide opportunities for increased use, as described in the preceding chapter; suitability for continued use; needs for remodeling; and whether facilities are outmoded and should be demolished.
- A determination is made of the additional space needed to be provided in new schools or additions to existing schools, including grades served in new schools, the number of students to be accommodated and when the new facilities are to be built.
- Facilities planning standards are used to calculate the amounts of each kind of space needed in new and remodeled schools.

The resulting facilities plan then becomes the basis for planning capital needs, and for development of building designs. The facilities plan should be updated periodically - each school district today should be following a plan that was developed in former years and modified as enrollment forecasts and educational programs changed.

## NEEDED IMPROVEMENTS IN SCHOOL DISTRICT PLANNING

It is the observation of CMP, based on experience from working with many school districts, that the proportion of districts with well-prepared facilities plans is low. And, facilities planning authorities interviewed in conducting this study agreed. At a large state education department, for example, a facilities specialist who spends most of his time reviewing individual school district building plans made the following observation:

"We have very poor long-range planners in education. The typical school district fails to make accurate enrollment projections. It provides insufficient guidance to its architects on programs. It fails to review preliminary plans carefully enough. "

The most obvious manifestation of poor facilities planning is insufficient space, resulting in overcrowded schools, double sessions and the need to use costly temporary classrooms. Equally prevalent, if less overt, is underutilization of school space, and overbuilt schools. Some opportunities for improving planning procedures follow.

### Enrollment Forecasting

Exact forecasting of future enrollments is not possible, but the use of appropriate forecasting procedures will enable a school district to project future space needs with sufficient accuracy to prevent gross space shortages, or overbuilding. Schools lacking a staff capability for doing this should obtain assistance from their state education department, or educational consultants. Development of the enrollment forecast should include:

- Examination of trends in district enrollment, by grade level, and high school program area, for the past 5 to 10 years
- Analysis of present enrollment figures by grade and evaluation of trends in student persistence through grades
- Assessment of population forecasts for the community and region, obtained from county or district planning agencies
- Analysis of trends in relationships between total population and school enrollment, as affected by changes in population age mix
- Identification of special factors, such as plans for new industry in the area, housing developments and prospective closing of independent schools.

## FACILITIES PLANNING STANDARDS

When the number of students to be accommodated and the programs to be offered has been determined, facilities planning standards should be applied to calculate the amounts of each kind of space that will be required. Standards may be developed or disseminated by state education departments to aid local school districts and their architects. Standards cover elements such as the following:

- Size of student stations in classrooms, number of stations per standard room, resulting size of rooms
- Utilization rates of general- and special-purpose rooms; resulting number of rooms needed to accommodate various enrollment levels
- Number and size of learning areas needed in relation to enrollment
- Percentage of student body to be accommodated at one time in lunchrooms and auditoriums; square footage per student; resultant size of facilities in relation to number of students
- "Net to gross ratio:" ratio of usable building space to total building area.

The following is an example of selected planning standards used in one state as a guide in room planning:

<u>Type Of Area Or Room</u>	<u>Net Square Feet Per Pupil</u>
Regular Secondary Classroom	25.0
Industrial Arts	75.0
Homemaking	50.0
Arts	40.0
Typing	20.0
Music	25.0
Study Hall	16.5

The misuse or nonuse of facilities planning standards results in schools that are not efficiently planned in relation to need, and the waste of capital funds. To CMP, some commonly used standards appear to be overly liberal. As cited above, a typical secondary school planning standard requires 25 square feet per student station in classrooms, while the accepted college standard is 15 square feet. Discussions with secondary school administrators revealed

no reason why high school students need classrooms that are 66 per cent roomier and 66 per cent more costly than those used by college students. Classrooms represent approximately one third the area and cost of the typical high school, and accordingly the use of the college standard would reduce the size and cost of the average new high school by more than 10 per cent.

Because some state education departments have not prepared or disseminated standards to guide school districts, schools in poorer districts tend to be underbuilt and those in richer districts, overbuilt, in relation to student enrollment. Even in those states that have established standards and review the plans of individual school districts, there are wide variations in the amount of space provided on a per-pupil basis. For example, a review of actual space provided in 15 elementary schools recently built in New York State showed variations of up to 50 per cent, as follows:

<u>Type Of Space</u>	<u>Range In Square Feet Per Pupil</u>		<u>Variation, In Per Cent</u>
	<u>High</u>	<u>Low</u>	
Regular And Special Classrooms	39	32	23%
Miscellaneous Educational Spaces	18	12	51
Noneducational And Service Space	31	17	77
Gross Area	83	66	25

A similar review of 13 high schools recently erected in New York State showed even greater variations:

<u>Type Of Space</u>	<u>Range In Square Feet Per Pupil</u>		<u>Variation, In Per Cent</u>
	<u>High</u>	<u>Low</u>	
Regular And Special Classrooms	55	32	72%
Miscellaneous Educational Spaces	48	20	140
Noneducational And Service Space	51	29	76
Gross Area	131	89	47

Planning standards should not be so rigidly applied as to prevent needed differences among schools; it is not likely that each school will have identical amounts of space on a per-pupil basis as all others. For example, small schools would need more space per pupil than larger schools, and differences in program emphasis and teaching methods cause further variations. However, since the extreme ranges found in actual practice exceed those that could be ascribed to reasonable differences in programs, it is apparent that many schools are overbuilt in relation to need.

## POTENTIAL SPACE SAVINGS

An indication of the magnitude of the savings that can be achieved by better control of school building plans is offered by the experience in New York State - its education department provides planning counsel to school districts, reviews plan and relates some portion of state aid to approval of local building plans. As a result of continuing efforts to encourage local districts to better relate school building plans to enrollment, the median gross square footage of New York State schools built since 1963 is 4 per cent less than those built before, as presented in the table below. Because building costs are proportional to square footage areas, savings would be comparable:

<u>Type Of School</u>	<u>Median Gross Square Feet Per Pupil</u>	
	<u>Schools Built Before 1963</u>	<u>Schools Built Since 1963</u>
Elementary	85	83
Middle And Junior High	100	95
High School	125	120

## IMPLEMENTATION

The volume of new school construction would be reduced by implementing the following:

1. All state education departments should disseminate realistic facilities planning standards, in the form of ranges, to permit reasonable variations among schools, according to local needs.

2. Standards should be updated periodically in accordance with advances in educational practices. Currently, for example, standards should be reviewed because of the growing trend toward the open-plan schools where open learning areas are used instead of traditional classrooms.

3. The state education department should review the building plans of local school districts, concentrating on whether overall building areas and costs are within reasonable limits. Adherence to standards should be encouraged by relating state approval of building plans to state aid programs.

4. All school districts contemplating any building or modernization programs should develop a comprehensive facilities plan and update it periodically. Large districts may employ staff facilities planners, while smaller districts should seek available assistance from facilities specialists of the state education department, or should engage qualified professionals.

Heretofore, means for reducing the physical volume of school construction were presented and examined. The following chapter discusses means for reducing the unit cost of school construction.

## PART D

### IV - REDUCING THE COST OF NEW CONSTRUCTION

Usually, when estimates for a new school building exceed the budgeted amount, the architect is instructed to eliminate the swimming pool or substitute cheaper materials throughout the building. Methods for achieving more fundamental economies in the cost of constructing new schools are incorporated in this chapter.

From 1951 through 1968, the median cost per square foot of building schools in New York State rose only 18 per cent, while the unit cost of other construction in the state and nationally rose more than 55 per cent. A factor in restricting the school building cost rise in New York State has been the advice provided school districts by the state education department. Besides counsel on amounts of space needed, the department also reviews district building plans and recommends means for economizing in the cost of construction. One important approach has been the use of performance standards which specify the performance to be attained, rather than the materials to be used. This permits school architects to utilize newly developed materials, and is reported by department planning specialists to have been a major factor in restricting the rise of school construction costs.

Two recently introduced methods with particular promise for reducing school construction costs are systems building and fast tracking, which have been fostered by the development efforts of Educational Facilities Laboratories. These are described in the following paragraphs.

#### SYSTEMS BUILDING

Historically, the construction industry has been an on-site assembly process, where the individual pieces of the building were cut, shaped and assembled into the final structure.

In contrast, manufacturing operations have achieved mass production status through use of assembly lines through which parts are made into subassemblies first, then into larger components that are fitted together to form the finished product. This technique reduces both the cost of manufacturing and time required.

Mass production techniques, under the term, systems building, are now beginning to be applied to school construction. First, specifications are developed for major components of the building, including structure and roof, ceiling and lighting, heating and air-conditioning, partitions, and cabinets. The components - designed and specified for compatibility - are assembled by the manufacturer, then brought to the building site for final assembly. This method of construction reduces costs by replacing expensive on-site labor with less expensive off-site labor.

The building-systems approach is applicable to schools of traditional design, but is particularly suitable for the new open-plan schools that are characterized by fewer permanent walls, large open areas and flexibility in layout. The compatibility of components furnished in the building-systems approach - design features that allow heating, air-conditioning and lighting controls to be relocated - permits easy and rapid changes in building layout, as demanded by the curricular patterns.

### FAST TRACKING

Fast tracking is a method of planning and scheduling the design - construction process that significantly reduces the time between beginning of design to building occupancy. It adapts features of the Critical Path scheduling method long used in industry.

Under both the traditional and fast track methods, the first step is the preparation of an architectural program that sets forth the kinds and amounts of space required, based on student enrollment, educational programs and facilities planning standards.

In the traditional method, the architect next prepares preliminary design drawings for overall building and room layouts. After approval, the architect develops the building plans in detail, and prepares working drawings and related contract documents, when approved. These contract documents then are submitted to contractors for preparation of bids. After the bids have been reviewed, contracts are awarded and construction begins. The whole process is sequential: each step is initiated following completion of the previous one.

In the fast-tracking approach, these work steps are telescoped. Following approval of the preliminary design drawings, bids are taken on certain major building components, such as the foundation and structural steel. Thus, construction can commence while the final detail drawings are being prepared. The overall project time may be reduced by about 25 per cent.

Various alternatives are possible under the fast-tracking approach. Where permitted by state or local laws, a single design-construction firm may be given responsibility for the entire project under a "turnkey" contract. Alternately, the architect may work with a number of contractors, using a "two-stage" bidding approach, whereby key components are prebid following approval of design drawings.

The fast-tracking approach is particularly compatible with the systems-building approach, since it is facilitated by the use of modular building components designed on the basis of performance specifications.

Together, systems building and fast tracking represent an innovative systems approach to building design and construction management.

#### COST REDUCTION

The initial development of the systems approach was encouraged by EFL, which aided individual school districts and state education departments in organizing projects, under which groups of schools were designed and built by the systems approach.

A representative of Building Systems Information Clearinghouse, which is funded by EFL, estimated that, during the past six years, the techniques have been applied to approximately 300 new school buildings in 32 states and Canada, and that cost reductions have averaged about 10 per cent in comparison with conventional building techniques.

The cost savings result from a combination of factors: lower cost factory-built components as compared with site-assembled buildings; use of more efficient bidding and construction management procedures; and during an inflationary period, the greater speed with which buildings are designed and erected. Some examples follow:

In an early application of the systems-building approach, 11 schools were built in California, under the School Construction Systems Development program. The cost of building components - which represented half of total building cost - was reduced from 15 to 20 per cent, resulting in an overall cost reduction of 10 per cent, as compared with conventional construction.

In Florida, since 1967, the systems approach has been applied to more than 50 separate school projects, including complete buildings and major additions. Initially, the cost per square foot of the systems project was

slightly higher than buildings constructed by traditional methods. However, costs of the latter escalated rapidly, and in the 1970-71 school year the average cost per square foot for schools constructed by the systems approach was \$16.08, and \$19.16 for traditional buildings.

Thus, the systems schools built in Florida were 16 per cent less costly than those built by traditional methods. Furthermore, according to officials of Schoolhouse Systems Project (the state education department unit responsible for the program), the systems approach has resulted in superior school buildings, with more sophisticated mechanical controls, better lighting and partitions that can be disassembled for future adaptability.

In Toronto, the School Education Facilities project built 31 schools under the systems approach, with reported average savings of 10 per cent. In Montreal, similar savings are being realized in the systems construction of 20 school plants by the Montreal Catholic School Commission.

#### IMPLEMENTATION

Laws and regulations in many states inhibit adoption of the systems approach to building schools which results in a waste of taxpayers' money. State education departments should evaluate the need for legislation or policy changes, and initiate corrective measures. It is recommended that special project teams be designated, to advance the systems concept. In several states such teams have been an effective means for encouraging local school districts to use the new techniques.

#### OTHER METHODS

Other opportunities for reducing construction costs were examined, and are discussed in this section.

##### Open-Plan Schools

Many of the new schools built during the past few years, particularly elementary schools, have been designed on the open plan, with the traditional classrooms replaced by large open learning areas. Open-plan schools generally have a more favorable net-to-gross ratio - less space is occupied by walls and corridors. Accordingly, the open-plan building shell tends to cost less per usable square foot and per pupil. However, open-plan schools need to be carpeted, generally have air-conditioning, and usually require more costly furnishings and equipment. Although some cost analyses have

shown overall savings for open-plan schools, it appears that the higher cost of furnishings tends to offset the savings in the building shell. This report favors the construction of open-plan schools because of their suitability to modern educational methods, flexibility and adaptability for subsequent program change, and also they are especially well adapted to the systems-building approach. It does not appear, however, that the open-plan design, per se, necessarily assures lower initial construction costs.

### Reuse Of Architectural Drawings

Architectural fees customarily represent about 6 per cent of the cost of constructing a school. To reduce this expense, some large school systems have developed standard modular plans, projecting their reuse for a number of schools. In practice, however, it appears that the potential savings are not realized because architects often must be engaged for each new school project to make substantial modifications in the standard plans. This is necessary because of variations in site conditions, changes in educational programs, esthetic requirements and the need to harmonize the building with its surroundings. Moreover, the use of standard plans tends to inhibit adoption of new methods, such as the use of performance specifications and the systems approach, which would save more than 6 per cent.

A more economical way for state education departments to save money would be to standardize the building components used in systems-built schools, thereby augmenting the economies achievable through the overall systems approach. The standardized components would be assembled in various configurations depending on requirements of individual schools.

### General Design Considerations

The following general design principles are suggested by the Council of Educational Facilities Planners as a means for achieving economies in building construction.

- Exterior building perimeters should be held to a minimum.
- Where possible, use should be made of repetitive units of space based upon a common set of dimensions.
- Relative costs of multi-story versus single-story construction should be considered, taking into account site costs and conditions, and the desired educational program.

- Rather than fixed walls, consideration should be given to less expensive partitioning systems for subdividing interior space.
- Building designs that impose special problems related to the visual, audible and thermal environments should be avoided.
- Over-design of structural, mechanical and control components should be avoided.

## PART D

### V - SHARING THE COST OF NEW SCHOOLS

During the past few years, a number of new public schools have been built with capital funds supplied in whole or in part from nonschool sources. These schools share their sites or facilities with other users, under "joint occupancy" arrangements.

Two forms of joint occupancy, which are described briefly in this chapter and in detail in Appendix D-2, are:

- Sharing of a school site with commercial buildings from which revenues finance all or a portion of the new school building
- Sharing of certain school facilities with community groups, with part of the cost of the "dual use" facilities financed by nonschool sources.

Normally, joint occupancy is difficult to arrange and besides cost savings, other benefits must ordinarily be provided to justify the additional efforts required to overcome political, technical and legal obstacles. Depending on circumstances, joint occupancy arrangements can offer such supplementary advantages as:

- Making better use of scarce and expensive land
- Providing new housing
- Protecting the community's tax base
- Better integrating school and community activities.

#### SHARING OF SCHOOL SITES: THE "AIR RIGHTS" APPROACH

This form of joint occupancy is potentially applicable primarily in large cities where land is expensive or scarce, and there is demand for additional housing or office space. At present the site sharing or "air rights" approach has been developed substantially only in New York City, where about 10 per cent of the total school construction now in the planning or building stage will be erected as part of joint occupancy developments.

Joint occupancy projects in New York City are managed by its Educational Construction Fund (ECF), a public authority established in 1966. After negotiation with the Board of Education and other pertinent agencies, ECF purchases a site for a planned new school and then arranges for a commercial developer to lease a portion of the "zoning envelope" surrounding the site.

The developer constructs the building or complex of buildings that include a school and a high-rise office or apartment tower, part of which at least is built in air space over the school.

ECF owns the land and the school portion of the complex that it finances through sale of tax exempt notes and bonds. The developer owns the commercial portion, and pays ECF two forms of revenue: lease payments for the occupied air space, and "tax equivalency payments," which are comparable to real estate taxes on similar facilities. ECF uses these two forms of income to retire its bonds. ECF leases the school to the city for a nominal \$1 annual charge. On retirement of the ECF bonds in 35 to 40 years, the complex is returned to the city, which will then collect air rights lease payments and taxes.

Last spring, ECF had 23 projects under way, which will provide schools estimated to cost \$151 million. It calculated that income from the commercial parts of the 20 projects will exceed their debt service charges. Accordingly, it may be concluded that these 20 schools will be "free" to the City of New York. Data concerning these projects are presented in Exhibit V-1, following.

About 85 per cent of ECF's income from the 20 projects will result from the tax equivalency payments, with the balance from income for air-rights-leasing. In essence, then, as developed in New York City, the air rights or site sharing form of joint occupancy is a means to derive real estate taxes from school sites - revenues that would not be generated if the site contained only a school. Tax revenues, then - supplemented by lease payments - pay for new schools.

#### SHARING SCHOOL FACILITIES: THE SCHOOL/COMMUNITY CENTER

Recently, a number of schools have been built as part of school/community centers. Usually about 50 per cent of the total space of the complex is used only for school purposes. An additional 20 per cent is used only for community purposes, such as offices and workshops for senior citizens, adult education and community service agencies. The remaining 30 per cent consists of a gymnasium, cafeteria, auditorium-theatre and perhaps a library that is used during the day for school purposes and by community groups in the after-school hours.

NEW YORK CITY EDUCATIONAL CONSTRUCTION FUND

Projections As Of April 1971

School Number	Number Of Seats	Cost In Millions	Housing Financing(a)	Number Of Units	Annual Fund Income			Annual School Debt Service	Annual Surplus Or (Deficit)	Income As Per Cent Of Debt Service
					Lease	Tax Equivalency	Total			
<b>A - Deficit Projects</b>										
P.S. 50 - M	1,400	\$ 7.0	M/L-236	300	\$ 12,000	\$ 60,000	\$ 72,000	\$ 560,000	\$ (488,000)	13%
P.S. 147-M	640	4.3	M/L	220	32,000	77,000	109,000	344,000	(235,000)	32
P.S. 209 - M	640	4.3	PHA	300	12,000	45,000	57,000	344,000	(287,000)	17
J.H.S. 47 - M	1,400	2.0	M/L	170	52,000	60,000	112,000	160,000	(48,000)	70
P.S. 124 - M	1,200	6.0	M/L	740	188,000	260,000	448,000	480,000	(32,000)	93
P.S. 212 - M	640	4.5	M/L 236	380	28,000	76,000	104,000	360,000	(256,000)	29
P.S. 99 - Q	1,120	2.0	M/L	220	68,000	77,000	145,000	160,000	(15,000)	91
Park West High School	3,650	25.0	M/L	400	82,000	140,000	222,000	2,000,000	(1,778,000)	11
Central Commercial High School	2,550	20.0	Office building	500,000 sq. ft.	500,000	800,000	1,300,000	1,600,000	(300,000)	81
P.S. 48 - M	1,200	6.0	M/L	300	36,000	105,000	141,000	480,000	(339,000)	29
I.S. 195 - M	1,800	10.0	M/L 236	1,000	60,000	200,000	260,000	800,000	(540,000)	33
ECC No. 2 - S.B.	120	0.9	PHA 236	120	8,000	8,000	16,000	72,000	(56,000)	22
P.S. 200 - X	1,000	6.0	M/L 236	600	24,000	120,000	144,000	480,000	(336,000)	30
P.S. 203 - X	1,500	8.0	PHA	300	12,000	45,000	57,000	640,000	(583,000)	9
ECC No. 1 - B.S.	120	0.9	PHA 236	140	8,000	11,000	19,000	72,000	(53,000)	26
P.S. 60 - K	1,500	8.0	PHA	480	18,000	72,000	90,000	640,000	(550,000)	14
Subtotal		\$114.9			\$1,140,000	\$2,156,000	\$3,296,000	\$9,192,000	\$5,896,000	36%
<b>B - Sustaining Projects</b>										
P.S. 169 - M	250	\$ 4.5	Comv.	200	\$ 85,000	\$ 300,000	\$ 385,000	\$ 380,000	\$ 5,000	101%
P.S. 141 - M	875	7.5	M/L 236	300	15,000	60,000	75,000	600,000	100,000	116
P.S. 126 - X	1,200	4.0	M/L 236	900	310,000	315,000	625,000	(b)	(b)	(b)
Downtown Commercial High School	2,500	20.0	Office building	1,000,000 sq. ft.	500,000	8,000,000	8,500,000	1,600,000	6,900,000	531
Subtotal		\$ 36.0			\$ 910,000	\$ 8,675,000	\$ 9,585,000	\$ 2,580,000	\$ 7,005,000	371
Total		\$150.9			\$2,050,000	\$10,831,000	\$12,881,000	\$11,772,000	\$ 1,109,000	109%

Note: All figures are estimates, subject to the fluctuations of interest rates; determination of bond maturity and construction costs.

(a)M/L - New York Mitchell-Lama Act; 236-Federal Housing Act, interest subsidy; PHA-Public Housing Authority; FHA-Federal Housing Authority; Comv. - conventional mortgage.

(b)Special City Fund agreement on sale.

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EXHIBIT V-1

The funding for several such projects has been provided by both the Board of Education and a combination of nonschool sources that may include a county recreation agency, United States Department of Housing and Urban Development and private foundations or citizens. Depending on the extent to which nonschool funding pays for a share of the dual-use facilities, it is possible to identify direct savings to school sources.

Five school/community centers were analyzed, and data concerning them are presented in Exhibit V-2, which follows.

On the basis of these examples, and of information provided by architects and EFL, CMP offers the following model for purposes of cost comparison.

To build a typical free-standing school that would accommodate 1,200 to 1,400 students would cost about \$4.5 million, of which about \$1.5 million would be represented by the gymnasium, cafeteria, auditorium and library - facilities with potential for dual use.

If - rather than a free-standing school - a school/community center is built, the dual-use facilities would be made more extensive and would cost about \$2 million. If the cost of these facilities is shared equally with non-school sources, the Board of Education would pay a total of \$4 million as its share of the overall financing (\$3 million for the school facilities and \$1 million for its share of the dual-use facilities).

In comparison with the cost of an equivalent free-standing school, the Board of Education thus would save \$500,000 or 11 per cent, and also would have access to facilities costing \$5 million.

### IMPLEMENTATION

Implementation of the joint-occupancy approach requires persistence of the involved local officials, because of the difficulties that present themselves in bringing together the various people concerned, and in overcoming historical and statutory obstacles. To spur development of joint-occupancy arrangements, the following steps are recommended.

1. State boards and departments of education should weigh whether existing state laws and policies prevent or inhibit the development of joint-occupancy arrangements, and should propose appropriate revisions, if necessary.

2. District boards of education should investigate savings opportunities and determine the steps necessary to implement them, which may include formation of new agencies such as the New York City Educational Construction Fund, and revision in existing municipal policies and statutes.

SCHOOL/COMMUNITY CENTER - FINANCIAL COMPARISONS

Item	Quincy School (Boston, Mass.)	Human Resources Center (Pontiac, Mich.)	John F. Kennedy Community Center (Atlanta, Ga.)	Thomas Jefferson Junior High School Community Center (Arlington, Va.)	South Commons Branch-Drake Elementary School (Chicago, Ill.)
Facilities					
Number of seats in School	800	1,800-2,000	1,200	1,400	250
Dual-use					
Auditorium	x	x	x	x	x
Gymnasium	x	x	x	x	x
Food service	x	x	x	x	x
Other	Pool, health center	Health center, arts and crafts	Library	Music room, industrial arts, home economics	
Community	x	x	x	x	x
Other	Housing, parking garage		Area school super- intendent office		Housing, parking garage, shopping center
Facilities Costs (in Millions)					
School	\$3.3	\$4.32	\$2.55	\$3.32	n.a.
Dual-use	2.2	0.85	1.02	2.00	n.a.
Subtotal	\$5.5	\$5.17	\$3.57	\$5.32	n.a.
Community	n.a.	\$1.33	\$1.53	\$1.23	n.a.
Total	n.a.	\$6.50	\$5.1	\$6.65	n.a.
Financing (in Millions)					
School sources	\$5.5	\$4.9	\$3.2	\$4.15	\$2.25(e)
Other sources	n.a.	1.6(a)	1.3(a)	2.50(c)	1.75(g)
Total	n.a.	\$6.5	\$5.1	\$6.65	\$4.00(f)
Savings To School(d)					
Amount (in Millions)	0	\$0.27	\$0.37	\$1.17	\$1.75(g)
Per cent of total School costs	0	5%	10%	22%	44%

n.a. - not available.

(a)HUD.

(b)Private.

(c)Recreation Department.

(d)Cost of school plus dual-use facilities, less school source financing.

(e)Lease cost (in dollars per square foot) - actual.

(f)Lease cost - usual cost for equivalent space.

(g)Savings in lease cost (in dollars per square foot).

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EXHIBIT V-2

3. The Federal government could spur joint occupancy by freeing more funds for support of public housing, particularly under Section 236 of the 1968 Housing Act, and by liberalizing the purposes for which HUD can allot funds under the Neighborhood Facilities Act.

## PART D

### VI - SUMMARY OF POTENTIAL REDUCTION IN CAPITAL OUTLAYS

This chapter summarizes opportunities to reduce capital outlays, and presents approximate estimates of the economies that could be achieved by adopting them.

As noted in Chapter I, USOE estimates that, during the 1970's, the nation's school systems will make annual capital outlays of about \$4,067 million for school land and buildings, and that each year this amount will provide new schools with 70,000 classrooms, at an average cost per room of \$58,100.

This section has proposed means whereby:

- The number of new rooms needed can be reduced by making more effective utilization of existing school facilities.
- The volume of new construction can be reduced further by building more efficient and, hence, smaller new schools.
- The unit cost of new construction can be reduced.

In effect, it is proposed that, in comparison with USOE projections, fewer new rooms are needed, can be made smaller and can be built at less cost per square foot.

On the basis of a number of assumptions, an approximate estimate is made of the resultant potential for reducing capital outlay, as described in the following paragraphs.

#### AVOIDING NEW CONSTRUCTION

Full adoption of the measures described in Chapter II - particularly the extended school year - would raise the capacity of existing schools by more than one third, and very drastically reduce needs for new rooms. However, ESY represents a major departure from current practice, and it is not reasonable to expect that all districts needing new capacity will adopt it.

It is estimated that about one-tenth of all school districts will plan to build new schools each year during the 1970's. During the latter half of the 1960's, the number of school bond issues each year averaged about 1,700. At that time there were about 20,000 school districts, and if each bond issue represented one district, each year about 8.5 per cent of all districts built new schools through bond sales. In addition, some districts built new schools from reserve funds. Although the number of districts has since declined to about 17,500, USOE projects no decline from the 1960's in the number of rooms to be built. Accordingly, an interpretation of the USOE projection indicates that about one-tenth of all districts, or 1,750, will build schools each year during the 1970's.

District planning to build new schools will be referred to in this section as "affected districts." These will tend to change each year; that is, a given district will probably build only once or twice in the decade, although some large city and fast-growing suburban districts will have continuous building programs.

It is estimated that the total number of usable rooms in affected districts is 166,000. In the fall of 1970, capacity of the nation's schools totaled 1,864,300 rooms, according to USOE data. Since affected districts are one-tenth of all districts, it is assumed that they have one-tenth of all existing rooms, or 186,000. It was previously projected that 20,000 existing rooms would be abandoned each year in districts building new schools, and therefore the number of usable existing rooms in affected districts would be 186,000, less 20,000, or 166,000.

An increase of only 5 per cent in the efficiency of use of these 166,000 rooms would increase the existing capacity of affected districts by the equivalent of about 8,000 rooms - which is greater than 10 per cent of projected new construction each year.

It is reasonable to expect that affected districts each year could increase the utilization rate of their existing rooms by an average of 4 to 5 per cent. For example, the equivalent of 7,000 new rooms - 10 per cent of the projected yearly requirement - could be provided if 250 average-sized school districts each year adopted ESY. (The average district has 95 rooms. A 30 per cent utilization increase through ESY would create the equivalent of 28 new rooms, or 7,000 rooms in 1,750 districts.) Alternatively, 7,000 new rooms could be "created" if only 100 districts adopted ESY and the remaining affected districts increased the efficiency of use of their existing facilities by an average of only 2.7 per cent.

It is estimated conservatively that the number of new rooms needed could easily be reduced 10 per cent, or 7,000 rooms, by increased efficiency in the use of existing facilities. This would reduce the number of new rooms needed from the projected 70,000 to 63,000 per year.

### REDUCING CONSTRUCTION VOLUME

Chapter III described opportunities for further reducing the required volume of new construction by better planning of new school needs and, in effect, lessening the square footage area of new schools without reducing their enrollment capacity. The following were noted:

- The weak planning procedures in many school districts, absence of sound enrollment forecasts, and failure to base building plans on comprehensive district-wide facilities plans
- Failure to use facilities planning standards to maximum effective extent, and resulting variations among new schools in space per pupil of 50 per cent and more
- Experience in New York State in reducing average school size per pupil by 4 per cent, using relatively moderate control procedures.

If firm planning and control procedures were initiated in districts building new schools, it appears reasonable to conclude that an additional reduction of at least 10 per cent could be made in the volume of new school construction.

The combined effect of increasing the utilization of existing schools and planning new schools more efficiently would be to reduce new construction needs from 70,000 rooms to the equivalent of 57,000 rooms.

### REDUCING CONSTRUCTION COSTS

Chapter IV described opportunities for reducing the unit cost of construction, with the greatest potential being the adoption, by all school districts, of the systems approach. It was pointed out that this technique has been applied in constructing more than 300 schools in the United States and Canada in the past few years, with reported savings averaging about 10 per cent in comparison with traditional construction methods. If wage rates of construction workers continue to rise more rapidly than those of factory workers, the cost differential between systems and traditional construction will increase further.

CMP believes that the systems approach could be applied to virtually all new school construction, and that a 10 per cent cost reduction is a reasonable expectation. This would reduce the per-room cost from the projected \$58,100 to approximately \$52,300.

Building 57,000 rooms at a cost of \$52,300 per room would require annual capital layouts for school land and buildings of approximately \$3 million - down 27 per cent from the projected level of \$4,067 million. Although this is a substantial reduction, it is believed by CMP to represent a conservative estimate of potentially achievable savings.

These savings should be viewed against the fact that school boards may choose, or be forced, to defer desired and even needed new school construction, if district debt limits are reached, or if school bond issues are rejected by voters. For these reasons, the actual volume of construction may be significantly lower than that projected by USOE. Thus, total school construction volume may be reduced to \$3 billion or less, without application of the economy measures proposed in this report. In this case, the further reductions, which could be achieved by the measures proposed here, would be less.

#### SHARING SCHOOL COSTS

Chapter V discussed two means for obtaining a portion of the capital outlays needed for new schools from nonschool sources:

- Sharing of school sites with commercial buildings, under the "air rights" approach
- Sharing of school facilities with community groups, by building combination school/community centers.

On the basis of a number of assumptions and uncertainties, estimates were derived of the potential of each of these approaches for reducing capital outlays by school sources.

#### Sharing Sites

The sharing of school sites with commercial buildings, is applicable essentially only in big cities where land is scarce and expensive. Currently, about 10 per cent of the schools under construction or planned in New York City will be 100 per cent financed by nonschool sources. Although the future outlook is clouded with uncertainty, it is assumed by CMP that the proportion of school costs financed by nonschool sources in New York City will continue to increase, and will average 18 per cent over the decade.

USOE estimates that over the past six years, New York City has accounted for 3.14 per cent of total capital outlays for school construction. If this ratio should continue, and if total national capital outlays were reduced to \$3 billion through adoption of the proposals previously described, annual outlays for schools in New York City would be \$94 million (a figure substantially below New York City's own projection, which is calculated on a different basis than that used by USOE and which does not reflect the potential economies described in this report). The annual capital savings to school sources in New York City would thus be 18 per cent of \$94 million, or \$17 million.

It is assumed that the site-sharing approach is also potentially applicable to the 14 other largest cities in the United States, although on a reduced basis as compared with New York City. These 14 cities have accounted for 7.6 per cent of national capital outlays over the past six years, according to USOE data. Application of this ratio to national outlays of \$3 billion, would result in annual capital outlays in these 14 cities of \$228 million.

The following table presents the estimated savings that would be achieved by the 14 cities, at various rates of adoption of the air rights concept in proportion to New York City.

Adoption Ratios: 14 Other Cities To NYC	School Costs Saved	Resultant Annual Savings In Millions		
		14 Other Cities	New York City	Total Of 15 Largest Cities
1:10	1.8%	\$ 4	\$17	\$21
1:4	4.5	10	17	27
1:2	9.0	20	17	37
1:1	18.0	41	17	58

Thus, if the 14 other cities achieve one fourth the potential estimated for New York City, the savings in capital outlays by school sources would be 4.5 per cent of \$228 million, or \$10 million.

On the basis of the foregoing projections, it appears that adoption of the air rights concept has potential for achieving savings among the 15 largest cities in the range of about \$20 million to \$40 million.

### Sharing Facilities

In Chapter V, a model was presented which indicated that the construction of school/community centers offers a potential for savings to school sources of 11 per cent of the cost of the school. It is assumed that the greatest potential for building school/community centers is outside the 15 largest cities, where projected annual capital outlays are assumed at \$2.68 billion, based on past trends and total national outlays of \$3 billion. Maximum savings achievable through building of school community centers would be 11 per cent of this, or \$295 million. If from 5 to 10 per cent of new schools actually built were constructed as school/community centers, the cost savings on a national basis would range from \$15 million to \$30 million.

### Potential Savings

The combined potential savings from both site sharing and facilities savings therefore would range from approximately \$35 million to \$70 million, and it is assumed that \$50 million is a reasonable expectation. On a national basis, sharing of sites does not offer an opportunity for major economies; however, the savings could be significant to individual districts.

### SUMMARY

The combined effect of all the foregoing measures would reduce capital outlays by school sources for new school construction from the projected level of \$4,067 million to \$2,950 million.

This section has thus far been concerned with means for reducing capital outlays. The following chapter describes the impact of construction economies on interest charges, which is treated as an operating expense in school accounting.

## PART D

### VII.- REDUCING THE COST OF FINANCING

In recent years, about 62 per cent of capital expenditures by school districts have been financed through the sale of bonds, the balance being provided from reserves or current income. Total debt for public school facilities now exceeds \$30 billion, requiring annual interest payments estimated by USOE at \$1.3 billion.

This chapter discusses methods by which the cost of financing future capital outlays might be reduced. As noted previously, USOE projects annual capital outlays by school districts of \$4.9 billion for the next several years. If recent trends continue, this would result in the annual issuance of about \$3 billion worth of school bonds. At a rate of 6 per cent, the first-year interest cost for the new bonds would be \$180 million (besides interest costs for bonds issued in previous years).

The most effective means for reducing interest costs is by avoiding capital outlays and bond issues. Adoption of the proposals presented earlier in this report would reduce outlays for land and buildings from \$4,067 million to \$2,950 million, and for equipment from \$833 million to \$750 million, resulting in total annual capital outlays of about \$3,700 million. If past trends continue, this would result in new bond issues of \$2,300 million per year. At an assumed interest rate of 6 per cent, this would result in first-year interest costs of \$138 million, a first-year reduction of \$42 million in annual interest charges.

Exhibit VII-1, following, presents data on school bond sales during 1969-70 which suggest an opportunity to make additional small reductions in interest charges.

Comparison of Part A and Part B of the exhibit reveals that about 60 per cent of total bond sales were general obligation bonds, in the amount of approximately \$600,000, which were rated by Moody's Investors Service. About two-thirds of these bonds received a rating of "A" or better, and commanded an interest rate averaging about 6.1 per cent. The remaining third received a rating of "B," and these drew a higher interest rate, averaging 6.7 per cent.

PART D  
EXHIBIT VII-1

BOND SALES FOR PUBLIC SCHOOLS

1969-70

	NUMBER OF SALES REPORTED	AMOUNT SOLD  (THOUSANDS)	PER CENT OF AMOUNT SOLD	AVERAGE NET INTEREST COST
<b>All Bond Sales, By Issuing Agency</b>				
State	14	\$ 188,100	6.7%	6.22%
County	85	219,899	7.8	6.43
City, town, twp.	112	286,476	10.2	6.38
School district	1,001	1,672,943	59.5	6.36
Authority	97	445,281	15.8	6.58
<b>ALL AGENCIES</b>	<b>1,309</b>	<b>\$2,812,699</b>	<b>100.0%</b>	<b>6.39%</b>
<b>Moody-Rated General Obligation Bond Sales, By Moody Rating</b>				
Aaa	13	\$ 155,625	9.2%	6.04%
Aa	97	337,831	19.9	5.90
A	296	662,193	39.0	6.28
Baa	234	514,658	30.3	6.71
Ba	10	25,958	1.5	7.09
<b>ALL RATINGS</b>	<b>650</b>	<b>\$1,696,265</b>	<b>100.0%</b>	<b>6.32%</b>

The rating of a bond issue is a measure of the general desirability of the bonds as an investment. Financially sound districts receive higher bond ratings (from Moody's or Standard & Poor) than districts less financially secure and thus obtain more favorable interest rates. Since the bonds of the less financially secure districts are often backed by the state in case of district default, it seems that there is little reason for down-rating the bonds of poorer districts. The New York State Controller recently contended that all bonds sold by school districts in New York should be rated at least "A" by both Moody's and Standard & Poor.

If this were done on all bonds, the net interest rate on bonds now rated less than "A" would decline about one-half percentage point. This decrease, applied to one-third of the annual total school bond sales, would result in an additional first-year reduction in interest costs of \$4 million.

It is recommended that each state education department investigate the ratings being received by its school districts, and endeavor to take action that would result in more favorable ones. This might include guarantees by the state to secure the bonds in the event of default by the district, or as some states are doing, issuing state bonds on behalf of local school districts.

#### POTENTIAL COST ECONOMIES

The resultant reduction in interest costs through the two foregoing means - reduction in capital outlays and reduction in interest rates - would amount to \$46 million for the first year following the issuance of bonds. The savings would however be cumulative. Most school bonds are "serial bonds" which mature in increments over the maturity period of the issue. Interest is paid only on the unredeemed bonds, and therefore the total interest payment on a given bond issue declines as the bonds are redeemed. It was calculated on the basis of USOE data that the average maturity period for school bonds issued during 1969-70 was about 12 years. On this basis, the amount of interest paid on a given year's bond issues would decline at an average rate of one-twelfth each year.

As noted above, the first-year savings in interest through reduction in bond issues and interest rates would be \$46 million. The amount of the savings from a given year's bond issues would therefore decline one-twelfth each year and be zero after 12 years. Each year, however, new savings would be generated through a reduction in that year's bond issues. Total savings for the first year would be \$46 million, for the second year \$46 million plus

even-twelfths of \$46 million, for the third year \$46 million plus eleven-twelfths plus ten-twelfths, and so on.

Total annual savings would increase each year for 12 years, after which they would stabilize, assuming, of course, a continuation of interest rates at 6 per cent, 12-year average bond maturity period, and ongoing reduction in construction volume and bond issues. The annual savings after 12 years would be \$299 million.

### LEASING

An alternative method to the purchase of new school buildings with funds raised by bond sales or transferred from reserves, is the leasing of buildings. Leasing is generally more expensive than purchasing, and normally is utilized only when a district has reached legal debt limits or fails to receive voter approval of bond issues.

Many states have laws that regulate the ability of school districts to enter into leasing contracts, and accordingly, the kinds of leasing arrangements vary from state to state. Typically, in a so-called "long-term" leasing program, a third party arranges to design, construct and finance the school building, which is then leased to the school district, usually on a year-to-year basis. The school district treats lease payments as an annual operating expense, and its debt is therefore not affected. Eventually when the mortgage on the property has been retired through annual lease payments, the school district takes ownership of the property. Most leasing arrangements also include a purchase option permitting the district to buy the property at any time by paying the balance due on the mortgage. Thus, if a bond issue is subsequently passed, the district may use the proceeds to buy the property.

Leasing normally costs more than purchasing because the third party must pay higher interest rates for borrowed money than a school district pays on tax exempt bonds. A number of states have adopted measures that tend to lessen the cost of leasing by reducing the cost of financing to the third party lessors. Typically, leases are permitted only on a year-to-year basis, which tends to raise interest rates because investors are not assured that the lease will be renewed. California now permits a form of seven-year leases on temporary facilities, and Florida enables school districts to take 30-year leases backed by motor vehicle license revenues. Indiana has instituted a program that provides for the formation of nonprofit leasing corporations which can normally borrow money less expensively than for-profit corporations because of tax exempt features.

Most of the foregoing information pertaining to leasing was obtained from a publication of the Educational Facilities Laboratory, **Guide to Alternatives For Financing School Buildings**. It is recommended that each state education department review the leasing options open to school districts, and recommend liberalizing legislation as appropriate.

**THE PRESIDENT'S COMMISSION ON  
SCHOOL FINANCE**

**ECONOMIES IN EDUCATION**

**APPENDIXES**

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**APPENDIX A-1**  
**SOURCES OF INFORMATION**

SOURCES OF INFORMATION

In carrying out the study, *Economies in Education*, a number of authoritative sources were contacted in order to obtain data, descriptive information, viewpoints, and judgments. Interviews were held both by means of personal visits and telephone conversations with representatives of organizations listed in this appendix. Many organizations were visited over an extended period, and interviews were held with individuals in a number of different departments or bureaus.

In addition to the organizations whose representatives were interviewed, a large number of research reports were studied, and information was obtained thereby on many additional school districts and educational agencies.

School Districts

Alexandria, Virginia  
Atlanta, Georgia  
Chicago, Illinois  
Dade County, Florida  
Deerfield, Illinois  
Duval County, Florida  
East Meadow, New York  
Elmhurst, New York  
Englewood, Colorado  
Gary, Indiana  
Glenview, Illinois  
Hicksville, New York  
Highland Park, Illinois  
Levittown, New York  
Lockport, Illinois  
Madison, Wisconsin

Manhasset, New York  
Mesa, Arizona  
Milwaukee, Wisconsin  
New Haven, Connecticut  
New York, New York  
Niles Township, Illinois  
Pontiac, Michigan  
Rockland County, New York  
Sagpaug Valley, Connecticut  
Skokie, Illinois  
Temple City, California  
Uniondale, New York  
Waterford, Wisconsin  
Wilmette, Illinois  
Winnetka, Illinois

National and State Educational and Governmental Agencies

Florida State Education Department  
Illinois Department of Public Instruction  
Massachusetts Business Task Force for School Management  
New York State Education Commission  
New York State Education Department  
Ohio Commission on Public School Personnel  
United States Department of Transportation  
United States Office of Education

Associations, Foundations and Universities

American Association of School Administrators  
Association of School Business Officers  
College of William and Mary  
Columbia University  
Educational Facilities Laboratory  
Educational Products Information Exchange Institute  
Georgia State University  
Lyle Spencer Foundation  
National Association of Purchasing Management  
National Education Association  
National Safety Council  
United States Chamber of Commerce  
University of Illinois

Consultants, Contractors, Architects, Publishers, Vendors

Academy for Educational Development  
Advanced Planning Research Group  
The Architects Collaborative  
Charles Luckman Associates  
Combined Motivation Education Systems  
Cushman & Wakefield, Inc.  
Education Turnkey Systems, Inc.  
McGraw-Hill Publications, Inc.  
Prentice Hall Inc.  
Quality Educational Development  
RCA, Inc.  
Vosbeck, Vosbeck, Kendrick, Redinger

APPENDIX B-1  
SUMMARY OF RESEARCH FINDINGS ON  
CLASS SIZE

**SUMMARY OF RESEARCH FINDINGS  
ON CLASS SIZE**

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Numerous research efforts have been made to evaluate the effect of class size on teaching and learning processes. Most research has been concerned with classes in a range of 10 to 35 pupils.

In published research studies these questions have been asked:

- How does the size of class affect the pupil, his achievement, his classroom behavior?
- How does size of class affect the teacher's morale, his teaching techniques, and his ability to individualize instruction?
- What should be given priority in establishing a school budget?

Because of the many variables which are present in the classroom learning environment, most research studies have attempted to control only a few of the variables. Therefore, caution should be exercised in drawing final conclusions from them.

In published research studies, five general types of criteria have been employed to assess the effect of class size:

- 1 - Cost and related expediencies, including efficiency, ease of administration, and availability of personnel, which is frequently the principal motivation in the investigation.
- 2 - Effect on working conditions, such as teacher load.
- 3 - Opinion of teachers, administrators, or both, which has had widespread use and which almost invariably favors small classes.
- 4 - Effect on pupils, as measured by achievement or adjustment. Some achievement measure is the criterion most frequently used.
- 5 - Class activities made possible, or prohibited, by the particular size of the group under investigation. " 1 /

The majority of recent studies on the effects of class size use standardized achievement test scores or class marks as criteria. Although education has other purposes it would appear that growth in measurable knowledge is a universal objective and therefore such a criterion could be defended. 2/

Some research on class size considers only pupil learning and the pupil, and disregards the effects of class size on the teacher. Yet class size may affect the mental, emotional and physical health of teachers. In a 1967 national survey of teacher opinion, the Research Division of NEA asked teachers, "Under which of the following conditions do you believe you could do the most effective job with students in your class or classes?" 3/ The options were as follows:

- a. Class or classes of 25 to 30 pupils with the usual clerical and non-teaching duties done by the teacher.
- b. Class or classes with 40 to 50 pupils with a full-time non-professional person to assist the teacher with clerical work and non-teaching duties.

The results of this poll overwhelmingly favored the first option, as shown in the following breakdown:

	<u>All Teachers</u>	<u>Elementary Teachers</u>	<u>Secondary Teachers</u>	<u>Men Teachers</u>	<u>Women Teachers</u>
"Teacher can do better job in small classes without help."	83.6%	88.1%	78.5%	77.6%	86.6%
"Teacher can do better job in larger classes with help."	16.4%	11.9%	21.5%	22.4%	13.4%

Ross and McKenna, in their study, "Class Size: The Multi-Million Dollar Question," report the following:

- 1 - "Numbers of non-classroom, professional personnel are at least as important in predicting what will happen in a classroom as the actual class size.
- 2 - Given generally a competent staff, the smaller the classes the greater the chances for invention and early adoption of newer and better practices.

- 3 - Class size that deviates too markedly from that which might be expected of a system, knowing its expenditure position and spending pattern, tends to have a negative result. " 4 /

This study reported no evidence that money spent for smaller classes obtains better results than money allocated for more effective teachers with larger classes.

Cohen studied class size in terms of behavioral differences which require that size of class be suitable to teaching-learning style appropriate at different age levels. The first of three student needs she outlined is the emotional-social dependency of the learner on the teacher. The need of the growing child, Cohen said, "can be met only by a human adult, and successful fulfillment at different stages in a learner's life may call for one class size rather than another as a learner shares the significant adult with others as needful to himself." 5 /

The second need of the student is cognitive-intellectual dependency on the teacher -- but the student's dependency is shifted from the person who conveys the material to the material itself. The teacher's effectiveness in freeing children from unnecessary dependency on him as a sole resource, Cohen believes, "is surely related to the number of children with whom he must so interrelate, as well as to the stage of dependency of the children." Furthermore, "at certain points in the life of a learner, incorrect class size may increase rather than decrease dependency if a teacher is unable to guide and supervise the efforts at independence of too many children at the same time."

The third need is for dependency on concrete and sensory nonverbal experiences. It involves, "the ability of the learner to assimilate verbal presentation of unfamiliar content, a concomitant of age, experience and maturity."

Thus, Cohen suggested that in assigning numbers of children to teachers, one needs to know:

- a. How much direct contact of an active, physical, concrete character is needed for clarification of meaning at different levels of learner growth
- b. How much interaction with a significant adult is needed for the fulfillment of emotional and cognitive needs and
- c. With how many children at any given state of learning a teacher can cope.

Unfortunately, there are no available data that identify the numbers of pupils per classroom -- for each type of pupil, at each age-need level and/or for each subject -- that would maximize emotional and intellectual growth. However, Holland and Galfo reported in 1964 an investigation to determine what conclusions and implications might be drawn from an analysis of research concerning class size. The analysis was limited to that literature in which:

- a. the author had identified an area to be investigated,
- b. data were collected and analyzed in a systematic manner, and
- c. conclusions were drawn in terms of the data collected.

The conclusions of the Holland and Galfo investigation follow:

- 1 - There is no optimum class size, nor is there a perfect teacher-pupil ratio.
  - a. Regardless of how the research is divided for analytical purposes -- by grade level, subject, experimental design, or historically -- the results are inconsistent. Either the research designs were uniformly invalid or else variables other than size of class were operating to produce learning results.
  - b. Even in cases limited to achievement alone, standardized testing showed inconsistent results.
  - c. There seems to be ample evidence that when learning objectives include the development of desirable attitudes and behavior patterns as well as subject matter content, the classes should be small. Here, too, there is no perfect class size nor pupil-teacher ratio. But the smaller classes proved more effective when learning outcomes were measured by a variety of techniques supplementing standardized subject matter tests.
- 2 - The proper class size is a function of many factors, including course objectives, nature of the subject matter, nature of the teaching process used, and teacher understanding and morale.
- 3 - More important to learning than any fixed teacher-pupil ratio are the ability of the teacher as a classroom practitioner and his willingness to be flexible in his approach to teaching.
  - a. It is impossible to control the contribution of a talented and devoted teacher to large or small class learning.

- b. Generally, teachers prefer small classes.
  - c. In instances where large class ratios proved to be superior to, or as effective as, small class ratios, the teacher had been given special training, special motivation or recognition for handling a large class. Often superior teachers were selected for both the experimental and control classes.
- 4 - Overall staff-pupil ratio is more important than teacher-pupil ratio.
- a. When numbers of pupils per teacher are increased, learning is increased only when the teacher is assisted by nonteaching personnel.
  - b. Studies of the use of teacher aides, lay readers, self-instructional devices, team teachers, released time for teachers of large classes, and use of teacher assistants show improved learning outcomes with large numbers of learners to one master teacher.
  - c. When a teacher has little or no help in handling large classes, discipline problems become more numerous and teacher morale suffers.
  - d. Learning in large groups can be effective provided (1) the teacher is trained and motivated, (2) there is an opportunity for small group work to meet objectives not fulfilled in large classes, and (3) school facilities and schedules are kept flexible. 6/

The conclusion reached by Otto in 1954, in his summary of four "class size" studies, revealed few significant differences - statistical or otherwise - between large and small classes. Otto wrote:

The class-size problem has not been resolved. The present study, plus those previously completed, merely indicates that small classes as now taught do not harbor in significant proportion their purported advantages over large classes. If the physical environment of classrooms, curriculum, method, child study procedures, and home school relations were tailored to be specifically suitable to small and large classes, it might be possible to demonstrate a genuine superiority for small classes. 7/

In a recent study for Columbia University's Institute of Educational Research, Martin Olson found that smaller classes could produce significantly higher test scores. However, his findings also indicate that class

**APPENDIX B-1**  
**Page 6 of 7**

size made little difference in certain subjects and with certain teaching techniques. This information does not refute the conclusions Otto formulated 17 years ago. The issue of maximum class size remains unclear and unresolved.

NOTES TO APPENDIX B-1

- 1/ Robert Ebel, Victor Noll and Roger Bauer (ed), "Class Size," Encyclopedia of Educational Research, p. 145.
- 2/ Ibid, p. 143.
- 3/ NEA Research Summary, Class Size, p. 16.
- 4/ Donald Ross and Bernard McKenna, Class Size: The Multi-Million Dollar Question, p. 8-17.
- 5/ Dorothy Cohen, "Dependency and Class Size," Childhood Education, September, 1966. p. 4.
- 6/ Howard Holland and Armand Galfo, An Analysis of Research Concerning Class Size, p. 12-16.
- 7/ Henry Otto and others, Class Size Factors in Elementary Schools, p. 155.

**APPENDIX B-2**  
**DIFFERENTIATED STAFFING**

### DIFFERENTIATED STAFFING

In recent years, changes have taken place in the way teaching staffs are organized. One example is team teaching, which was initially introduced as a means to improve staff utilization and provide each teacher an opportunity to specialize in some phase of the curriculum. However, in introducing team teaching, many schools merely reverted to the traditional practice of "departmentalization," without adopting the real essence of teaming which involves shared planning, shared teaching, and shared evaluation.

Some elementary schools have found that team teaching offers possibilities for other kinds of specialization not related to subject matter departmentalization. Each teacher on a team can be a generalist in the content of elementary education; and also a specialist in some phase of teaching. For example, one teacher may have particular skill in using role playing, simulation, and elaborative thinking. Another may be especially capable in concept development and inquiry training, while a third has strong interest and ability in diagnosis of learning needs in skill development. Together these team members plan teaching strategies for all curriculum areas and for all the pupils in their team. These teachers are truly specialists, but in a form quite different from the subject matter depth definition.

Teachers using this approach contend that specialization of instructional skills is valuable in today's changing elementary school and contributes more appropriately to more children than departmentalization was able to do. It prevents the curriculum fragmentation that often resulted from subject matter specialization.

Another example of a changing organizational pattern is represented by the World of Inquiry School in Rochester, New York, funded through Project UNIQUE, a federal project dealing with a variety of urban-suburban educational problems. In this school, children are assigned to heterogeneous interage "family" groups or multiage groups which may include children with an age range from 6 to 9, from 5 to 8, or 5 to 10 years. The "family teacher" provides individualized instruction in math and reading skills. Each child is given a great deal of freedom and responsibility. He plans his own schedule to take advantage of interest areas staffed by specialists in science, art, social studies, technology, music, library, and "shop" (which may include such interests as photography, cooking and electricity). In addition, many kinds of specialists are brought in, or children are taken to community resource specialists outside the school in such fields as urban problems, fine arts, medicine, human relations, and black history. Again, the function of specialization in this school represents

a far broader definition than the one so typically ascribed to specialization in the departmentalized school organization. It provides subject specialists but utilizes them within a framework of an individualized program.

McLure and Pence predict that the secondary schools of 1980 will exhibit a variety of innovative instructional practices including:

- Planning and teaching on a collaborative basis by departments or instructional fields rather than on an individual basis
- Greater flexibility in schedule to accommodate more independent study and individualized pupil progress within broad social context
- Use of latest technological media to enhance learning, including films, tapes, computerized instructional units, learning centers and closed circuit TV.
- Open physical environment. Campus plans. Allowance for various sizes of groups and team teaching.
- Extended learning experiences through imaginative approaches to the use of community resources, including contracting of special educational tasks to external agencies, such as contracts to businesses and industry to conduct special training in industrial arts and vocational education.
- Differentiated teaching staffs which include head teachers, special subject teachers, teacher aides, and research and evaluation specialists. 1/

Differentiated staffing provides the organizational structure in which other innovative practices can be implemented.

The National Commission on Teacher Education and Professional Standards (NCREPS) describes differentiated staffing as follows:

Differentiated staffing is a plan for recruitment, preparation, induction and continuing education of staff personnel for the schools that would bring a much broader range of manpower to education than is now available. Such arrangements might facilitate individual professional development to prepare for increased expertise and responsibility as teachers, which would lead to increased satisfaction, status, and material reward. 2/

Don Barbee defines differentiated staffing as:

... a concept of organization that seeks to make better use of educational personnel. Teachers and other educators assume different responsibilities based on carefully prepared definitions of the many teaching functions. The differential assignment of educational personnel goes beyond traditional staff allocations based on common subject matter distinctions and grade-level arrangements and seeks new ways of analyzing essential teaching tasks, and creative means for implementing new educational roles. 3/

Some professional teaching staffs have moved to differentiated staffing patterns in an attempt to offer an excellent educational program, reflecting maximum individualization of instruction at minimum dollar expenditure. These plans include the use of team teaching, teacher aides, interns, student teachers and community volunteers.

#### DEVELOPMENT OF STAFFING MODELS

The approaches mentioned have not been designed primarily to save money but rather to provide more individualization of instruction and to make optimum use of staff talents, interests and commitments. Although many teachers are opposed to any change in traditional staffing patterns, a number of school districts are exploring more economical ways of staffing schools.

Some school leaders have motivated their staffs to undertake a systematic analysis which includes: 1.) Evaluation of alternatives to the self-contained classroom, 2.) Extent to which human and material resources are presently utilized, 3.) Development of a feasible program which best utilizes the financial resources available.

As a consistent base for study in each school in a district, a sequence of activities has been recommended by Dr. Fenwick English, director of the differentiated staffing project at Temple City, California. He suggests that the following sequence will lead to an acceptable model:

1. Systematic assessment of needs (societal, student, teacher, and community).
2. Formulation of global educational goals from the needs assessment.
3. Construction of specific and measurable learning outcomes working back from the global statements.

4. Separation of learning tasks from each learning outcome into common categories (appropriateness, level of difficulty, etc.).
5. Relating of learning tasks grouped in common categories to teacher skills, knowledge, and attitudes in producing the specified outcomes.
6. Reclassification of teaching tasks into vertical and horizontal role hierarchies.
7. Establishment of (suggested) salary ranges for each proposed hierarchical role based upon supply and demand, level of training and experience needed, and related factors.
8. Determination of need for specific changes in the school structure (including school schedule, decentralization of instructional resources in resource centers, and other support systems) to provide for maximum utilization of resources.
9. Establishment of personnel policies to apply during the transition.
10. Establishment of screening groups, screening criteria, evaluation procedures, and the filling of positions. 4/

When the staff at each school has accomplished the first six activities, it will be necessary to work at the district level to accomplish the remaining four, to assure a uniform approach to the personnel program.

When a district has moved toward individualized instruction and the staff has been involved, differentiated staffing is the next step. This step cannot be developed and implemented without the involvement and acceptance of the staff. The National Commission on Teacher Education and Professional Standards states that the real differentiated staffing could cost more, not less, for two reasons: teachers high in the hierarchy are paid more and there is greater use of paraprofessionals. (However, effective models are in use which result in cost savings.)

In 1966, an early differentiated staffing model was designed by Dr. Dwight Allen, Dean of the University of Massachusetts' School of Education, and introduced in Temple City, California.

The Temple City program represents a stairstep, or hierarchial, model. Starting at the top and going down are master teachers, senior

teachers, staff teachers, associate teachers, and three types of paraprofessionals -- teacher aids, resource center assistants, and lab assistants. Responsibilities and salaries for these positions are varied, though the staff teacher and associate teacher are tenured. 5/

The criteria, roles, and salary range of the four basic professional positions in the Temple City model are as follows:

Associate Teacher (A. B. or Intern) - a beginning teacher who spends most of his time in the classroom as an intern. Salary Range \$6,500 - 9,000.

Staff Teacher (B. A. and Certificate) - an experienced teacher who is assigned more difficult responsibilities, including tutorial sessions and small group instruction. He also works on new curriculums and supervises their field testing. Salary Range \$7,600 - 11,000.

Senior Teacher (M. S. or Equivalent) - who teaches, consults with associate teachers, develops new teaching strategies, sets up in-service training programs, and develops resource banks for new instructional units, including the use of media. Salary Range \$14,000 - 17,500.

Master Teacher (Doctorate or Equivalent) - who teaches at least a part of the time and has district-wide responsibilities in the application of research to curriculum design. Salary Range \$15,500 - 25,000.

When first introduced, the differentiated staffing plan at Temple City raised annual costs by about \$200,000. However, the plan has been improved over the past five years and according to the superintendent now costs no more than a conventional staffing plan.

Under this plan, the single salary schedule is no longer possible. While opponents of differentiated staffing claim that it is a ploy for merit pay, defenders cite differences in degree of responsibility and functions among teachers.

The Walnut Hills Elementary School, Cherry Creek Schools, Denver, Colorado, has applied a differentiated staffing plan which supports the feasibility of economic savings without a corresponding reduction of the quality of the educational program. Exhibit B-2A, following, presents a comparative analysis of costs under traditional and differentiated staffing plans.

WALNUT HILLS ELEMENTARY SCHOOL  
DIFFERENTIATED STAFFING MODEL

(ENROLLMENT: 375-450)

TRADITIONAL				DIFFERENTIATED		
STAFF	NUMBER	SALARY		STAFF	NUMBER	SALARY
		AVERAGE	TOTAL			
Classroom Teacher	18	\$ 8,119	\$146,142	Team Leader	1	\$ 10,000
Resource Teacher	1	8,119	8,119	Teacher	1	8,000
Physical Education Teacher	1	8,119	8,119	Teacher	1	7,000
Music Teacher	1	8,119	8,119	Beginner Teacher	1	6,300
Teacher Aides	3	-	5,000	Intern	1	1,500
<b>TOTAL</b>	<b>24</b>	<b>\$32,476</b>	<b>\$175,499</b>	Intern	1	3,000
				5-Hour Teacher Aide	1	1,575
				Student Teacher	1	-
				High School Student	1	-
				Subtotal	9	\$ 37,375
				Teams	x3	x3
				Subtotal	27	\$112,125
				Resource Teacher	1	8,119
				Physical Education Teacher	1	8,119
				Music Teacher	1	8,119
				<b>TOTAL</b>	<b>30</b>	<b>\$136,482</b>

Adult/Student Ratio: 1/19

Adult/Student Ratio: 1/15

Savings: \$39,017 or 22%

APPENDIX B-2  
Page 6 of 10  
EXHIBIT B-2A

Walnut Hills teachers were assigned to develop a plan which did not cost more than the traditional arrangement. They managed to allocate their resources in a way which enabled them to provide six more staff members and save \$39,000.

#### Teacher Aides

Interestingly, the Walnut Hills model makes rather limited use of teacher aides. Noticeable savings can be effected through the employment of aides to work directly with teachers and students as important members of the instructional team. Although most aides would not possess teacher certification, they would be involved in various aspects of classroom teaching. For instance they might be called upon to serve as substitute teachers. This would not violate school regulations which require certified teachers to initiate and direct instruction. Certified members of the teaching team would be responsible for planning instruction and would offer advice and direction to aides.

#### CHALLENGES AND RESPONSIBILITIES

Support by the instructional staff is essential to the successful adoption of a differentiated staffing program which will provide both quality education and cost savings. Some plans have been thwarted by teacher resistance. For example, in Montgomery County, Maryland, an attempted introduction of differentiated staffing lead to strikes over two issues: alleged unilateral imposition by administrative or board dictum and merit pay.

The literature in this area provides a number of additional examples of staffing patterns which call for greater use of paraprofessional teacher aides and clerks. Both the paid non-certificated employee and volunteer should be carefully considered as needs are assessed by staffs.

The use of part-time non-certified employees should be encouraged by all administrators for two reasons: (1) the cost of operating a school would be reduced and (2) because more members of the community can be used as part-time employees. 6/

The teacher has a major responsibility to redefine the teaching role in the light of this concept of the teacher-learner relationship, an approach which is highly personalized and one in which the teacher must diagnose, prescribe, implement, and evaluate an individual learner's needs.

As Conte and English emphasize,

Differentiated goals demand differentiated means, a knowledge of the effectiveness of the means, and a knowledge of efficiency of various methods to realize the goals. The current turmoil in education is a result of efforts aimed at discovering new means to meet these demands. As such, staffing patterns utilizing machines and men in varying relationships is a solvable problem and represents the key to improving public education itself in the next generation. 7/

What are the various kinds and levels of teaching and non-teaching assignments in a school? Who should be assigned to these responsibilities and in what numbers? By reallocating human resources to the more carefully delineated learning setting, new staffing patterns should evolve. How can community volunteers be utilized in a meaningful and money-saving way? An elementary school staff has a responsibility to carefully analyze needs and to recommend a workable staffing plan. No school staff sees its task the same way and the plan for one school may not be workable for another school. But as schools work toward alternatives to the self-contained unit, they employ Allen's ingredients of differentiated staffing:

- Assessment of student needs
- Definition of roles
- Training for differentiated roles
- Evaluation of performance
- Reward system. 8/

Barbee summarizes the impact on the teacher of the growing trend to differentiated staffing:

It has much in common with the prevailing educational climate in which the classroom teacher is beginning to assert himself ... as a professional .... He continues, Differentiated staffing warrants exploration and testing as long as improvement in the quality of the learning situation for students remains the ultimate focal point. 9/

In summary, differentiated staffing is an effort to enhance learning opportunities for pupils while offering school budget planners a number of options in expenditures for instruction. Specialists, volunteers, interns, and

other human resources will be used in greater numbers to assist in building a quality educational program. How their roles are synthesized, who they are, and the degree of expertise they offer will make the difference between a mediocre educational setting and a vibrant and viable humanistic learning environment.

NOTES TO APPENDIX B-2

- 1/ William P. McLure and Andra Pence, Early Childhood and Basic Elementary and Secondary Education, National Education Finance Project. Special Study No. 1, pp. 46-47.
- 2/ Differentiated Staffing in Schools, Education U.S.A. Special Report, Washington, D.C.: National School Public Relations Association, 1970, p. 2.
- 3/ Don Barbee, Differentiated Staffing: Expectations and Pitfalls, TEPS Write-In Papers on Flexible Staffing Patterns, No. 1, 1969, p. 1.
- 4/ Fenwick English, Teacher May I? Take Three Giant Steps! The Differentiated Staff, Phi Delta Kappan, Vol. LI, No. 4, December, 1969, p. 214.
- 5/ Differentiated Staffing, Nation's Schools, Vol. 55, No. 6, June, 1970, Chicago: McGraw Hill, Inc., p. 43.
- 6/ James Canfield, The High Cost of Non-Teaching Assignments, The Clearing House, Vol. 44, No. 5, January, 1970, p. 298.
- 7/ Joseph M. Conte and Fenwick English, The Impact of Technology on Staff Differentiation, Audiovisual Instruction, Vol. 14, No. 5, May, 1969, p. 108.
- 8/ James L. Olivero, The Meaning and Application of Differentiated Staffing in Teaching, Phi Delta Kappa, Vol. LII, No. 1, September, 1970, p. 40.
- 9/ Don Barbee, Differentiated Staffing: Expectations and Pitfalls, TEPS Write-In Papers on Flexible Staffing Patterns, No. 1, 1969, p. 7.

APPENDIX B-3  
DRIVER EDUCATION

### DRIVER EDUCATION

Driver education is an accepted and usual course of study in secondary schools today. According to George R. Babigian, a director of the Association of School Business Officials and Business Manager of the New Trier (Illinois) Township High Schools, driver training is available to 65 per cent of all eligible students with the proportion increasing, partly because of the efforts by states to meet requirements of the Highway Safety Act of 1966. A recent study by the National Safety Council indicated that 91 per cent of 450 school superintendents and 505 board members polled at recent American Association of School Administrators and National School Boards Association meetings, were in favor of teaching driver education in the schools.

Although a few studies have suggested that driver education in the high school does not substantially reduce the number of automobile accidents and moving violations, the weight of opinion among both educators and traffic safety experts is that driver education is effective in promoting traffic safety. Driver education has been promoted vigorously by insurance companies, many of which offer incentives in the form of reduced automobile insurance premiums for youths who have successfully completed prescribed driver education courses in their high schools.

In this appendix, three methods of teaching driver education are examined:

- The traditional method
- The multiple vehicle facility method
- The simulator method.

The multiple vehicle facility and simulator methods of teaching driver education provide for lower cost per pupil than the traditional method, and are believed to produce equivalent or better-quality results. All three methods are described in the following paragraphs.

The traditional or dual control method of driver education utilizes a combination of classroom study and laboratory (in-car) instruction in about equal proportions. The chief advantages of the traditional method are: the individualized attention each student receives in his laboratory periods and "behind the wheel" experience under actual traffic conditions.

Typically, in the classroom phase, students are grouped into classes of 30 to 36 with a teacher. In the laboratory portion, each instructor works in one car with four students, who take turns driving under the tutelage of the instructor.

The cost of driver education under the traditional method may be calculated by considering a typical high school with an average of 360 students enrolled in driver education each year, and a daily teacher workload of five periods. Each teacher could cover five classes a day, five days a week over two 18-week semesters each year. On this basis, the number of periods per year for each full-time-equivalent (FTE) teacher is:

$$5 \text{ periods} \times 5 \text{ days} \times 36 \text{ weeks} = 900 \text{ periods.}$$

Calculations of the FTE teacher requirements for a traditional driver education program involving a total of 360 students a year or 180 students each semester, are as follows:

<u>Classroom Phase</u>	<u>Laboratory (In-Car) Phase</u>
<p>180 Students Per Semester Sectioned Into Groups Of 36 Students Each</p> <p>5 class sections per semester x2 periods each week (40 minutes) <u>x36</u> weeks per year 360 periods each year of classroom instruction</p>	<p>180 Students Per Semester Divided Into Laboratory Sections Of Four Students Each</p> <p>45 laboratory sections each semester x2 periods each week <u>x36</u> weeks per year 3,240 periods each year of laboratory instruction</p>

Total teaching periods a year for 360 students is thus 3,600, and the FTE teacher requirement at 900 periods per teacher is four FTE teachers.

At various teacher salary levels, the costs to the school for the traditional driver education program are as follows:

<u>Item</u>	<u>Amount At Teacher Salary Level Of</u>			
	<u>\$ 8,000</u>	<u>\$10,000</u>	<u>\$12,000</u>	<u>\$14,000</u>
Number Of Teachers	4	4	4	4
Teacher Cost	\$32,000	\$40,000	\$48,000	\$56,000
Vehicle And Related Expenses	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
Total Cost	\$33,000	\$41,000	\$49,000	\$57,000
Cost Per Student	\$91.67	\$113.89	\$136.11	\$158.33

Vehicle and related expenses, consisting of insurance costs, maintenance and fuel costs and the cost of a dual control system, often differ regionally, but are estimated to average \$1,000 per year for a program of 360 students. In the foregoing analysis, it is assumed that vehicles are donated to the school districts free of charge, since this has been the prevailing practice. However, some districts are charged for vehicles, and if this practice becomes more common costs would rise correspondingly.

#### MULTIPLE VEHICLE FACILITY METHOD

The multiple vehicle facility method involves a classroom phase which is the same as that of the traditional method, but in the laboratory phase this method utilizes a combination of traditional in-car experience and driving practice in a specially prepared paved area. Lines are painted on the paved surface to represent all of the necessary maneuvers made by drivers during normal driving on streets. The applicability of this method is sometimes limited by the availability of a suitable area and the considerable cash outlay necessary to acquire and prepare one. The program's cost advantage is that one instructor can, while standing in the area, simultaneously monitor six, eight, 10 or 12 cars, depending on the size of the area and the level of expertise attained at a given time by the student drivers. Thus, the program requires fewer instructors for the laboratory phase, resulting in a cost saving per pupil. The method enables a student to acquire the feel of a car as rapidly as the traditional method and more rapidly than the simulator method discussed later. However, because students drive with no instructor in the car, the probability of automobile accidents is increased somewhat. Both educators and traffic safety experts believe that the overall quality of instruction in this method is superior to that of the traditional method.

The cost per pupil of driver education under the multiple vehicle facility method may be calculated for 360 students in a typical high school with the following program elements per semester:

- Eighteen 40-minute periods of in-car instruction at a pupil/teacher ratio of 4:1
- Eighteen 40-minute periods of in-car instruction employing the multiple vehicle facility, at a pupil/teacher ratio of 8:1
- Thirty-six 40-minute classroom periods.

Total periods per year are as follows:

<u>Type Of Period</u>	<u>Number Per Year</u>
Classroom	360
Laboratory	
In-car with instructor	1,620
In-car multiple facility	<u>810</u>
Total	2,790

The FTE teacher requirement is thus:  $2,790 \div 900$  or 3.1 FTE teachers.

At various teacher salary levels, the costs to the school for the multiple vehicle facility method are calculated below:

<u>Item</u>	<u>Amount At Teacher Salary Level Of</u>			
	<u>\$ 8,000</u>	<u>\$10,000</u>	<u>\$12,000</u>	<u>\$14,000</u>
Number Of Teachers	3.1	3.1	3.1	3.1
Teacher Cost	\$ 24,800	\$31,000	\$37,200	\$43,400
Vehicle And Related Expenses	<u>3,000</u>	<u>3,000</u>	<u>3,000</u>	<u>3,000</u>
Total Cost	\$ 27,800	\$34,000	\$40,000	\$46,000
Cost Per Student	\$ 77.22	\$ 94.44	\$ 111.66	\$128.88
Estimate Of Multiple Vehicle Facility Cost Per Student	<u>\$ 5.00</u>	<u>\$ 5.00</u>	<u>\$ 5.00</u>	<u>\$ 5.00</u>
Total Cost Per Student	\$ 82.22	\$ 99.44	\$ 116.66	\$133.88

In the foregoing analysis, vehicle and related expenses are estimated at \$3,000, since a radio receiver must be installed in each car to enable the driver to receive instructions from the teacher. This cost may differ regionally.

As noted, the model developed here assumes a teacher monitoring eight cars at one time, although one teacher can effectively monitor up to 12 vehicles at one time. The estimated multiple vehicle facility cost of \$5 per pupil represents the cost of constructing and maintaining a driver training area over a 10-year period, including paving and curbing the area, constructing of signals, and painting and maintenance. This cost could also be greatly affected by regional differences.

SIMULATOR  
METHOD

A third alternative is the simulator method. This involves a classroom phase, as in the traditional method, traditional in-car experience, and laboratory practice with machines that simulate driving experience. The simulator method is the least costly of the three methods on a per pupil basis and delivers what many educators and vehicle safety experts consider the highest quality of training.

Simulator machines can be purchased in 8-, 12- or 16-unit groups and amortized over 10 years, the life of the machines. A 12-machine unit, together with a monitoring unit that detects student errors, costs about \$30,000. A mobile facility with 12 machines mounted on a trailer costs about \$40,000.

By providing part of the laboratory phase in the simulator machines, a 1:8, 1:12 or 1:16 teacher student ratio can be achieved, which reduces the cost per pupil for that portion of the training and results in lowest overall costs. The simulator method trains students in "anticipation situations" with no risk of accident and lowest cost per pupil. Larger numbers of students benefit, fewer teachers are needed, and students develop better driving attitudes because electric scoring devices immediately detect any student errors.

The cost of driver education per pupil using the simulator technique is calculated below for a class of 360 students. The laboratory phase includes 18 40-minute periods in cars at a 4:1 student/instructor ratio, and 18 40-minute periods in the simulator machines at a 12:1 student/instructor ratio. The classroom phase is equivalent to the traditional method. Total periods per year are as follows:

<u>Type Of Period</u>	<u>Number Per Year</u>
Classroom	360
Laboratory	
In-car with instructor	1,620
Simulator	<u>540</u>
Total	2,520

The FTE teacher requirement is thus:  $2,520 \div 900$  or 2.8 FTE teachers.

The costs of the simulator method at various teacher salary levels are calculated below:

Item	Amount At Teacher Salary Level Of			
	\$ 8,000	\$10,000	\$12,000	\$14,000
Number Of Teachers	2.8	2.8	2.8	2.8
Teacher Cost	\$22,240	\$28,000	\$33,600	\$39,200
Vehicle And Related Expenses	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
Total Cost	\$23,400	\$29,000	\$34,600	\$40,200
Cost Per Student	\$ 65.00	\$ 80.00	\$ 96.11	\$111.66
Simulator Amortization (10-year period)	<u>\$ 10.00</u>	<u>\$ 10.00</u>	<u>\$ 10.00</u>	<u>\$ 10.00</u>
Total Cost Per Student	\$ 75.00	\$ 90.55	\$106.11	\$121.66

Vehicle and related expenses include the same cost elements as in the traditional method. The simulator cost of \$10 per pupil represents annual cost on the basis of amortization over a 10-year period.

Data used in the foregoing analyses were provided by the New York State Education Department.

#### APPLICABILITY AND OTHER COST FACTORS

The New York State Education Department, Safety Division, has conducted studies to determine the level of student enrollment required under each method to achieve lower cost per pupil. Up to an enrollment of 300 students the traditional method is more economical than the other two. With 300 to 350 students, the multiple vehicle facility is the least costly per pupil. However, if the land for a facility is immediately available, the minimum enrollment required in the multiple vehicle method is 200 students. For the simulator technique, the minimum enrollment required to achieve the lowest cost per pupil is 350 students. Normally, the simulator technique requires that three teachers be fully utilized to obtain the lowest cost per pupil. A level of 200 students and two teachers, however, can result in a lower cost per pupil than other methods if the simulators are obtained through federal funds.

Driver education is provided in rural, suburban and urban districts alike. Examples of the use of all three methods in each of the three types of districts are available. The foregoing analysis and data suggest that small districts should cooperatively share simulators or multiple vehicle facilities. Larger urban districts should use the simulator technique exclusively since multiple vehicle facilities are generally not available.

The following paragraphs describe the experience of two school districts which adopted the simulator method:

#### Texas Region XIX

In this region, which includes a number of cooperating districts, the simulator method was initiated on June 1, 1969, following a study which concluded that the simulator method is more effective and less costly than other methods of driver education. From that date through the 1969-70 school year, 8,000 students had completed the course at an annual cost of \$40 per pupil, which includes purchase and amortization of the simulators over a 10-year period. Indications are that a satisfactory level of quality has been maintained. Under the traditional method used in the 1967-68 school year, 2,400 students completed the program at a cost of \$75 per pupil.

The Texas case is also a good example of the benefits to be gained in regionalization and consolidation. Class scheduling is centralized, all teachers in the driver education program attend a five-week course at Texas A&M University, and candidate teachers throughout the region are carefully screened. The program also includes a regional supervisory group, which provides substitute teachers to districts, conducts demonstrations, and monitors the performance of teachers in the program.

#### Uniondale Public Schools, New York

The Uniondale school system moved from the traditional to the multiple vehicle technique and then to the simulator method. District administrators believe that the simulator method is the most effective and least costly. The Uniondale program includes the following elements:

- The laboratory in-car section is given before and after the regular school day, for which teachers are paid at the rate of \$8 per hour. This keeps teacher costs low and does not impinge on the regular academic program during the school day. It also reduces the need for recruiting and hiring a number of separate driver training instructors.

- Because of the increased student and teaching capacity obtained through the use of simulators, Uniondale plans to discontinue its summer driver education program.
- The simulators are also used in an adult education program providing a helpful link between the school district and the community.

Although most students in Uniondale would prefer in-car training during all of the laboratory phase, Uniondale school officials are convinced that the simulator program offers improvement in the quality of instruction, better program control and a better coordinated program. Moreover, the district saves money on insurance rates because of the reduced time spent in cars. Insurance companies appear assured that the use of simulators is a satisfactory substitute for automobiles and that it well equips the student for the actual in-car experience.

ESTIMATE OF COST  
SAVINGS POTENTIAL

Nationally, it was calculated that the average teacher's salary in 1970-71 was \$9,463. Applying this to the cost derivations described previously, the following per pupil costs are calculated for each of the three methods of driver education:

<u>Method</u>	<u>Per Pupil Cost</u>
Traditional	\$107.92
Multiple Vehicle Facility	94.82
Simulator	86.38

According to the National Safety Council, 13,200 schools provided driver education to 2,283,294 students during the 1969-70 school year, and it is assumed that the numbers were substantially the same in 1970-71. Of these schools, 11,043 used the traditional method of driver education, 446 used the multiple vehicle facility method, and 1,711 used the simulator method. If it is assumed that the distribution of students trained by each method is proportional to the distribution of schools using each method, then the total costs of driver education in 1970-71 can be calculated by applying the per pupil cost figures shown above. The resulting total estimated cost is \$236 million.

Had all students been trained by the simulator method, the total cost would have been \$174 million. Thus, it is estimated that a total potential saving of

\$62 million could be achieved by nationwide adoption of the simulator method of driver education.

This would require that schools with eligible student enrollments below the minimum economical level of 350 join with other districts in cooperative arrangements. Furthermore, in some states it may be necessary to revise statutes, codes or regulations to permit schools to adopt the most economical method of driver education.

APPENDIX B-4  
INSTRUCTIONAL TECHNOLOGY

## INSTRUCTIONAL TECHNOLOGY

This appendix reviews applications of computers, television and other technological developments in education.

The number and variety of such applications have increased markedly in recent years, and have been the subject of a great deal of publicity and comment. However, the number of children being taught by new technological methods is still very limited. A 1967 NEA survey indicated that only three percent of the nation's teachers had access to computer-aided instruction -- one of the most significant forms of instructional technology -- and it does not appear that this proportion would be a great deal larger today. One of the most promising and heralded innovations which makes use of technological innovations is individually prescribed instruction (IPI) and although its use is increasing rapidly, in 1970 IPI was used with only 75,000 students in 264 schools, according to an estimate reported in the publication Education USA.

It is clear that education has been slow to adopt new technological aids, and other innovations to which they relate, such as individualized instruction and differentiated staffing. Many observers ascribe this to conservatism by the educational community. An obvious additional factor which has slowed adoption of new technology is cost. Many observers believe -- supported by some firm data -- that computers and other innovations can be cost-effective; that is, their appropriate application will result in increased pupil achievement per dollar of cost. However, educators and funding sources are accustomed to thinking in terms of outright costs, rather than cost effectiveness, and although expenditures are carefully measured they are seldom related to the educational effects they produce, except in occasional research studies. A report by the Secretary's Task Force on Instruction Technology challenged the nation's schools to translate their goals and educational targets into observable performance terms so that "the instructional technology capability of this nation can assist in increasing the cost effectiveness of education." 1/

Meanwhile, however, the acceptance of computers and television is delayed by cost. A related factor is that technological innovations are often introduced on the basis of enriching existing programs, so that their cost is purely incremental. The new techniques supplement existing methods, and little attempt is made to provide offsetting cost benefits by such means as reducing the number of teachers needed under the new programs.

Thus for a combination of reasons, the adoption of new technological innovations has been slow, despite the many and varied applications which have been made on an experimental or restricted basis, and widespread publicity on the need for their general use.

The balance of this appendix describes the following:

- Individualized instruction -- a learning mode which has spurred the application of instructional technology
- Individually prescribed instruction (IPI) -- an organized method for individualizing instruction
- PLAN -- an educational system incorporating the principles of IPI, and making use of the computer to help manage the learning process
- Computer-aided instruction -- the use of the computer to interact directly with the pupil
- Educational television -- as a learning medium

#### Individualized instruction

A major motivation in the development of technological innovations has been the desire of progressive educators to individualize the learning process in accordance with the capabilities and learning rates of individual children. It is widely agreed in progressive educational circles that the methods of discovery and inquiry should replace the rote learning still so prevalent in many schools, and that a variety of learning resources should be used to enrich the learning process for each student. Over the years, research into the learning process confirmed the obvious fact that all students do not learn at the same rate, and "individual differences" and "individualization of instruction" became popular terms in the professional literature. Learning aids such as filmstrips, motion pictures, and recordings were used by many teachers; however, it was difficult to help the individual student to learn according to his needs while children were in groups of 25 to 40. The teacher who understood that he should individualize instruction was really unable to do so. Then new organizational patterns were introduced, such as team teaching, non-grading, and others, which gave some promise of breaking down the artificial grade and classroom groupings. Large group lectures were planned to free more teacher time for smaller seminar discussions and some individual work. However, obstacles to individualization were and are considerable. Assuming the teacher is willing to transform her arena into a student-learner setting and that administrative influence is positive, serious mechanical problems remain which are centered around diagnostic tools, record-keeping capabilities, retrieval methods, and the availability of a variety of high-quality instructional materials.

As individualized instruction has taken various forms, it has been defined differently by different authorities. Hunter offers the following:

Individualization of instruction is now defined as an educational process in which all decisions related to the learning task, the behavior of the learner, and the behavior of the teacher emerge from the diagnosis of each learner. This requires individualized instruction that is geared to the distinctive attributes, needs and cognitions of the particular person. It does not mean that individuals must be taught singly, with different materials designed for each alone. This instruction requires, however, instructional methods and materials of such scope and flexibility as to reasonably fit the diverse requirements of different individuals. 2/

Anderson goes further into specifics about the situation in which those processes occur:

1. Individual pupils interact with programmed materials, work independently in libraries or other school spaces, or otherwise pursue learning tasks by themselves and on their own timetable.
2. Individual pupils receive counseling, tutorial service, or other personalized help from a member of the school staff.
3. Small groups of pupils, presumably very similar to each other in aptitude and achievement history, engage collectively in a task that promises essentially the same educational benefit to each of them.
4. Small groups of pupils, presumably different from each other in aptitude, interests, experience, and other factors, engage collectively in an activity (such as discussion) that promises to benefit each of them uniquely.
5. Groups of pupils attend a lecture or presentation by the teacher, a demonstration, an audiovisual lesson of some sort, or other class activity in which all the youngsters are exposed to a common stimulus but the responses expected of the children either at that moment or in some subsequent activity will vary within a range the teacher has in mind. 3/

Baker and Goldberg emphasize the need to differentiate between individualization and independent study. The terms are not synonymous. A student may be assigned independent study in a non-individualized program, whereas, a student could conceivably function in an individualized program without choosing to work alone. The important point, according to Baker and Goldberg, is that in individualized instruction the student and teacher select from a variety of materials and media which may include independent study. 4/

Walter Johnson, in an unpublished dissertation, analyzes and conceptualizes individualization of instruction, individualization of learning, and independent study. His model establishes individualized learning as the goal. One component of that goal is individualized instruction which is teacher-centered; the other component is the pupil-centered independent study. Both components have options of content, grouping, pacing and evaluating. 5/

An effective system for individualization of instruction also requires statements of intent in terms of behavioral objectives. Robert F. Mager, a leading authority on the development of behavioral objectives, proposes the following procedure:

1. You will communicate your intentions to students only by accurately describing the kind of behavior you expect them to display at the end of the course.
2. In order to indicate accurately what you expect:
  - a. name the behavior required (e. g., identify minerals),
  - b. list any conditions (given a set of mineral tables, etc.),
  - c. state the criteria for a passing grade (make 15 out of 20 correct determinations).
3. Write as many objectives as you need. The more clearly stated objectives you write, the more likely you are to achieve your instructional goals.
4. Give each student a copy of the objectives.

If you do this you may not have much else to do. 6/

Individually prescribed instruction

An organized method for individualizing instruction is provided by the approach of Individually Prescribed Instruction (IPI) which R. Louis Bright of USOE called one of the greatest educational breakthroughs of recent times, which proves the real possibility of economically feasible individualized instruction. 7 /

In 1970 IPI was in use in an estimated 264 schools serving 75,000 students, up from 164 schools and 50,000 students in the previous year. 8 /

IPI provides an individually paced program for the elementary age youngster, in the areas of reading, mathematics, science and spelling. Its step-by-step sequence from kindergarten through sixth grade is designed to provide considerable independent study with abundant use of multimedia materials in an ungraded organization.

The fundamentals of IPI begin with behaviorally stated objectives arranged with consideration for sequence and development. Materials for lessons are then geared exactly to the instructional objectives and permit pupils to proceed quite independently. Also included is detailed provision for diagnosis of pupil abilities and continuous monitoring of his progress. Achievement tests are given frequently. A post-test score of 85 percent mastery on a given unit constitutes a satisfactory level, and the youngster is then permitted to proceed. Another fundamental of IPI lies in the teacher's role; he must lecture very little, diagnose and evaluate much, and spend a great deal of time "tutoring" and conferring.

An observation by the Human Relations Research Organization dramatically supported that the teachers were in fact doing some of those things as they compared a conventional school with an IPI school:

In the conventional school the study found that over half of the communications in the classroom had nothing to do with instruction; about 90 percent of the communications were teacher-initiated, and half of these were directed to the single student and half to groups of students; when the teacher talked to one student, it was most likely that the communication was non-instructional; when the teacher talked to more than one student, it was likely that the communication was instructional.

In the IPI class the study found that over three-quarters of the communications were instructional in nature;

20 percent of the communications were teacher-initiated and three-quarters were directed to the single student; about 80 percent of the communications were student-initiated, and three-quarters of these were instructional in nature; there was a trend for the overall number of communications to decrease in the IPI classes. In general, the study found that the responsibility for teacher-student communication in IPI classes fell upon the student and the content of most communication was instructional in nature. 9/

Other observers are also enthusiastic. Mortimer Smith described the IPI program at the Baldwin-Whitehall district in Pennsylvania:

In the classes we visited attention and application seemed high. We were impressed by the independence and poise of many of the students, especially in a first grade science class. Here the tots filed in, got their individual kits of materials, and proceeded to their own carrels where they put on their headphones and received recorded instruction for use of the kit. One boy we observed was following instructions to divide the soft and hard minerals in his kit. He wrote the numbers on the minerals in the appropriate space in his workbook. Others were engaged in rudimentary science lessons of greater or lesser complexity. The training in careful listening and in following directions seemed especially useful. It was delightful to watch the sangfroid with which most of the children approached their lessons. And one noted that few of them had to ask the attending teachers for further instructions. 10/

Formal evaluation of the effectiveness of IPI and other individualized instructional approaches is complex and difficult, and most of the evaluative studies have been limited to student and teacher questionnaires rather than measured behavior. Some IPI practitioners believe that two or three years must elapse before research on pupil achievement can be considered conclusive, but the limited testing and in-depth observations completed to date indicates success for the IPI approach. In Urbana, Illinois, for instance:

One group of 200 pupils was given the IPI math and reading programs. It was paired with 200 students progressing through Urbana's regular ungraded primary program without "individualized" instruction. The test period lasted one school year, 1966-67. At the end of this period the pupils were given the California Achievement Test.

The result: the IPI pupils at almost all IQ levels scored better than those who were not exposed to IPI. At the lower primary level, IPI pupils in the 110-119 IQ range received a grade placement score of 2.97 in reading comprehension; similar non-IPI pupils received a grade placement score of 1.18. At the 140 IQ level, IPI pupils scored 2.94 compared to 2.44 for the non-IPI pupils in reading comprehension.

In arithmetic fundamentals IPI lower primary pupils in the 110-119 IQ range scored 2.42; similar non-IPI pupils scored 1.97. At the middle primary level IPI pupils in the 120-129 IQ bracket received a grade placement score of 5.12 in reading comprehension, compared to 4.12 for non-IPI pupils.

However, in a few instances the IPI pupils scored lower than non-IPI pupils. At the 90-109 IQ level, for example, the non-IPI middle primary pupils scored 2.57 compared to 2.44 for the IPI group. 11/

#### Computer-managed instruction

The administration of IPI programs can be facilitated if computers are used as an aid in managing the program. In this application of "computer-managed instruction" which is to be distinguished from "computer-aided instruction" discussed later, the computer is not used as a teaching machine by the students, but rather as a means to assist the teacher in monitoring the progress of individual students, and prescribing succeeding learning materials. For instance, when IPI was introduced at the Richmond School in Quakertown, Pennsylvania, teachers complained that prescription writing and individual attention required too much of their time. The problem is being solved by adding aides to the staff and by incorporating the computer into the system. The Richmond program now includes the use of a computer for data collection and analysis, pupil record keeping, and feedback of prescription patterns. 12/

#### PLAN - Program for Learning in Accordance with Needs

A comprehensive program which is based on the IPI approach and which incorporates the use of computer-managed instruction is the PLAN system, or Program for Learning in Accordance with Needs, which was designed as a system of individualized instruction for grades one through 12.

PLAN was created by the American Institute for Research in the Behavioral Sciences under the directorship of John C. Flanagan and Westinghouse Learning Corporation, and was initiated in 1967. Westinghouse undertook a comprehensive development and marketing program to introduce the program to schools, at cost of \$100 per pupil per year. By the 1970-71 school year, PLAN was serving a reported 30,000 students and it appears that the cost of the program has limited its adoption.

Under the PLAN program, a computer terminal at the participating school is linked by direct telephone lines to a central computer in Iowa City, Iowa.

PLAN fits the specifications for a computer-managed system rather than computer-assisted since there is no direct student-to-computer interface. Instead the computer terminal serves the teacher. The computer records, stores, and feeds back the student's academic history and his program of studies. It also scores his tests. The computer monitors on a day-to-day basis the progress of the youngster in the program. The computer is non-instructional but managerial; it helps the teacher manage his various tasks in a program of individualized learning.

PLAN makes use of learning materials, drawn from a wide variety of sources, which are presented as modules. Donald Deep described the function of the computer in PLAN as follows:

1. Records the pupil's learning and academic history. Keeps a record on how best an individual learns.
2. Records the pupil's present program of studies. Makes modifications and recommends certain modules for pupils.
3. Scores all module tests and examinations and provides the results to the teacher and the pupil. Suggests the next module to be taken. Indicates objectives missed so that the pupil does not have to repeat the entire module.
4. Monitors the progress of the pupil daily. Progress cards are submitted on a weekly basis. Progress reports, including report cards, are sent back periodically.
5. Compares available learning materials and pupil's successes with those materials. Results can be used in making future recommendations for other pupils.

6. Provides backup support for the teacher so that the amount of teacher-student instructional time is maximized. The pupil can use his time in a flexible way. He can work on different teaching-learning units at the same time. The computer suggests to the teacher what action she needs to take today, what pupil groups need to be called together, what special materials are needed, and so on.
7. Assists in the formative evaluation of PLAN... A formative evaluation would evaluate the components of an instructional system such as objectives, the progress of the teacher, and the materials... The computer can eliminate antiquated, unsatisfactory, or spoiled educational products. 13/

Utilization of currently available materials makes the instructional adequacy of PLAN dependent upon the adequacy of the materials reservoir. Flanagan considers that the most salient characteristic of available instructional materials is not their adequacy or inadequacy, but rather the lack of evaluative data regarding them. He envisions PLAN as serving to make that needed evaluation. In the broader sense he sees the role of PLAN as one of formulating and testing "at least in a preliminary way, some basic principals of individualized instruction." 14/

#### Computer-aided instruction

The foregoing section described the use of computers to aid in managing instruction. This section describes computer-aided instruction -- a more advanced application of instructional technology in which the pupil interacts with the computer as an integral element of the learning process.

Many investigators and authorities have predicted that computer-aided instruction will have a major impact on education. However, the slow acceptance of even the more simple use of computers to help manage IPI and other individualized instructional programs suggests that large-scale use of computer-aided instruction is still many years away. Participants at a recent seminar devoted to CAI were in general agreement that in spite of the "on-the-shelf" availability of such equipment the educational community is only inching its way. 15/ R. Louis Bright is quoted as having lamented that in education there is a 30-year lag between innovation and widespread adoption of the innovation. Bright said it takes about 15 years before the first three percent of school districts make any change. 16/

On the other hand, Harold Howe II, the former U. S. Commissioner of Education, warned that since massive federal support for innovation has

entered the scene, there has been a temptation to jump the gun. "The result," he said, "has been a wave of hasty enthusiasm for the promise of a new device followed by a more leisurely repentance when it fails to live up to its billing." 17/

Unlike individualized instruction which is favored -- at least theoretically -- by nearly everyone, CAI is viewed by some as heretical and dehumanizing, and by others as democratic and more humanizing than traditional classroom situations.

Proponents of CAI point out that computers can adapt and modify their teaching approach in response to the student's characteristics and performance -- thus accommodating individual differences. CAI can take over time-consuming rote instruction which does not require the teacher; and can present remedial or enrichment material in subject matter which the teacher may not have time to present.

Proponents argue that CAI will be particularly advantageous in educating disadvantaged children who have done poorly in traditional ghetto schools. Computer games and simulations are considered by some to be particularly well suited to disadvantaged children. In a computer game the student is presented with information about a situation in which he must make decisions. His decisions are fed back into the computer and result in a new set of data -- the consequence of his decisions. He must then make new decisions.

As the group that will be most immediately affected by computers, many teachers take a negative view of CAI, although some commentators believe its adoption will benefit teachers as well as students, in the following way:

Computers can substantially enhance the learning process. As the computer's potential for learning is realized, it has been claimed that the teacher's role in the educational process will become less important. Experience teaches us that this will not be the case. On the contrary, computer-based systems will strengthen the teacher-learner relationship. Teachers will operate as managers, with a complex network of learning resources available and the means for deploying them flexibly. They will have a ready record of each student's performance and a ready access to the information the student needs during each stage of his progress. Teachers will be able to devote more time to slow learners and will have the means for challenging fast learners to even greater accomplishments. Slow learners will see a merciful reduction, possibly the disappearance of pressures from their peer groups. Tutorial and even dialogue systems employing computers will allow the

fast student to explore subjects in greater depth, or the slow student to catch up with his peers through extra effort. Teachers will be developers of human beings -- not mere dispensers of facts and keepers of records. 18/

Many applications of CAI have been made, but most have been experimental in nature or limited in scope. As with PLAN and IPI it has proved difficult to assess the effectiveness of CAI in comparison with traditional learning methods, and the research reports tend to be inconclusive. Feldman and Sears have reported on a CAI program with first graders in which a 66-category behavior survey instrument was employed. Results indicate that "critics may have some justification for suggesting that CAI leads to more sedentary, constricted behavior." On the other hand, "claims that CAI individualizes instruction have also been given support in this study, with the finding that correlations between behavior and achievement are less in the CAI subjects." 19/

Literally all the opinionnaire studies done on students, teachers and parents indicate overwhelming preference for individualized programs under consideration -- regardless of whether they are CAI, IPI, PLAN or others. 20/

Other studies suggest that although no conclusive results can be cited favoring greater achievement through CAI programs, there are indications that learning materials can be completed about 10 percent faster than in conventional situations. 21/

#### CAI cost considerations

A number of analyses have been made of the cost of traditional instruction in comparison with computer-aided instruction wherein the cost of the computers and related equipment is partially offset by an increase in the number of pupils served by one teacher. The cost findings to date are not conclusive. Costs of the different programs in use vary widely, and furthermore, authorities in the field disagree on their interpretation. For instance, in his book "Run, Computer, Run: The Mythology of Educational Innovation," Anthony Oettinger implies that all available programs are and will continue to be very expensive. However, a number of other authorities disagree, and cite data which indicates that CAI can be competitive with traditional instruction in cost.

One of the most promising CAI programs from the cost standpoint is the PLATO system (programmed logic for automatic teaching operations) developed at the University of Illinois. Alpert and Bitzer, in an analysis of PLATO, calculate that the system, amortized over five years, could provide

instruction at \$0.34 per student contact hour -- slightly less than the cost of conventional instruction at \$0.35 to \$0.60 per student contact hour. However, achievement of the low cost would require the sharing of the computer system by a large number of pupils and would be expensive for small school systems. The derivation of the PLATO cost is presented in the following table:

<u>Item</u>	<u>Total Cost in millions of dollars</u>	<u>Cost/year in millions of dollars 5 years Amortization</u>	<u>Cost per student contact hour</u>
Computer and extended memory	4.5	0.9	8¢
Software	1.5	0.3	4¢
4,000 student terminals	<u>7.5</u>	<u>1.5</u>	<u>15¢</u>
Subtotal	13.5	2.7	27¢
Lesson material	----	---	3¢
Data distribution lines	----	----	<u>4¢</u>
<b>TOTAL</b>			<b>34¢</b>

Various other estimates and projections of CAI costs are as follows:

- Lawrence Stolurow calculated a cost of \$0.56 per student contact hour for a CAI program utilizing an IBM 1500 system. 22/
- An article in the December, 1967 issue of Nations' Schools claims that the cost of computer-assisted instruction could by 1978 be lower than that of traditional instruction
- A July, 1968 report of the Committee for Economic Development, Innovation In Education: New Directions For The American Schools, states that if CAI were extended to the 16,000 public school systems which represent the majority of our students, the annual costs would be from \$9 billion to \$24 billion.

Educational television

Like computer-aided instruction and other forms of instructional technology, educational television has been widely acclaimed as a means for reducing costs and/or improving educational quality. Fred Pula cites the following potential advantages:

1. Pupil achievement can improve significantly when television is consistently used as a teaching aid. This is true regardless of age, grade, subject, or pupil's range of ability -- even after the novelty effect has worn off.
2. Television accelerates the teacher's professional growth. Classroom teachers learn by observing the techniques of the television instructor.
3. Television makes it possible to upgrade the curriculum and enrich the educational program more easily and economically than before. New courses can be introduced and special services offered to the classroom -- talks by scientists, poets, government leaders.
4. Television is especially useful as an instructional aid to add new learning experiences to the school program. It does not "replace" the teacher or "substitute" techniques and procedures which would eliminate regular classroom learning activities and personal teacher-pupil relationships. Its effectiveness is dependent directly on the way it is used by the classroom teacher.
5. The operational costs of television usually can be met without increasing the normal school budget. Savings to pay for television can be affected through redeployment of teaching equipment, changed organization within schools, and altered scheduling of personnel.
6. The problem of finding and retaining top quality teachers is eased. Teachers make their skills more widely available through television. The challenge of teaching on television gives many good teachers an added reason for remaining in the profession.
7. Television changes the role of the classroom teacher and makes him -- along with the studio teacher -- part of a teaching team.

8. Television brings greater equality of opportunity for all pupils. In an underprivileged area or in the most cultured district children participate in the same lessons and special events through television.
9. School television facilities can serve the public in a variety of ways -- for adult education, community projects, and the dissemination of many kinds of information. The schools can serve as centers for interested adults. 23/

It appears that although television is an effective educational medium to date no large-scale applications have been made by schools which have resulted in significant reductions in cost.

NOTES TO APPENDIX B-4

- 1/ Report: Secretary's Task Force on Instructional Technology, p. 10.
- 2/ Innovations in the Elementary School; An /I/D/E/A/ Occasional Paper, Melbourne, Florida: Institute for Development of Educational Activities, Inc., 1970, p. 11.
- 3/ Robert H. Anderson, Sustaining Individualized Instruction through Flexible Administration, in Don D. Bushnell and Dwight W. Allen, The Computer in American Education, New York: Wiley and Sons, Inc. p. 31.
- 4/ Gail L. Baker and Isadore Goldberg, The Individualized Learning System, Educational Leadership, XXVII, May, 1970, p. 775.
- 5/ Walter E. Johnson, A Conceptual Model for Evaluation of Learning Centers, unpublished Ph. D. dissertation, Dept. of Education, Northwestern University, 1970, pp. 19-22.
- 6/ R. F. Mager, Preparing Objectives for Programmed Instruction, San Francisco: Fearon Publishers, Inc., 1962.
- 7/ Individually Prescribed Instruction, Washington, D. C.: Education U. S. A. Special Report, 1968, p. 1.
- 8/ Individualization Breakthrough Announced, Education USA, February 2, 1970, p. 121.
- 9/ Individually Prescribed Instruction, op. cit., p. 5.
- 10/ Ibid.
- 11/ I. P. I., op. cit., p. 23.
- 12/ Kenneth Gehret, How Richland's Wrinkles are Ironed Out, American School Board Journal, CLVII, August, 1969, p. 24.
- 13/ Donald Deep, Computers Can Help Individualize Instruction, Elementary School Journal, LXX, April, 1970, p. 357.
- 14/ B. F. Skinner (ed.), Technology and Innovation in Education, New York: Appleton-Century Publishers, 1967, p. 149.

- 15/      The Computer in Education, An /I/D/E/A/ Occasional Paper, Melbourne, Florida: Institute for Development of Educational Activities, Inc., 1970, pp. 14-5.
- 16/      Technology in Education, Washington, D. C.: Education U. S. A. Special Report, 1967, p. 16.
- 17/      Ibid., p. 23.
- 18/      Ross Neagley and others, A New Age Of Media And Learning - What's Ahead? The School Administrator and Learning Resources, p. 7.
- 19/      David Feldman and Pauline Sears, Effects of the Computer Assisted Instruction on Children's Behavior, Educational Technology, March, 1970, pp. 10-14.
- 20/      Fred O'Neal, The Role of the Public Schools in Computer Assisted Instruction, Educational Technology, March, 1970, pp. 5-10.
- 21/      The Computer in Education, op. cit., p. 16.
- 22/      Lawrence M. Stolurow, Computer Assisted Instruction (CAI), unpublished Master's thesis, Harvard University, 1967, p. 56.
- 23/      Fred Pula, Educational Television, Application and Operation of Audiovisual Equipment in Education, pp. 240-241.

**APPENDIX B-5**  
**PERFORMANCE CONTRACTING**

### PERFORMANCE CONTRACTING

During the past few years, a number of private firms have been commissioned by school districts and the Office of Economic Opportunity (OEO) to assume responsibility for specific teaching-learning programs. This is referred to as performance contracting. Usually, educational contracts are let to business firms after specifying educational contingencies and the criterion behavior students must demonstrate as a function of instruction. School districts pay, on a per-pupil basis, only for those students who reach predetermined levels of competence as specified in the original contract.

Introduction of performance contracting has met with controversy. Some educators feel that districts which employ outsiders for a teaching function have tacitly admitted impotence. Teacher organizations, especially labor unions, claim that the traditional teacher role is threatened on performance contracts, that contracts cause teachers to lose their jobs, and that incentive pay for individual teachers (as offered in some contracts) is incompatible with established salary schedules.

#### Procedures

A brief description of successful procedures used by Combined Motivation Education Systems of Rosemont, Illinois, was obtained from Mr. Charles Welsch, program director, of this performance contracting organization.

1. Contracts are designed to promote maximum interaction between the school staff and program directors. Local teachers, chosen for their interest and ability are trained and employed in the program.
2. Standardized pre- and post-tests of student achievement are selected jointly by the school district and the contractor before initiating the program. (The use of tests designed by contractors themselves led to criticism of a performance contract in Texarkana, Texas.)
3. The school district purchases any necessary hardware and/or materials, thereby investing directly in the contract's proposed success.
4. Specification of behavioral objectives in small steps coupled with strict learning contingency management provides for observable approximations to terminal objectives. Multiple learning programs, offering remediation if necessary, are available.

5. Successful learning by students is consistently reinforced or strengthened by rewards, such as free activity time.
6. Cognate instructional units are supplemented with lessons on achievement motivation and developing study skills.

Welsch indicated that through careful preparation of instructional materials, structuring and control of environmental effects and training of teachers in basic behavioral/attitudinal principles, student achievement can be remarkably improved.

Many commentators on performance contracting have looked at it as a solution to the "accountability" problem. They see guaranteed performance as a way of assuring that someone will accept responsibility for the success or failure of the individual pupil's learning. This aspect of performance contracting is perhaps the single most important aspect of this innovation.

The most publicized performance contracts are those at Texarkana and Gary. Articles on these programs have appeared in nearly every educational publication and many general periodicals in the past two years.

#### Texarkana Project

In October, 1969, the first performance contract began in the twin cities of Texarkana, Texas and Arkansas. Dorsett Educational Systems of Norman, Oklahoma was awarded a contract which included the following terms:

The program - previously developed in the district with the help of model cities consultants - must be implemented by the contracting company to help up to 400 students in grades 7-12 achieve satisfactory skills in reading and mathematics.

All participants will have grade level deficiencies of 2.0 or more (as determined by the Iowa Test of Basic Skills) and a minimum I. Q. of 75 (as determined by the Lorge-Thorndike Test).

The contractor will be responsible for the satisfactory progress of pupils who are present at least 50 percent of the instruction offered, and will be paid solely for demonstrated learning achievement.

Substantial financial bonuses or penalties will be awarded depending on whether learning rates are slower or faster than stipulated in the contract.

Outside agencies, including some trained by USOE itself, will serve as auditors of the project. 1/

Dorsett's winning bid on this contract guaranteed a gain of one grade level after 80 hours of instruction at a cost of \$80 per pupil. Bonuses were granted for faster performance, and penalties for slower performance. All materials were provided by Dorsett, and the firm paid the personnel involved.

Controversy involving Performance Contracting arose after the first year of the Texarkana project. Since Dorsett Educational Systems was to be paid according to the students' test scores, conflict was generated when an independent evaluator found that many of the teachers were guilty of "teaching to the test." The incident has caused many people to question the validity of performance contracting.

#### Gary, Indiana Project

The Gary, Indiana contract involved more money (over \$2, 000, 000), more responsibility (an entire school) and a longer period of time (four years) than any other performance contract in force at the time of this study.

Behavioral Research Laboratories (BRL) was granted the contract with the School City of Gary without the formality of bids. The contract provides for payment to BRL of about \$800 per year for each pupil who demonstrates a one-year improvement in skill in five areas - language art, mathematics, science, social studies and foreign language, and "enrichment," which is defined as arts, crafts, music, drama, and physical education. The \$800 per pupil per year stipend is the present average per pupil cost under existing programs at Gary schools.

For pupils who fail to show the required improvement, Gary pays nothing to BRL, but holds the \$800 in a sort of escrow fund. If at the end of two years, these underachievers catch up to the minimum levels, BRL receives payment for both years the pupil was enrolled. In this way, BRL has four years to improve a pupil's skills by four grade levels.

Despite the fact that BRL is paid only Gary's average cost per pupil for each successful student, with no bonus for high achievers, its detractors claim that the performance contract will raise costs to Gary. Critics cite the following two reasons, as reported by Mecklenburger and Wilson:

First, roughly \$34, 000 per year accrues to BRL as "extra" income; this is so because Indiana schools determine cost per pupil based on "average daily attendance while BRL is paid based on "active enrollment." If enrollment is 850 students, and daily attendance averages 95 percent of enrollment, BRL receives 5 percent more than a Gary school would; 5 percent means 43 students BRL is paid for that Gary school would not be.

The detractors' second point is that BRL is paid the average annual cost per pupil in grades one through 12, which is roughly \$800. However, at Gary, the average elementary school cost per pupil is less. McAndrew estimated for us that K-6 expenditures average \$700; the union says \$696. This means Gary pays BRL approximately \$85,000 per year more than it would spend in an average elementary school. 2/

These qualifications would result in BRL's program costing nearly 20 percent more than Gary spends for an average elementary school. However, two factors modify this analysis. The first is that if BRL were only 80 percent successful at raising achievement of every child, BRL would return to Gary approximately 20 percent of its fee. At 80 percent success, the project at the Banneker School would cost no more; at less than 80 percent success, Gary would save money on the project. The second is that, because output for teachers salaries varies with the staff's experience, some elementary schools in Gary may spend well over \$800 per pupil.

A further problem for administrators considering performance contracting for their districts is the cost at which they would be bid. Few think it would be as low as BRL's price to Gary.

In the January American School Board Journal, BRL's president, George Stern, reveals that BRL can afford not to make a profit on the Gary project. If one considers the large profit margin that business usually requires in a high-risk enterprise, and if one suspects that BRL may not even recoup costs in Gary, he begins to wonder what it would really cost to contract with a corporation that had to make its profit on site. It seems that Gary has gotten a bargain rate; one may look askance at the publicity that says this project can be endlessly duplicated at the Gary price. It might better be thought of as a "loss leader" aimed at the education market. 3/

Perhaps the most significant questions to be asked of the Gary performance contract, and others which might follow it, center on who the program excludes.

While BRL is nominally "accountable" for every student, the contract reveals a substantial minority of students for whom no guarantee applies. The annual turnover of students in Banneker School is reported at 5 percent to 7 percent. Because a student must be in the program a full year for either portion of the guarantee to apply, as many as 15 percent of the students at Banneker, over three years, will not qualify. Moreover, even at Banneker

some students are already at grade level or above and should remain so without BRL. If these number 25 percent, as is said, then BRL has no effective accountability under the contract for this one-fourth of the school's students.

Most intriguing, there will be a number of students for whom an overwhelming effort would have to be mounted to raise them to grade level-special education students, for example, or simply children years below grade level who do not work well in programmed texts-much more than \$800 worth of effort. Would a corporation make this effort, or instead concentrate on the vast majority most likely to succeed? That is, if one is motivated by profit, are there some students too expensive to teach? 4/

There are many other problems related to performance contracting, and certainly no one pretends to have the solutions to all the problems. Some Gary school officials believe that the Banneker project will result in savings for Gary. Based on preliminary results these officials are very enthusiastic about performance contracting.

Other Performance Contracts Funded By O. E. O.

At the time of this study, the Office of Economic Opportunity had funded performance contracting projects in 18 cities at cost of \$5.6 million, as follows:

<u>School District</u>	<u>Contract Value</u>	<u>Contractor</u>
Portland, Maine	\$308,184	Singer/Graflex Corp.
Rockland, Maine	299,211	Quality Education Development
Hartford, Connecticut	320,573	Alpha Systems, Inc.
Philadelphia, Pennsylvania	296,291	Westinghouse Learning Corp.
McNairy County, (Selmer) Tennessee	286,001	Plan Education Centers, Inc.
McComb, Mississippi	263,085	Singer/Graflex Corp.
Duval County, (Jacksonville) Florida	342,300	Learning Foundations, Inc.
Dallas, Texas	299,417	Quality Educational Development
Taft, Texas	243,751	Alpha Systems Inc.
Hammond, Indiana	342,528	Learning Foundations, Inc.
Grand Rapids, Michigan	322,464	Alpha Systems Inc.
Fresno, California	299,015	Westinghouse Learning Corp.
Seattle, Washington	343,800	Singer/Graflex Corp.
New York, New York	341,796	Learning Foundations, Inc.

<u>School District</u>	<u>Contract Value</u>	<u>Contractor</u>
Clarke County (Athens), Georgia	\$301,770	Plan Education Centers, Inc.
Las Vegas, Nevada	298,744	Westinghouse Learning Corp.
Wichita, Kansas	294,700	Plan Education Centers, Inc.
Anchorage, Alaska	444,632	Quality Educational Development

In addition to the performance contracting firm, two other outside organizations are involved in the foregoing performance contracting programs. Education Turnkey Systems, Inc. serves as a "management support group" to the school systems since it is felt that school boards and administrators are not yet sufficiently expert to supervise the implementation of performance contracting programs. Another contractor, the Battelle Memorial Institute serves as an independent auditor for the O. E. O. projects. Battelle administers pre- and post-tests to experimental and control students, analyzes results, and collects and analyzes other data relevant to the evaluation.

#### Internal Contracts

The O. E. O. also supported contracts for experimental performance contracting programs in Mesa, Arizona and Stockton, California. These are unusual in that the contracts are between the local boards of education and the local teacher organizations rather than outside contractors. This arrangement is termed an internal performance contract.

Salient features of the internal contract at Mesa, Arizona are as follows:

- Type: Internal, using regular teachers' methods in regular classrooms.
- Description: Remedial work in math and reading in grades one through three and seven through nine. Selected disadvantaged students: 100 per grade. Incentives for students and teachers.
- Objective: To determine if use of incentives for students and teachers can accelerate mastery of basic reading and math skills by disadvantaged students.
- Contractor: Mesa School District and Mesa Education Association.
- Evaluator: Battelle Memorial Institute.

#### External Contracts

Two examples of contracts with external organization which however involve some local teachers are projects in Dallas, Texas and Duval County, Florida. Key elements of the Dallas plan are as follows:

- Type: External, but local teachers are used.
- Description: Remedial education experiment to raise achievement levels of disadvantaged children in reading and math.
  - Six hundred students, grades 1-3 and 7-9.
  - Cash bonus incentive for teachers.
  - Use of Accelerated Learning Achievement Centers.
- Objectives:
  - Identify potential dropouts.
  - Improve basic math and reading skills.
  - Design high interest level academic program.
- Contractor: Quality Education Development, Inc.
- Management support group: Education Turnkey Systems, Inc.
- Evaluator: Battelle Memorial Institute

The Duval County plan has the following characteristics:

- Type: External, but with teachers selected from existing faculties.
- Description: Includes 300 first graders from three Jacksonville schools. Developmental rather than remedial. Emphasis on reading and math.
- Objectives:
  - Raise IQ's and increase thinking, reading, math, writing, social studies and science skills.
  - Improve teaching skills and use of professional resources.
- Contractor: Learning Research Associates.
- Management Support Group: School district personnel.
- Auditor: Educational Testing Service.

### Summary

The introduction of performance contracting has been surrounded by controversy, with teacher unions and other spokesmen contending that it reduces public control over education, puts too much pressure on students to achieve, encourages questionable testing procedures and "teaching to the test," and promotes unprofessionalism.

Supporters of performance contracting believe it represents an important new approach in education which can have very beneficial effects, particularly by focusing attention on output or achievement, rather than input or processes. Potential advantages claimed for performance contracting are:

- Accountability - shifts emphasis from input and process to output.
- Gives school boards indices of costs of learning, in contrast with cost of teaching.
- Improves morale of slow learners.
- Eliminates cost of programs that fail.
- Reduces dropouts by improving pupil achievement.
- Reduces fear that underachievers will adversely affect achievement of others, by use of individualized instruction which brings expected performance of all students to specified levels.
- Provides a cost/effective method for introducing individualized instruction into less affluent schools.
- Rewards effective teachers. Tends toward elimination of dull, uninspiring teaching.
- Internal contracts subject teachers to peer evaluation and regulation, which is regulated by districts professional organization.
- Internal contracts give the individual teacher a greater voice in developing curriculum and setting educational objectives.

Most important, supporters of performance contracting believe that it results in improved learning by pupils of basic skills, such as reading, on which progress in all other subject areas depends.

NOTES TO APPENDIX B-5

- 1/ Performance Contracting: How It Works in Texarkana, Bratton, Gillin, and Roush, School Management, August, 1970, pp. 8-10.
- 2/ The Performance Contract in Gary, Mecklenburger and Wilson, Phi Delta Kappan, March, 1971, pp. 406-410.
- 3/ Ibid.
- 4/ Ibid.

APPENDIX C-1

METHOD OF ESTIMATING EXPENDITURES FOR  
PURCHASING, SUPPORT SERVICES AND OTHER PURPOSES

METHOD OF ESTIMATING EXPENDITURES FOR  
PURCHASING, SUPPORT SERVICES AND OTHER PURPOSES

This appendix describes the methods used to estimate the amounts of expenditures by school districts for support services, purchases, instruction and other purposes. The base year selected for the survey was the school year 1970-71. Data on expenditures by school districts were obtained from The National Center for Educational Statistics, a unit of the United States Office of Education. As reported in the USOE publication, Statistics of Public Schools, Fall, 1970, it was estimated that in 1970-71 total school expenditures were \$44,424 million, and current expenditures for elementary and secondary day schools were \$36,454 million. It was necessary to determine current expenditures by account category; however at the time of this study, USOE had not prepared more detailed breakdowns of 1970-71 expenditures. Accordingly the most recent data available (for the year 1967-68) were analyzed, and the percentage of total current expenditures applied to each account category was calculated for that year. It was assumed that 1970-71 expenditures were distributed in the same proportion, and accordingly the 1967-68 percentages were applied to 1970-71 current expenditures.

This procedure provided estimates of expenditures for instruction, operation of plant, pupil transportation services, and other account categories. Further analyses were made of USOE data for 1967-68, including some unpublished information, in order to further break down instructional costs by salaries of classroom teachers and various other classes of instructional personnel.

The foregoing procedures resulted in estimates of 1970-71 expenditures for various account categories, as presented in Part A, Exhibit I-1. It was next necessary to break these down further to estimate the proportions expended for purchase of supplies and equipment, salaries and other purposes. National data were available which enabled breakdown of instructional expenditures by item, but not of support service account categories. Accordingly, detailed budgets were obtained for 16 representative school districts in New York State. By analysis, determination was made of the percentage of each expense category used for:

- Purchase of supplies and equipment
- Salaries of district employees
- Purchase of contracted services and other expenses

Averages were calculated which were applied to the national data, as presented in Part C, Exhibit II-1.

The representative school district budgets were further analyzed to determine the breakdown of purchases by various categories of supply and equipment items. The resulting data were applied to total national expenditures to derive estimates of expenditures by kind of item purchased, as presented in Part C, Exhibit II-2.

Expenditures by district size category

Estimates were also made of expenditures for all districts in each of six different size categories, according to total enrollment: more than 25,000, 10,000 to 24,999, 5,000 to 9,999, 2,500 to 4,999, 300 to 2,499, and under 300. USOE summarizes expenditure data for all districts in these categories; however, the 1970-71 figures were not available at the time of this study. Accordingly the most recent available data (for the year 1967-68) were adjusted to estimate 1970-71 expenditures by district size category. This was done by calculating 1967-68 expenditures for the average district in each size category, multiplying this by the actual number of districts of each size in 1970-71 (which had changed since 1967-68), and correcting each resulting total to reflect the total national rise in expenditures from 1967-68 to 1970-71.

In this way, total expenditures for each district size category were estimated. These totals were divided by the number of districts in each category to calculate expenditures by the "average" district in each category. Expenditures for each average district were also broken down by expense category. This revealed that smaller districts allocate their budgets differently than larger districts: for example - as would be expected - smaller districts spend a much higher proportion on pupil transportation.

\* \* \* \* \*

The foregoing analyses resulted in base data from which many additional figures were derived, and reference is made to these throughout the text of the report.

APPENDIX C-2  
METHOD FOR DETERMINING  
CUSTODIAL STAFF SIZE

METHOD FOR DETERMINING CUSTODIAL STAFF SIZE

This appendix describes a formalized method for determining the adequate size of a school custodial staff, which was developed for the New York State Education Department by Lee R. Wolfe of the State University of New York. Following a survey of representative schools in the state, Wolfe applied the statistical techniques of "multivariate analysis" to identify the variables which most significantly affect the number of custodians required. According to the findings, these are:

- Area of the individual school; square footage of each floor, including the basement
- Number of pupils enrolled
- Number of "teaching stations" which includes classrooms and the "classroom equivalents" of gymnasiums, shops, music rooms, etc. (Classroom equivalents are determined by dividing square footage of areas by 1,000; for example, a 60-foot by 80-foot gymnasium counts as 4.8 teaching stations.)

School characteristics and custodial requirements also vary according to grade levels. The following formulas were derived to determine the number of custodians needed by each of five kinds of schools; where C equals number of custodians needed, S equals number of teaching stations, A equals area in thousands of square feet, and P equals number of pupils:

Primary Elementary Schools (K, K-1, K-2, K-3, K-4, 1-4)

$$C = 0.023S - 0.0027A + 0.0027P + 0.46$$

Middle Elementary Schools (K-5, K-6, K-7, K-8, K-9, 1-6, 2-6, 3-6, 3-8, 4-8, 5-8, 4-6)

$$C = 0.081S + 0.011A + 0.0005P - 0.01$$

Junior High Schools (6-9, 7-9)

$$C = 0.016S + 0.033A + 0.0008P + 0.92$$

Senior High Schools (9-12, 10-12)

$$C = 0.027S + 0.043A + 0.0009P - 0.84$$

Junior-Senior High Schools (7-12)

$$C = 0.091S + 0.0007A + 0.0019P - 0.53$$

(Custodians are defined as individuals who spend less than one-fourth of their time on specific maintenance tasks. Part-time employees and those who carry out both custodial and maintenance tasks are counted fractionally.)

Thus, the number of custodians needed in a K-4 school with 400 pupils, 20 teaching stations, and 40,000 square feet of area is determined as follows:

$$(0.023 \times 20) - (0.0027 \times 40) + (0.0027 \times 400) + 0.46 = 1.89$$

Such a school would need about two custodians.

The formulas also can be used with a "confidence factor" which provides for determining the number of custodians needed in terms of a range, to allow for local variations.

The formulas can be used to calculate the number of custodians needed for a new school and also to evaluate staffing of existing schools. As an example of the latter use, the following table presents data for a school district on Long Island, New York with one high school, one middle elementary school, and five primary elementary schools.

<u>School</u>	<u>Number of Custodians</u>	
	<u>Actual employed</u>	<u>Needed by formula</u>
High School	14	13.7
Middle Elementary	13	10.5
Primary A	5	3.0
Primary B	5	4.2
Primary C	5	3.2
Primary D	5	4.0
Primary E	5	3.2
Total	52	41.8

Each school is overstaffed, according to the formula, although the total number of custodians employed is within the permissible range determined by application of the confidence factor. Nevertheless it appears that this district could reduce the number of custodial employees by about 8, or 15 percent of its total. Consistent with the foregoing, it was found that per pupil operating and maintenance cost for this district was more than 50 percent over the statewide mean for districts of its size. It was also found that, despite the high costs, the schools were not well cleaned. Analysis indicated that a major reason for this was that the custodians worked during the day when classes were in session. As one means of reducing costs, it was suggested to the district by the New York State Education Department, which provided the foregoing data, that the custodial staff could work more efficiently after school hours, and that only a skeletal force be on hand during school hours.

APPENDIX D-1

THE VALLEY VIEW 45-15

CONTINUOUS SCHOOL YEAR PLAN

THE VALLEY VIEW 45-15  
CONTINUOUS SCHOOL YEAR PLAN

Valley View Public Schools  
Research & Development Office  
104 McKool Avenue  
Lockport, Illinois 60441  
(815) 838-7981

The Valley View 45-15 Continuous School Year Plan is a method of assigning pupils, building facilities, and staff members. By more efficient use of the physical plant, by a more extensive use of the personnel, and by a more equal distribution of pupil class attendance throughout the year, the school district has realized a savings in building construction costs, a longer working year for some certified and non-certified employees (with corresponding increases in income), and quality education for the student body.

The Plan is educationally sound, financially desirable, and legally possible. This Plan was developed in the Valley View Public Schools and should not be confused with other scheduling systems.

1) Saturdays and Sundays, all Illinois legal holidays, a Christmas vacation period, an Easter vacation period, and a short adjusting period around the Fourth of July are designated as school closing days. A five year calendar has been prepared to insure that the pupil schedules are in logical segments. When classes are not in session, however, the buildings could be open for maintenance, athletic events, community activities and library service. All provisions of the Illinois "Monday Holiday Bill" are observed.

2) All families have been placed in one of four groups (A, B, C, or D) according to the small neighborhood in which they live. Unless the parents request differently, all children in the same family are placed on the same attendance schedule, even though the children may be at different grade levels or at different buildings. The four groups always stay in the same order of rotation.

All children in grades K-8 have attended school according to the 45-15 scheduling pattern since the summer of 1970. All students in grades 9-12 will begin the 45-15 Plan in the summer of 1972.

3) On June 24, 1970, the teachers and staff members for Group A began a four day Teacher Institute. On June 30, 1970, the pupils in Group A began classes. These pupils attended school for 45 class days then had a 15 class day vacation. Four cycles of attendance such as this gives the pupil 180 class days per school year and per calendar year.

4) Group B staff members had a four day institute immediately prior to the beginning of classes for Group B. Group B pupils began classes on July 21, 1970, which was 15 class days after Group A began.

5) Group C staff members had a four day institute after which Group C pupils began classes on August 11, 1970. At this time, three of the four groups of pupils were in school and one group was on vacation.

6) After pupils in Group A finished 45 class days of schooling and began a 15 class day vacation, the pupils in Group D began classes utilizing the classrooms and (in some cases) the teachers that were used by the Group A pupils. Group A pupils returned to replace Group B pupils; Group B pupils replaced Group C pupils; Group C pupils replaced Group D pupils, etc.

7) The families in the community were scheduled first. The teachers and classrooms were scheduled to match the pupils for grade level and department.

8) Bus service, building administrators, library and resource center staff members, cafeteria workers, and custodial employees were scheduled as required.

Provision was made for special education pupils, pupils who transfer into the Valley View Public Schools, and pupils who may be retained or advanced. Kindergarten classes are provided on a partial day basis.

Provisions have been made for emergency school closing days and teacher institute days.

9) This scheduling system was designed to provide Valley View pupils with quality education, full school days (except for kindergarten pupils), and 180 class days per year. The 45-15 schedule is not a device for increasing class days of instruction.

10) So far the use of this plan has resulted in saving the construction costs of seventy six equipped classrooms. All new buildings and additions will also be scheduled under the 45-15 pattern.

**APPENDIX D-2**

**SHARING SCHOOL FACILITIES COSTS  
THROUGH JOINT OCCUPANCY**

**SHARING SCHOOL FACILITIES COSTS  
THROUGH JOINT OCCUPANCY**

An approach for significantly reducing - or even eliminating - the cost to school sources of providing new schools is slowly gaining ground in the United States. This is the concept of joint occupancy in which a school shares part of its site or its facilities with nonschool users, who in turn pay a part of the cost of constructing the school facilities.

This appendix describes two essential forms of joint occupancy:

- A portion of the school site is sold or leased to a private developer for construction of housing or office space. Lease payments and "tax equivalency" payments by the developer wholly or partially offset the cost of the school. The portion of the school site leased may be a part of the ground area, the air rights over the school building, or a combination of these.
- A school/community center complex is developed in which some facilities, such as auditoriums and gymnasiums, are used jointly and financed partly by nonschool funds.

Within these groupings there are further variations in joint occupancy arrangements, as described in this report. Some are applicable where land is expensive or scarce, as in dense urban areas. Others are applicable also in smaller cities and suburban areas where the concept of combining schools and other facilities on one site offers economic and social advantages.

**Potential Advantages In Joint Occupancy**

Depending on the particular situation, a number of other advantages in addition to cost savings are possible through joint occupancy, and in fact one or more supplementary benefits must usually exist to justify the inherent difficulties in developing a joint-occupancy arrangement. A major advantage is that joint use of site and buildings can provide for more effective use of scarce and valuable land. Furthermore, if the building of a school in a residential area means the elimination of existing housing, the provision of new apartment units atop the school or adjacent to it tends to offset the problems created in relocating families.

Building commercial property on the school site protects the community's tax base: the land or air rights remain as a source of tax revenues. Combining a school with community facilities can result in a center that serves as a focus for community activity and promotes better integration of the school with the neighborhood. Sharing in the cost of facilities can also result in better facilities for both the school and community than either could afford alone. Moreover, some joint occupancy plans offer opportunity for specific "programmatic interaction" between the school and its neighbors; for example, a commercial high school in school/office building complex may develop work/study arrangements with employers and serve the tenant industries as a source of trained workers.

The joint occupancy arrangement with probably the greatest potential for outright cost savings is the sharing of a portion of the school site, particularly the air rights, and this is discussed in the following section of this report. A subsequent section describes the sharing of joint-use facilities in school/community center complexes.

#### Sharing School Sites: The "Air Rights" Concept

The "air rights" concept has reached its fullest stage of development in New York City, where land is scarce and expensive, housing is tight, new schools are needed, and the city's capital budget is under constant pressure for many other municipal facilities in addition to schools.

In 1966, a new public authority, the New York City Educational Construction Fund (ECF), was created to serve as a vehicle for financing and building schools under joint occupancy arrangements outside the City's capital debt limit. By the end of its fourth fiscal year, ECF was engaged in 23 school projects ranging in size from 120-seat Early Childhood Centers to a 3,600-seat high school. By the spring of 1971, it was estimated by officials that about 10 per cent of the total value of budgeted new school construction in New York City was through ECF.

When a site for a new school in New York City is selected, the Educational Construction Fund may be invited to build a school in combination with a commercial use. (Usually the site chosen has been designated in the City's capital budget for school use.) ECF evaluates the commercial potential of the property and endeavors to locate a developer who will be responsible for the nonschool portion of the complex.

In planning a development, ECF thinks in terms of the best use that can be made of the "zoning envelope" surrounding the school site, not merely of the "air rights" per se. In some ECF projects the commercial property will occupy a portion of the ground area of the site, as well as a portion of

the air rights over the school. In other projects the commercial portion of the project is situated entirely in the air space over the school. In evaluating a site, ECF considers whether a multiple-use situation can be created which is not only economically and physically sound, but is also consistent with community needs, such as housing, and with political realities.

Following consultation with the Board of Education and other interested agencies, ECF works out an agreement with the developer who designs and constructs the entire complex. Various agencies - including ECF and the Board of Education - participate in choosing the architect, approving the building design, selecting contractors, and working out other construction aspects.

The land and the school portion of the completed complex are owned by ECF, which finances their purchase initially by issuing tax-exempt bond anticipation notes and subsequently by selling tax exempt bonds. ECF will issue its own bonds outside the city's debt limit, an important advantage when the volume of outstanding bonds nears the limit.

The nonschool portion of the complex is owned by the developer or sponsor. The developer leases the air rights from ECF (or in some instances may buy the air rights although this reduces ECF income and adds to financing costs because the ECF bonds, which finance the land purchase from the city are tax exempt, but private financing normally is not). In addition to air rights lease payments, the developer pays to ECF an amount equivalent to the taxes on the nonschool portion of the complex.

ECF uses these two sources of funds from the developer - air rights lease income and tax equivalency payments - to retire its bonds. ECF leases the schools to the city, for a nominal \$1 annual charge. However, should the revenues paid ECF by the developer be less than its annual debt service charges to retire the bonds, lease charges to the city for the school buildings may be increased to make up the difference.

Until its bonds are retired in 35 to 40 years, the schools will be owned by ECF and leased to the city. After that the city will take title to the schools and will receive payments from the developer (or the then owner of the nonschool portion of the building) for air rights lease and taxes.

As of the spring of 1971, ECF had made preliminary estimates of the cost and income from 20 projects in various stages of planning and completion. It was estimated that 16 schools will be constructed on a "deficit" basis: that is, the income from the air rights lease and tax equivalency payments will not equal the cost of debt service on the bonds used to finance

the school portion of the project. However, it was projected that four other projects will return a net income after payment of debt service; and that the entire 20 projects will generate annual net surplus of \$1.1 million. Projections are presented in Exhibit D-2A, following.

If the preliminary projections prove to be correct, within the next few years, New York City will have 20 "free" schools worth \$151 million and in 35 to 40 years will begin collecting taxes on the nonschool portions of each complex. (Tax equivalency payments in the meanwhile will go toward paying for the schools, as previously noted.)

Of the total projected ECF revenues of \$12.9 million on the 20 projects, air rights leases provide \$2 million and tax equivalency payments \$10.9 million. Thus, the 20 schools will be "free" to the Board of Education mainly because of tax equivalency payments on the air rights. It could be argued that the schools are still costly to New York City taxpayers because, if they were not built at all, the taxes on commercial buildings erected on the site would go into the municipal treasury instead of being used to retire the ECF bonds that financed the school. However, the sites usually have been designated for school use, and the air rights approach provides a means of building needed educational facilities at a minimum additional cost to the taxpayers.

As can be noted from the Exhibit, the projects vary greatly in the extent to which the lease and tax equivalency payments pay for the school cost. The housing projects are generally the least profitable but are sought to provide needed housing or because the site is located where a commercial office project is not feasible. (One housing project is to be financed by a conventional private mortgage, but the others require some form of subsidy to be economically attractive, either Federal subsidy through the FHA, state subsidy through the Mitchell-Lama Act, or city subsidy through its Public Housing Authority.) In the least profitable housing project, the deficit amounts to 91 per cent of the cost of the school, or conversely only 9 per cent of the cost of the school is "free." The two office building projects are more profitable; income from one will cover about 80 per cent of the school cost, and the other is projected to return an annual surplus after school debt service charges of almost \$7 million. This last project - a one million square foot office tower over a 2,500 seat commercial high school - is in fact chiefly responsible for the overall surplus on the 20 projects.

Implementation of the air rights concept - or most other multiple occupancy arrangements - is difficult and complex. The air rights idea had been considered in New York City for a number of years prior to 1966, but a variety of state and city laws, traditions, practices and prejudices forestalled its adoption. In particular, it would have been impractical for

**NEW YORK CITY EDUCATIONAL CONSTRUCTION FUND**

Projections As Of April 1971

Number	School Number Of Seats	Cost In Millions	Housing		Annual Fund Income			Annual School Debt Service	Annual Surplus Or (Deficit)	Income As Per Cent Of Debt Service
			Financing(a)	Number Of Units	Lease	Tax Equivalency	Total			
<b>A - Deficit Projects</b>										
P.S. 50 - M	1,400	\$ 7.0	M/L-236	300	\$ 12,000	\$ 60,000	\$ 72,000	\$ 560,000	\$ (488,000)	13%
P.S. 147-M	540	4.3	M/L	220	32,000	77,000	109,000	344,000	(235,000)	32
P.S. 209 - M	640	4.3	PHA	300	12,000	45,000	57,000	344,000	(287,000)	17
J.H.S. 47 - M	140Ad	2.0	M/L	170	52,000	60,000	112,000	160,000	(48,000)	70
P.S. 124 - M	1,200	6.0	M/L	740	188,000	260,000	448,000	480,000	(32,000)	93
P.S. 212 - M	640	4.5	M/L 236	320	28,000	76,000	104,000	360,000	(256,000)	29
P.S. 99 - Q	112Ad	2.0	M/L	220	68,000	77,000	145,000	160,000	(15,000)	91
Park West High School	3,650	23.0	M/L	400	82,000	140,000	222,000	2,000,000	(1,778,000)	11
Central Commercial High School	2,350	20.0	Office building	500,000 sq. ft.	500,000	800,000	1,300,000	1,600,000	(300,000)	81
P.S. 48 - M	1,200	6.0	M/L	300	36,000	105,000	141,000	480,000	(339,000)	29
I.S. 105 - M	1,800	10.0	M/L 236	1,000	60,000	200,000	260,000	800,000	(540,000)	33
ECC No. 2 - S.B.	120	0.9	FHA 236	120	8,000	8,000	16,000	72,000	(56,000)	22
P.S. 200 - X	1,000	6.0	M/L 236	600	24,000	120,000	144,000	480,000	(336,000)	30
P.S. 203 - X	1,500	8.0	PHA	300	12,000	45,000	57,000	640,000	(583,000)	9
ECC No. 1 - B.S.	120	0.9	FHA 236	140	8,000	11,000	19,000	72,000	(53,000)	26
P.S. 60 - K	1,500	8.0	PHA	480	18,000	72,000	90,000	640,000	(550,000)	14
Subtotal		<u>\$114.9</u>			<u>\$1,140,000</u>	<u>\$ 2,136,000</u>	<u>\$ 3,276,000</u>	<u>\$ 9,192,000</u>	<u>\$ (5,896,000)</u>	<u>36%</u>
<b>B - Sustaining Projects</b>										
P.S. 147 - M	250	\$ 4.5	Conv.	200	\$ 85,000	\$ 300,000	\$ 385,000	\$ 380,000	\$ 5,000	101%
P.S. 141 - M	875	7.5	M/L 236	300	15,000	60,000	75,000	600,000	100,000	116
P.S. 126 - X	1,200	4.0	M/L 236	400	(b)	(b)	(b)	(b)	(b)	(b)
Downtown Commercial High School	2,500	20.0	Office building	1,000,000 sq. ft.	100,000	8,000,000	8,500,000	1,600,000	6,900,000	531
Subtotal		<u>\$ 36.0</u>			<u>\$ 310,000</u>	<u>\$ 8,675,000</u>	<u>\$ 9,585,000</u>	<u>\$ 2,580,000</u>	<u>\$ 7,005,000</u>	<u>371</u>
<b>Total</b>		<b>\$150.9</b>			<b>\$2,050,000</b>	<b>\$10,811,000</b>	<b>\$12,861,000</b>	<b>\$11,772,000</b>	<b>\$ 1,109,000</b>	<b>109%</b>

Note: All figures are estimates, subject to the fluctuations of interest rates; determination of bond maturity and construction costs.  
 (a)M/L - New York Mitchell-Lama Act; 236-Federal Housing Act, interest subsidy; PHA-Public Housing Authority;  
 FHA-Federal Housing Authority; Conv. - conventional mortgage.  
 (b)Special City Fund agreement on sale.

the Board of Education to sponsor multiple occupancy projects because of the long-standing prohibitions against public and private ownership of one building which are a part of many New York City and New York State laws. It was decided that a new authority could more readily overcome the numerous problems, and, in 1966, the ECF was created by an act of the state legislature.

The ability of the ECF to generate 23 projects since then is a tribute to its pertinacity, since virtually every project has required cutting through a complex series of obstacles. Even under the conventional process, selecting a site, obtaining capital funding, and designing and building a school in New York City is a very complex procedure which involves a local school board, community groups, many units of the City Board of Education, City Planning Commission, Board of Estimate, Budget Bureau, Mayor's office, and other agencies - many of which are more or less-hostile to each other.

Construction of an air rights project introduces a new order of complexity, because of the additional agencies and organizations that become involved: developers, mortgage lenders, urban renewal agencies, city, state and federal agencies involved in mortgage subsidies, and many others. Furthermore, particular difficulties have been created by escalations in construction costs and interest rates and scarcity of mortgage funds. These have required new approaches to many projects while in midstream, and the cancellation of some.

The laws in New York State and City relating to bidding on public construction projects further complicate the process and may increase the cost of creating a joint occupancy building. Problems also arise in allocating costs of foundations, plumbing, heating and so on between the school and commercial part of the building. Technical and engineering problems may also be considerable: for example, column spacing will differ between the school and apartment portions and this may require building an expensive platform over the school portion of the building to support the upper floors. However, depending on the particular project, there may also be opportunities to save on construction costs because of the larger structure being built. On balance, ECF estimates that the cost of the school portions of its current projects are about equal to the cost of building freestanding schools.

Despite the many difficulties encountered, the ECF has forged ahead and made substantial progress because of the basic economic and land-use advantages of the process.

A prime mover in the formation of ECF was the then President of New York City Board of Education, Mr. Lloyd K. Garrison, and shortly after its formation he was quoted in The New York Times as predicting that the multiple-occupancy program would account for one fourth to one half of the total school construction planned by the Board for the 10 years hence.

Several years later, in 1971, ECF was sponsoring about 10 per cent of the schools in the planning/construction cycle and ECF officials contacted at that time declined to speculate on the total potential because of the many uncertainties involved. It would seem that the prospect of obtaining free or partially free schools would provide a powerful incentive to utilize the ECF approach in a high percentage of the schools constructed in New York; however, a variety of economic, legal and political considerations stand in the way.

With respect to economics, the best prospects for obtaining high income from air rights leases obviously are on high-priced land, and the land under one ECF project in Manhattan is valued at about \$200 per square foot. However, land availability as well as cost is also a factor, and at the other extreme, ECF is developing a school-apartment project in Brooklyn on land valued at only \$2 to \$3 per square foot. This project will displace families in an area where there is already a shortage of housing, and where there are pressures to allot scarce land for other public purposes such as parks. The housing built over the school will more than replace the number of units torn down to create the school site. The dollar return on housing constructed in air rights over this low cost land will be small, and the minor contribution it makes to the cost of the school would probably not by itself justify the many extra difficulties involved in putting together a joint occupancy project. Essentially, this particular project is justified by the need to make the best use of available land, rather than by the economic return on the air rights.

ECF points out that each project is unique and must be examined individually. Some school projects will not be feasible for the joint occupancy approach because of difficulties in putting together an acceptable financing package. In other cases, zoning prohibits high-rise construction or the community resists construction of housing for low-income families. The local community school boards in New York City are beginning to exert an important influence on school construction and they, along with the central Board of Education and the City Budget Bureau, may prefer to avoid the many complexities of the multiple-occupancy process and elect to build a conventional freestanding school with no cost sharing. In some cases, however, the community school board has demanded construction of housing along with the school.

One New York City school project evaluated by ECF was so complex that it was finally decided to have the project handled by an agency with even greater powers than ECF, the New York State Urban Development Corporation. This project, now in the planning stage, involves construction of a school/community center complex and requires the closing of a street, changing of zoning ordinances, and solution of extremely involved engineering, legal and

community relations problems. It was decided that the Urban Development Corporation could better override zoning ordinances, develop the community facilities, cut through legal obstacles, and speed building design and construction.

Despite the innumerable difficulties and the resistance encountered, it has been demonstrated that under certain circumstances the leasing of air rights offers major opportunities to reduce school construction costs. As noted previously, the air rights concept is a special case of the joint occupancy approach, which has been developed to the fullest extent in New York City where land is either scarce, expensive, or both. The following section describes other applications of the air rights and joint occupancy approaches.

#### Site Sharing By Private Schools

The use of the "air rights" or "zoning envelope" concept as a means of reducing school facilities cost is not necessarily limited to public schools. The following describes application of this approach by two private schools, in New York and Philadelphia, respectively.

In the early 1960's, the Trinity School, a private school in Manhattan, needed room for expansion and was considering a move to the suburbs where land could be obtained more cheaply than in the city. However, land adjacent to the school became part of an urban renewal program and was available at greatly reduced prices to private developers who would construct middle- and low-income housing. After complex investigations and negotiations, the school agreed to act as the developer of a 25-story 200-unit apartment tower to be built over a new school building on 30,000 square feet of urban renewal land.

The school created a special corporation which bought land valued at \$1 million for a small fraction of its true value, in exchange for serving as developer of the housing units. Through its corporation, the school constructed the housing, under the terms of the New York Mitchell-Lama Act which limits return on investment to 6 per cent.

Unlike some of the Education Construction Fund projects in New York City, the economic return on the air rights in this project is small. The main cost advantage to the school was that it obtained \$1 million worth of well-placed land, at a fraction of this cost, on which it constructed a four-story school.

Another private school which has implemented the zoning envelope approach is the Friends Select School in downtown Philadelphia. Like the Trinity School, the Friends Select needed new facilities but, unlike Trinity, it had sufficient land - three acres - provided the site was developed properly. The three acres were valued at about \$4 million. After investigating various alternatives, the school decided to lease one acre to the Pennwalt Company and build a new school on the remaining two acres, immediately adjacent to, but not under the office tower.

The new school, more than double the size of the old buildings it replaced, cost \$3.2 million and the reported annual charge for debt service is \$175,000. Income from the 99-year ground lease signed by Pennwalt is \$125,000 and the school receives an additional 14 cents per square foot of office space, for total income of about \$200,000 - more than the debt service on the school. In effect, the school gave up one third of its property for a new 120,000 foot school building. The reduction in area was mitigated by putting the playground on the roof of the school building, which is covered with artificial grass.

#### Sharing School Facilities: The School/Community Center

This section describes a joint occupancy arrangement in which the school shares some of its facilities with other community users, and obtains funds from nonschool sources to aid in construction.

The concept of sharing certain school facilities with community users has fundamental economic appeal. A school is typically in use for about 7 hours per day, 5 days per week, 36 weeks per year - or only about 25 per cent of the total "waking hours" of the year. In the afternoon and evenings, while the school stands empty, the community library and YMCA gymnasium are busy.

In the past decade, a number of cities have endeavored to improve on low-school utilization rates by building schools which are a part of a community center complex. In 1962, the Henry A. Conte School and Community Center was built as part of the New Haven, Connecticut urban renewal program to extend the concept of school/community cooperation and increase the utilization of school facilities in after-school hours. This pioneering venture, which included an elementary school, public library, senior citizens center, and joint school-community auditorium pointed the way for a number of school/community projects planned on a joint-occupancy basis.

Typically, the new centers contain three kinds of facilities:

- School facilities - (classrooms, laboratories, offices)
- Community facilities (senior citizens center, community agency offices)
- "Dual use" facilities (auditorium, gymnasium, cafeteria used by both school and community groups).

Typically, school/community centers are financed as complicated packages, with the major share of financing contributed by school sources, and supplementary funds provided by various city, state, federal, or private agencies. A number of school/community centers are described in this section, and an attempt is made to estimate the savings to school sources resulting from the contribution by outside agencies of funds which financed facilities used in part by the school.

The economies in joint user arrangements should also be considered from the broader perspective of providing for more full use of a costly public investment. A noneconomic advantage is also important; the school/community center is designed to serve as focal point for integrating the school into the life of its neighborhood and to provide significant if unmeasurable advantages in improving life in the community.

Quincy School, Boston, Massachusetts. The Quincy School, being developed on 2.5 acres of urban renewal land in downtown Boston, will include three elements: a public school for 800 pupils, housing units for medical and dental students at Tufts University, and varied community facilities. Originally, to conserve land area, it was planned to build the complex as one building, with the school and community facilities on lower floors, surmounted by a housing tower in the air rights. However, as the economic and technical aspects were explored further, it was found that the separate buildings would provide sufficient space at less cost. Accordingly, as now designed, the complex will consist of the following two buildings, separate but intimately connected at the lower levels.

- A housing tower which will contain apartment units for the married students in the upper floors, and some community facilities on lower floors.
- A school building which will contain the school itself, some community facilities, and certain facilities to be used by both the school and the community - a gymnasium, swimming pool, auditorium, health area, dining quarters, and roof playground with artificial grass.

Community facilities included in the two buildings are a day-care center, parking garage, family services center, teenage drop-in center and others.

The two basic parts of the project - housing and housing-related, and school and school-related - are respectively privately and publicly owned. This mixed ownership required a change in Massachusetts laws which prohibited mixed public and private ownership of condominium facilities - one of the many complexities which had to be overcome in the project. The school portion is controlled by the Boston School Committee (equivalent to a Board of Education). The housing portion is controlled by Tufts-New England Medical Center (T-NEMC), a joint agency of Tufts University and the

**New England Medical Center Hospitals.** (The Quincy School is adjacent to the medical center complex and much of the planning for it was done by T-NEMC.)

The T-NEMC or housing share of the complex is being financed by the Massachusetts Health and Educational Facilities Authority which in turn will lease it to T-NEMC. Community forces, which were very active in the overall project planning and which forced many changes in design and concept, are not represented in the financing, although T-NEMC obtained an interest subsidy from the federal Department of Housing and Urban Development which will have the effect of lowering the rental charges for the student housing.

The whole complex will be built by the Boston Public Facilities Department. The school and school-related portion of the complex will be financed by the Boston School Committee, with a 65 per cent contribution of state aid.

It is estimated that the school building portion of the complex will cost about \$5.5 million. Of this, about 40 per cent or a little more than \$2 million will be used to provide facilities to be jointly used by school and community including the gymnasium, swimming pool, auditorium, dining area, and health facility. Because the entire cost of the school portion of the complex was provided by school sources, no direct savings can be ascribed to the use of the joint occupancy approach in this project. However, there are intangible economic benefits in that about 40 per cent of the school will have substantially greater use than if it were built for school purposes alone.

Human Resources Center, Pontiac, Michigan. Planned for completion in the fall of 1971, the Human Resources Center was conceived in 1966 as a means for providing a school community center in a deteriorating sector of downtown Pontiac. The objectives were to replace an old school, provide facilities for community service, and create an impetus for reviving the downtown area.

An intricate low-rise complex is being built which will include:

- An elementary school to serve 1,800 to 2,000 children
- Office space and related facilities for community service organizations
- Dual-use facilities to be used both by the school and the community, including an auditorium-theatre, gymnasium, health station, arts and crafts center, and cafeteria.

Funding of the Human Resources Center is complicated. The school portion of the Center is being financed by the Pontiac School District. No funds were available from within the community for the community service portion, so an approach was made to U. S. Department of Housing and Urban Development. After considerable negotiation, HUD agreed to change its former policy and provide funds to the school district to construct portions of the complex to be used by the community. It was also necessary to change a Michigan State law which prohibited school districts from accepting federal funds for constructing a part of a building.

It is important to note that HUD funds cannot be used to construct school facilities, per se, but in this instance the school will have access to facilities constructed for dual use.

When finally completed, it is projected that the Human Resources Center will cost about \$6.5 million of which the school district is expected to provide \$4.9 million and HUD \$1.6 million. About \$1 million of the HUD funds will finance community facilities and \$600,000 will help fund dual-use facilities.

The cost of the pure school facilities is estimated at \$4.32 million and the cost of the dual-use facilities at \$850,000. (The balance of \$1.33 million will provide for the community facilities.) Thus, the school will have access to facilities costing \$5.17 million for which it will pay \$4.9 million. In a sense then, the school district "saved" \$270,000, although the dual-use facilities are more extensive and costly than they would have been if built for school purposes alone. In this project, the major effect of the dual-use concept has not been so much to save the school district money in construction costs, but to give it access to bigger and better facilities than it could have afforded on its own.

John F. Kennedy Community Center, Atlanta, Georgia. In early 1971, the John F. Kennedy Community Center opened in Atlanta with the following facilities:

- A middle school for 1,200 sixth, seventh and eighth graders
- Offices of the area school superintendent and his staff
- A complex of community service facilities for senior citizens, vocational education counseling, adult education and the like
- Dual-purpose facilities to be used by the school and community, including a gymnasium, auditorium, library, cafeteria, and locker room large enough to accommodate a swimming pool planned for the future.

Like the Pontiac Human Resources Center, HUD provided part of financing. Of the total cost of \$5.1 million, a HUD grant provided \$1.3 million, a private foundation contributed \$600,000 to make up a deficit, and the school board provided \$3.2 million.

In this project it is estimated that the school portion represents about 50 per cent of the total complex, and the dual-use facilities about 20 per cent. On this basis, the school will have access to facilities costing over \$3.5 million, for which school sources paid \$3.2 million, for a net "saving" to school sources of \$370,000, or 10 per cent of the cost of the portion of the complex used by the school.

Thomas Jefferson Junior High School And Community Center, Arlington, Virginia. In this school/community center, scheduled for completion in late 1972, it is possible to trace more direct savings to the school district through the joint occupancy approach. The complex was financed jointly by the school district and the county recreation department, and will be jointly built and operated. It will include classrooms, laboratories, cafeteria, auditorium, music room, industrial arts and home economics facilities, offices. The most striking feature of this complex will be a one-and-one-half acre enclosed "controlled environment facility" with a running track, and space for nine basketball courts, tennis courts or football practice field on a synthetic floor surface.

The \$6.65 million facility was financed by a joint issue of \$2.5 million in recreation department bonds and \$4.15 million in school bonds. An approximate estimate is that the school will make extensive use of about 80 per cent of the total space. (Of the total area, about 50 per cent is school space, 30 per cent is dual-use space, and 20 per cent is community space.) Thus, the school system will use facilities costing 80 per cent of \$6.65 million or \$5.32 million - for which it paid only \$4.15 million. (The recreation department made similar economies because it will use many school facilities in after-school hours.) Thus, in this instance, it can be said that the school district "saved" more than \$1 million or more than 20 per cent of the cost of the school and dual-use portions of the complex.

South Commons Branch, Drake Elementary School, Chicago, Illinois. The new South Commons Branch of Chicago's Drake Elementary School is part of an unusual multiple occupancy complex under an arrangement which provides specific cost savings to the school system. A private developer purchased 30 acres on urban renewal land in a former Chicago slum and erected a low- and high-rise complex containing moderate income housing, a shopping center, community service facilities, church, and school.

The housing was financed by HUD through the National Housing Act. An amendment by HUD of the Housing Act also enabled it to provide the same favorable terms for financing the community building in which the church and school are located. In exchange the developers agreed to turn over the profits of the shopping center to help support the community building.

The community building is owned and operated by a community corporation established for this purpose. Besides the church and school, the building contains the following dual-use facilities:

- Parking garage for all tenants
- Gymnasium-playroom used by the community and school
- Auditorium used by the school, church and community.

The Chicago school system rents the school space for \$2.50 per square foot. Similar space would normally cost about \$4.00 per square foot. Thus, the joint occupancy concept saves the school board more than 40 per cent. Low rental is made possible by a combination of factors, including the sharing of dual-use facilities and the profit contribution from the shopping center.

#### Summary Of Potential Savings

Salient features of these five school/community centers are summarized on Exhibit D-2B, following. The "cost savings" to the school district as a result of outside financing ranged from 0 to 44 per cent, calculated on the difference between the cost of the facilities available to the school, and the cost paid by school sources. This comparison may overstate the savings, inasmuch as the dual-use facilities in school/community centers tend to be more elaborate than would have been provided for a school alone.

In order to provide an additional basis for estimating the potential for cost savings, the following model is presented, based on the five examples cited, and on data provided by school architects, and on certain assumptions. It is assumed that a typical school, built as a freestanding unit, to accommodate 1,200 to 1,400 students would cost \$4.5 million. Typically, about one third the cost of a school is represented by facilities with potential for dual use - gymnasium, cafeteria, auditorium and library. Thus, in a typical \$4.5 million freestanding school, the "school" portion will cost about \$3 million and the "dual use" portion about \$1.5 million.

Now, it is assumed that the same school capacity is to be provided in a school/community center, rather than in a freestanding school. The dual-use facilities would be planned on a more extensive basis and would cost

SCHOOL/COMMUNITY CENTER - FINANCIAL COMPARISONS

Item	Quincy School (Boston, Mass.)	Human Resources Center (Pontiac, Mich.)	John F. Kennedy Community Center (Atlanta, Ga.)	Thomas Jefferson Junior High School Community Center (Arlington, Va.)	South Commons Branch-Drake Elementary School (Chicago, Ill.)
Facilities					
Number of seats in School	300	1,800-2,000	1,200	1,400	250
Dual-use					
Auditorium	x	x	x	x	x
Gymnasium	x	x	x	x	x
Food service	x	x	x	x	x
Other		Pool, health center	Health center, arts Library	Music room, industrial arts, home economics	
Community		and crafts			
Other	x	x	x	x	x
	Housing, parking garage		Area school super- intendent office		Housing, parking garage, shopping center
Facilities Costs (In Millions)					
School	\$3.3	\$4.32	\$2.55	\$3.32	n.a.
Dual-use	2.2	0.55	1.02	2.00	n.a.
Subtotal	\$5.5	\$5.17	\$3.57	\$5.32	n.a.
Community	n.a.	\$1.33	\$1.53	\$1.23	n.a.
Total	n.a.	\$6.50	\$5.1	\$6.65	n.a.
Financing (In Millions)					
School sources	\$5.5	\$4.9	\$3.2	\$4.15	\$2.25(e)
Other sources	n.a.	1.6(a)	1.3(a)	2.50(c)	1.75(g)
Total	n.a.	\$6.5	\$5.1	\$6.65	\$4.00(f)
Savings To School(d)					
Amount (In Millions)	0	\$0.27	\$0.37	\$1.17	\$1.75(g)
Per cent of total School costs	0	5%	10%	22%	44%

n.a. - not available.

(a)HUD.

(b)Private.

(c)Recreation Department.

(d)Cost of school plus dual-use facilities, less school source financing.

(e)Lease cost (in dollars per square foot) - actual.

(f)Lease cost - usual cost for equivalent space.

(g)Savings in lease cost (in dollars per square foot).

on the order of \$2.0 million, rather than \$1.5 million as in the freestanding school. It is assumed that - since the dual-use facilities are to be used about equally by school and nonschool sources - a plan is worked out whereby school sources would provide half the cost of the dual-use facilities, or \$1 million, with the other half provided by nonschool sources, such as HUD, local recreation agencies, local foundations, city tax funds or other sources.

On this basis, the cost to school sources would be \$3 million for the "school portion" plus \$1 million for the "dual use" portion, or \$4 million. In comparison with the cost of the facilities to which it has access - \$5 million - the school board has saved \$1 million, or 20 per cent. However, in comparison with the cost of the comparable freestanding school - \$4.5 million - the school board has saved a lesser amount - \$500,000, or 11 per cent. The total savings to the public are greater than this, since the community now has the use of facilities which it would customarily not use in a freestanding school. If the gymnasium, cafeteria, auditorium and library were provided both in a freestanding school and in a separate community center, the total cost of building them would be perhaps \$3 million. Thus the overall savings to the public are about \$1 million.

It is felt that the figure of 11 per cent represents a reasonable estimate of the cost savings that are achievable to school sources by building new schools as part of school/community centers - provided that the financing is so structured that nonschool sources pay for half the cost of the dual-use facilities incorporated in the complex.

#### Implementation

Although on a national basis, the potential savings achievable through the sharing of sites or facilities is limited, these techniques clearly present major opportunities for savings in the construction of a given school or a large number of schools in a major city.

As noted, sharing of facilities in school/community centers can reduce building costs to school sources by 10 per cent or more. The sharing of New York City school sites with commercial tenants will provide about 10 per cent of the schools now in planning or construction at essentially no cost to the taxpayers. Implementation of the savings potentials in site and facilities sharing is essentially a local or state matter although certain actions could be taken by the Federal government to encourage it. The following are suggested measures to encourage more widespread use of these approaches.

1. Each state government should investigate the extent to which existing statutes may inhibit establishment of joint occupancy arrangements by boards of education in its state. Such agencies as the state Board of Education and Department of Education should evaluate opportunities and take the lead in suggesting enabling legislation to overcome existing restrictions. Where indicated by analysis, consideration should then be given to the need for new state agencies, such as the New York State Urban Development Corporation, to implement joint occupancy arrangements.

2. Governmental agencies in large cities, including the Board of Education, City Council, Mayor's office, and Budget Bureau should assess the opportunities for cost savings through site sharing and air rights leasing by carrying out evaluations of future school construction needs, cost and availability of city land, and demand for housing and office space. Means for implementing the approach should be investigated, including the suitability of existing agencies and the possible needs for a new agency such as the New York City Educational Construction Fund.

The chief need at both the state and local levels will be concerned and committed agencies or officials to recognize the opportunities for savings and to push through all the difficulties and frustrations that are normally encountered in implementing joint occupancy approaches.

Certain actions can also be taken at the federal level. Major encouragement would be provided to both existing and prospective joint occupancy programs by freeing more federal funds for support of public housing. The New York City Educational Construction Fund has been hampered by the lack of funds made available under Section 236 of the 1968 Housing Act. An increase in fund appropriations by the Congress, as well as disbursement by federal agencies of all funds appropriated, would spur the implementation of air rights leasing programs. So, too, would an improvement in the approval processes of the Federal Housing Authority which are reported to have delayed and discouraged a number of projects.

As noted, funds provided by the Department of Housing and Urban Development under the Neighborhood Facilities Act made possible the financing of school/community center projects in several cities. Further liberalization of the purposes for which such funds can be applied would spur the development of more joint occupancy projects at local levels. The application of federal funds for such purposes as interest subsidies, public housing support, urban renewal, and neighborhood facilities has had a catalytic effect which enables local agencies to use local, state and private funds more economically and efficiently in constructing schools.