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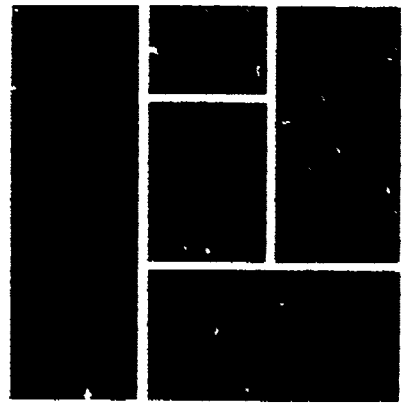
ABSTRACT

The primary purpose of this report is to provide guidelines to school systems and businesses on ways to increase the likelihood that science and math school-business partnerships will be successful in: (1) improving student competence in science and math; (2) increasing student interest in science and mathematics related subjects; (3) increasing the number of students seeking science or math careers; (4) increasing student self-esteem; and (5) helping teachers strengthen their science or math teaching performance. The guidelines presented here are based on observations of both good practices and problems encountered in the 24 partnerships reviewed for this report. These observations include on-site assessments of 17 partnerships in 11 communities. In addition, off-site reviews were conducted of an additional seven programs in seven other communities. The programs examined were selected because they focused on math or science, had been in existence for at least 1 full year, and involved an extensive commitment of time from business personnel. The partnerships were then placed into the following categories: (1) class demonstrations and lectures; (2) business providing teachers for credit courses; (3) out-of-class voluntary partnerships; (4) tutoring partnerships; (5) mentorship programs; and (6) partnership activities for teacher development and training. Sections I and II present guidelines that are applicable to all six of the categories of science and math partnerships. Section III presents additional guidelines for each of the six individual partnership categories. Section IV presents some of the special overall issues in partnerships such as monitoring and evaluation of partnerships and issues relating to disadvantaged student populations. A list of partnership contacts and a brief description of the 24 partnerships used in this study are appended. (13 references) (KR)

Guidelines for School-Business Partnerships in Science and Mathematics



THE URBAN INSTITUTE
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Project Report

Guidelines for School-Business Partnerships in Science and Mathematics

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GUIDELINES FOR SCHOOL BUSINESS PARTNERSHIPS IN SCIENCE AND MATHEMATICS

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CHAPTER 1
INTRODUCTION

Overview

Improving elementary and secondary education in science and mathematics has become a major national priority in recent years. Mathematics and science education has been of particular concern because of:

- Long-term needs for national capabilities in technological development.
- Shortages of qualified science and math teachers.
- Evidence that United States students lag behind students from other industrialized nations in math and science performance.
- Rapid advances in technology outstripping teacher knowledge.
- Growing demands for technical and computer literacy to participate in the job market.
- The growing need for people in modern society to have a reasonable background in science and math for every day living, and the need for an informed electorate.

Many types of actions can strengthen science and mathematics education. One approach with relatively low cost to schools is to draw on the private sector through school-business partnerships.

Businesses and their employees can provide students with up-to-date, practical, "real world" applications of abstract concepts presented in the classroom. Furthermore, they can often demonstrate these applications with equipment and materials not generally available to schools. Businesses can stimulate student interest in science and math, increase student learning, and update teachers on recent developments and applications of science and math.

Partnerships between schools and businesses have sprung up throughout the country. While most partnerships have not focused on science and math, noteworthy examples of partnerships exist with significant science or math components. We have examined 24 of them.

Effective partnership programs require careful planning and implementation along with commitments by businesses and schools to make them work. While there are a number of pitfalls, there are also a number of practices that seem to contribute to the success of partnership activities. By adopting such practices, communities can enhance the likelihood of partnership success.

Partnership Activities

School-business partnerships can provide a large array of activities. Exhibit 1 illustrates the range of activities businesses and schools have undertaken in the partnerships examined in preparing this report. Undoubtedly there are others.

Partnership Benefits

Partnerships can benefit students, teachers, businesses, and individual business volunteers in many ways. The specific benefits depend on the nature of the partnership, its goals or objectives, and its level of success. Exhibit 2 highlights benefits found in various partnerships.

Partnership Limitations

Despite these potential benefits, we present a cautionary note. While science and math partnerships have a lot to offer, they also have shown significant limitations. These need to be recognized to avoid unreasonable expectations and subsequent disappointment.

1. Partnerships seldom play a central role in teaching or motivating students. Teachers have this role. The partnership, thus, should be considered a peripheral, even though important, activity.

2. Partnerships can be limited as to the number of students they can serve. Both the number of private sector, technically-trained personnel who are available to help, and the amount of time these persons can provide to the schools, are limited. Businesses and volunteers rarely view their partnership involvement as one of their major work activities.

3. Partnerships generally do not reduce the work load of teachers. Partnerships are not "free" for schools, since schools usually need to commit staff resources for a wide range of coordination and

support activities. The costs, however, appear modest in light of the benefits achievable, and with good coordination, the excess burden on teachers can be kept to a minimum (see Chapter 3).

4. Partnerships rarely result directly in substantial increases in test scores and grades because they tend to involve relatively low levels of intervention.

Objectives of Report

The primary purpose of this report is to provide guidelines to school systems and businesses on ways to increase the likelihood that science and math partnerships will be successful in:

- Improving student competence in science and math.
- Increasing student interest in science and mathematics related subjects.
- Increasing the number of students seeking science or math careers.
- Increasing student self-esteem (by reducing students' fears of participating in, or understanding, science and math and by giving them greater confidence in their technical skills).
- Helping teachers strengthen their science or math teaching performance.

The guidelines presented here are based on observations of both good practices and problems encountered in the partnerships reviewed for this report.

Scope and Methodology

The guidelines presented in this report are based on findings from the examination of experiences of 24 partnerships in 18 communities across America.[1] These include on-site assessments of 17 partnerships in 11 communities. In addition, off-site reviews were conducted of an additional seven programs in seven

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1. To identify the sites, the project team contacted a wide variety of state and local educational agencies, civic organizations, business organizations, educational associations, and individuals active in partnerships. The team also reviewed a variety of publications and reports describing individuals partnerships. Partnerships that appeared relevant to our study criteria were then telephoned and interviewed to assess whether they met the study criteria. We screened nearly 100 partnerships.

other communities. These relied on extensive telephone interviews with key participants in each program and program reviews. The programs examined were selected because they met the following criteria:

- o They focused on math or science.
- o They had been in existence for at least one full year so that there would be enough time to adequately assess their experiences.
- o They involved an extensive commitment of time from business personnel.

In addition, the partnerships were chosen so that a number of them served substantial numbers of minority or disadvantaged students. While most of the partnerships were selected because they were considered successful or effective, partnerships were not excluded because of lack of evidence of success or non-success. In fact, one of the 24 partnerships had been terminated prior to our examination.

Programs reviewed for this report involved voluntary, formal agreements between one or more businesses and a school system or individual school to use business volunteers over an extended period of time to improve science and math education through direct involvement between volunteers and students and/or teachers. These partnerships usually involved a commitment of substantial amounts of volunteer time and sometimes the use of business facilities and laboratory equipment. In some cases, schools, in return, agreed to provide tangible benefits to the businesses. This review covered neither arrangements in which business personnel provided only sporadic, short-term involvement, such as for one-time guest lectures or field trips to a facility, nor partnerships in which the only element was the donation of money or equipment and supplies.

The term "partnership" is commonly used to describe learning activities involving direct interaction between business volunteers and students and/or teachers. While we will use the term "partnership" throughout this report, it should be recognized that these activities are sometimes called by other names. Some prefer terms such as "cooperative efforts" or "joint efforts." These activities are also included among those associated with efforts having a broader focus, such as "alliances" and "collaborations," which are

typically more focused on curriculum development and/or overall educational system reform. While these latter topics are extremely important issues, and we encourage schools and businesses to address them, they are beyond the scope of this report.

The sizes of the school systems examined for this report varied, ranging from very small to very large. Most were either urban or suburban school systems, but a small number were rural. Some partnerships involved only one school; others, a number of schools or all schools in a school system. (Two involved multiple school systems.) Some partnerships involved the schools working with only one or a few businesses; others drew on personnel from many businesses. Partnerships also varied as to which students (or teachers) they covered, such as which grade level, achievement level, and whether or not the focus was on disadvantaged students.

Selected characteristics of the partnerships we examined are presented in Exhibit 3. Brief descriptions of the partnerships and contact information can be found in the Appendices.

In the course of the field research, we interviewed over 250 school officials, teachers, business partners, and volunteers. We also administered structured questionnaires to more than 560 students. In all instances, we sought information as to the respondents' perceptions of the effectiveness of partnerships in which they were participating and the factors that contributed to its effectiveness.

Our intent is not to present case studies of the partnerships examined, but rather to extract guidelines useful to schools and businesses for developing and implementing successful partnerships.

Applicability of Guidelines

These guidelines are broadly applicable. They can be used for many kinds of partnerships, whether they are aimed at helping:

- bright and/or motivated students
- average or typical students, not necessarily especially interested in science or math

- disadvantaged students, often with remedial education needs

Special attention is devoted to partnerships for disadvantaged students-- students coming from racial or ethnic minorities, from poor households less able to provide the family support for learning than more well-to-do families can provide, or from inner cities or rural areas without access to advanced courses and good laboratory facilities.

The guidelines provided here are generally applicable to all kinds of schools or school systems: urban, suburban, and rural; large or small. They can be applied to students or classes at different grade and achievement levels. Most can be applied to partnerships involving subjects other than science and math. Important exceptions to any of these applications are noted where appropriate.

Finally, the focus of these guidelines is on partnerships that include one or more private businesses as a major partner, though government or universities may also participate as partners. However, most of these guidelines apply equally to partnerships that use a government organization (federal, state, or local) or college or university as one of the partners, or even as the only partner with the school system.

Categories of Partnerships

To help present materials in an orderly manner, the major types of science and math partnerships examined in this effort have been classified into six categories, based on the type of activities they undertake. Exhibit 4 lists the categories used in this report. A partnership can choose to use more than one category of activity.

Special guidelines applicable to each of the categories in Exhibit 4 are presented in later chapters. Readers particularly interested in obtaining further information on one (or more) of these individual categories can contact the school systems or businesses identified in the Appendix A.

Organization of Remainder of Report

Sections I and II (Chapters 2-8) present guidelines that are applicable to all six of these categories of science and math partnerships. Section III (Chapters 9 -14) presents additional guidelines for each of the six individual partnership category, guidelines special to that partnership category. Readers interested in only one of the six categories of partnerships can skip over the other chapters in this section. Section IV (Chapters 15 and 16) presents some of the special overall issues in partnerships. Chapter 15 discusses monitoring and evaluation of partnerships. Chapter 16 discusses special issues relating to disadvantaged student populations. Finally, Chapter 17 provides some final summary views about these partnerships. The Appendices give brief descriptions for each partnership examined for this report and contact information for readers wanting further information. A selected set of references is given for further reading.

EXHIBIT 1: EXAMPLES OF PARTNERSHIP ACTIVITIES

- Special lectures, demonstrations, hands-on experiments and short courses (provided in the school or at the business) to help illustrate abstract science and math principles with real life examples.
- Advanced courses taught by volunteers.
- Programs to encourage students to attend college and/or to pursue science and math careers.
- Science and math curriculum development.
- Development of experiments and special school science laboratories.
- Homework hot lines.
- Student and teacher access to business facilities, laboratories, libraries, and technical information.
- Teacher training/retraining and professional development programs through special summer institutes, weekend sessions, and attendance at professional seminars.
- Field trips.
- Mentor programs and one-on-one assistance to guide students working on special projects, science and math fair projects, etc.
- "Shadowing" programs in which individual students accompany the volunteer on his/her regular work assignments.
- Tutoring and coaching students individually or in small groups for remedial purposes.

EXHIBIT 2: BENEFITS FOR PARTICIPANTS

Students:

Better grasp of science and math concepts and better understanding of real world application of abstract concepts.

Enthusiasm for science and math; increased participation in science and math classes and in science and math activities inside and outside school; more interest in school.

Increased confidence, self-esteem and competence; enhanced maturity; decreased "science or math anxiety"; increased pride in specific activities.

Improvements in study habits; improved grades, test scores, and passing rates for standardized tests on practical applications of knowledge.

Better attendance.

Increased awareness of career opportunities; help in getting into better colleges; summer/vacation/part-time employment.

Development of special interests; help with math or science fair projects; opportunity to see and use equipment that schools don't have/cannot provide; possibility to undertake projects and understand concepts with which many regular teachers cannot provide help; early development of good research practices and techniques.

Friendship, encouragement and support; role models - especially for disadvantaged students; showing that academic success is OK; "big brother" or "big sister" relationship; avenue for youths to talk to adults - about school problems or social problems or things at home.

Teachers:

Help in covering the assigned curriculum; concrete examples of science and math applications for classroom use; new approaches and ideas that can be incorporated into examples for teaching concepts.

Familiarization with recent developments in science and math and their societal impacts; knowledge of technical skills and abilities students need to prepare for technical careers.

Assistance in working with special children--whether disadvantaged or exceptionally bright; help in making science and math interesting and vital.

Stimulation teacher interest in science and math and increasing capabilities to teach these subjects (especially important in elementary school which sometimes lack science and math specialists); increased morale.

Exhibit 2 Continued

Interaction with other professionals; respect and recognition for their efforts; higher self-esteem; building motivation and enthusiasm; rejuvenation.

Better understanding of the business community; "I have learned to see things the way the scientists did--how they come up with ideas for continuation or a variation of the project, or how to take the experiment further."

<u>School system:</u>

Expansion of educational opportunities for students; help in conveying message that specific points being taught in math and science programs are important for success; access to experts for special courses, supplies and /or equipment that school systems couldn't justify; increased community support for school system; maintenance of current and relevant science and math curriculum; variation in the typical teaching method and setting, adding another dimension to classroom instruction; local and national recognition for outstanding achievements; link for students and teachers to an upper level of science or math otherwise inaccessible to them; better attendance on partnership days; contacts that can lead to a variety of assistance (gifts, donations of equipment, purchases of video tapes and other special teaching material, persons to serve on curriculum advisory committees).

<u>Volunteers:</u>

Enjoyment from working with students and seeing them learn; sense of social responsiveness and contribution to the community; many scientists are "closet teachers"--chance to move out of the closet; elevating the excellence of the school system in which volunteers' children attend; understanding of what is going on in school today; help students understand that researchers and scientists are real people doing useful work.

<u>Businesses:</u>

Creative outlet for some employees; access to school facilities and special programs.

Way to contribute to the community; positive public image with students, school officials and parent, helping to overcome negative views about company for defense-related activities, pollution, layoffs, etc.; increased public understanding of business community and appreciation for some of its problems.

Improvement of the school system, which is helpful in recruiting new employees.

Access to a talented local labor pool--students and teachers; enlargement and enhancement of the future job applicant pool.

Development of management, communication, and presentation skills and leadership abilities of employees; mechanism of team-building.

EXHIBIT 3: CHARACTERISTICS OF PARTNERSHIPS WE EXAMINED

LEGEND:

Type of community
- U=Urban
- S=Suburban
- SC=Small City
- R=Rural

Activity Category
- 1=Class demonstrations and lectures
- 2=Business providing teachers for credit courses
- 3=Out-of-class voluntary partnerships
- 4=Tutoring partnerships
- 5=Mentorship programs
- 6=Partnership activities for teacher training and enrichment

	City or County	School System/ Business	Type of Community	Partnership Categories	Grade Levels	Client Focus	Minority
1.	Berks County, PA	Berks County Schools/multiple firms	R	6	7-12	Teachers	No
2.	Cincinnati, OH	Rockdale Elem. School/Children's Hospital	U	5	5-6	All	Yes
3.	District of Columbia	District of Columbia Public Schools/Federal City Council	U	4,1	7-9	All	Yes
4.	Elkhart, IN	Elkhart Community Schools/multiple firms	SC	5	7-8	All	No
5.	Hammond, IN	Hammond School System/Inland Steel	SC	2,3	10-12	Advanced & All	No
6.	Hartford, CN	Hartford Board of Education/Aetna Institute for Corporate Education	U	3	7	Remedial	Yes
7.	Howard County,MD	Howard County Public School System/multiple firms	S/R	5	9-12	Advanced	No

Exhibit 3 Continued

	City or County	School System/ Business	Type of Community	Partnership Categories	Grade Levels	Client Focus	Minority
8.	Indianapolis, IN	Shortridge J.H.S., Arsenal Technical H.S./multiple firms	U	6,3	7-12	Advanced	No
9.	Long Island, NY	Multiple School Districts/ Grumman Corporation	S	6,3	All levels	All & Teachers	No
10.	Los Angeles, CA	Cowan Avenue Elem. School/Chevron Corporation	U	1	4-5	All	Yes
11.	Los Angeles,CA	Tenth Street Elem. School/ARCO	U	4,1	K-5	All	Yes
12.	Pinellas County,FL	Osceola HS/ General Electric, Paradyne	S	4	9-12	Remedial	No
13.	St. Louis, MO	Carr Lane Elem. School/Centerre Bank Long Middle School/ Boatmen's Bank	U	1	5-7	All	Yes
14.	St. Louis,MO	Southwest H.S./ Monsanto	U	1	10-12	All	Yes
15.	St. Louis, MO	St. Louis Academy of Mathematics & Science/McDonnell-Douglas	U	1	10-12	All	No
16.	St. Louis,MO	St. Louis Academy of Mathematics & Science/GALIC	U	1	11-12	All	No
17.	St. Louis Park,MN	St. Louis Park H.S./Honeywell	S	3,6	10-12	All & Teachers	No
18.	Seattle, WA (TIE)	Multiple School Districts in Puget Sound area/Multiple firms	U/S	6	7-12	Teachers	No

Exhibit 3 Continued

	City or County	School System/ Business	Type of Community	Partnership Categories	Grade Levels	Client Focus	Minority
19.	Seattle,WA (MESA)	Seattle School District/Multiple firms	U	3,1	9-12	All	Yes
20.	Seattle, WA	Franklin H.S./ Security Pacific Bank Washington (formerly Rainier Bank)	U	4	9-12	Remedial	Yes
21.	Springfield, MA	William DeBerry School/DEC	U	3	3-4	All	Yes
22.	Tulsa, OK (Science Enrich-ment)	Tulsa Public Schools/AMOCO	U	1	4-5	All	No
23.	Tulsa,OK Physics Enrich-ment Project)	Tulsa Public Schools/AMOCO	U	3	11-12	Advanced	No
24.	West Point, VA	West Point Public Schools/Chesapeake Corporation	R	2	11-12	Advanced & All	No

EXHIBIT 4: CATEGORIES OF PARTNERSHIPS

1. Volunteers provide classroom demonstrations and lectures in support of regular classroom teaching.

2. Volunteers teach regular classes. The volunteer is the teacher for one or more classes.

3. Volunteers provide enrichment experiences for students outside of regular classes, such as in resource laboratories or advanced weekend or summer classes (generally non-credit) taught by, or involving participation of, business volunteers. Student participation is voluntary.

4. Volunteers tutor students. Volunteers provide remedial assistance related to regular coursework to one or a small group of students.

5. Volunteers provide mentorship experiences. These may take place in the school, in which case volunteers work with students to guide them on special projects, such as science fair entries, in the school setting or the mentorships may take place outside the school. In the latter case, students are exposed to career-related experiences at the volunteers' workplace. The students' work may or may not involve project work or class credit.

6. Businesses provide help for teacher development and training. The assistance includes such elements as workshops or lecture series provided by business volunteers; or summer internships or job assignments at the business partners' facilities.

SECTION I

BEGINNING PARTNERSHIPS

Partnerships begin for many different reasons and in many different ways. This section highlights the basic "start-up steps" that are required to get partnerships under way. Besides these "basic" steps, specific suggestions are made for increasing the chances of having school-business partnerships get off to a good start.

CHAPTER 2
INITIATING A PARTNERSHIP PROGRAM

Why They Begin

Partnership programs are initiated for a variety of reasons.

Some have resulted from special studies or task forces of community organizations or school officials concerned about education in general or science and math in particular.

- o A special Science Education Task Force of The Junior League of Tulsa conducted a two year study on ways to enhance science and math competency of students. It concluded in a well publicized report that school science partnership programs should be established.

- o The St. Louis Park, Minnesota School District initiated an extensive futures planning process to identify steps needed for the school system and businesses to prepare the community for the next century. The process identified partnerships as a necessary step to maintain the competitive edge for both students and businesses.

- o In Hartford, a committee of community leaders and professionals from the Black community worked for several months to identify special needs of inner city children and to define an enrichment program to supplement existing curriculum. A special Saturday Academy partnership program was recommended.

Some partnerships have developed in response to voluntary efforts to desegregate school systems or more equitably distribute resources to schools:

- o In St. Louis, Missouri and Tulsa, Oklahoma, partnerships were established to help build community support for an extensive voluntary effort to desegregate the school system.

- o The Seattle Partners in Public Education (PIPE), a nonprofit affiliate of the Seattle Chamber of Commerce, was formed to help channel resources to public schools more equitably, and to promote desegregation without a court mandate.

Partnerships do not always come into being as a result of pressing social matters or special task forces. Some developed simply because a teacher or a business person had a bright idea and acted on it!

Regardless of the reasons for establishing partnerships, their initiation involves a number of basic "start-up" steps that are required (or are very helpful) in getting partnerships under way. These are:

1. Developing a statement articulating the reasons for establishing the partnership program.

2. Identifying and recruiting business partners (or, if a business initiates the partnership, identifying and recruiting school partners).

3. Obtaining formal commitments from school administration and corporate leader(s) for partnership activities.

4. Providing needed resources to implement the partnership.

Each of these is discussed, and suggestions are provided, in the following sections.

Articulation of Need

The statement of need should articulate perceived problems or needs in the educational system and community. It should identify ways in which cooperation between businesses and the school system can strengthen the educational process and benefit the community. To the extent possible, needs should be stated in specific terms relevant to science and math education, not generalities. For example, needs might be expressed in terms of poor, or declining:

- o science and math test scores
- o enrollments in elective science and math courses
- o dropout rates from science and math classes
- o number of students interested in science and math careers
- o number of entries in science fairs
- o availability of entry level employees with satisfactory science and math skills

A needs statement can serve many purposes. It can develop and focus community support for partnerships. It can help gain acceptance within the school system for partnerships, providing rationale for the school system to devote staff and other resources to partnership promotion and coordination activities. It can give direction to schools and businesses as to the needed partnership activities. It can raise community consciousness of the benefits of partnerships and the need for business involvement, helping recruit businesses and business volunteers, and making teachers, parents and students aware of the benefits of

participating in partnerships, thus helping sell the concept to them. Finally, it can provide goals and objectives against which progress can subsequently be measured.

Needs statements for partnership efforts that involve only one school do not have to involve wide community participation. A needs statement can come from a particular school and its business partner(s). It might also be developed by the school alone to help recruit business partners.

- In Long Island, New York, the Grumman Corporation invited schools near their facilities to develop partnerships with them, but required each school to define its own needs and formulate requests for assistance. Then, Grumman officials met with officials from each school to discuss what form the partnership could take to address the needs identified.

- Osceola High School in Largo, Florida developed a tutoring partnership as a spin-off of Adopt-A-School arrangements the high school had with two nearby companies. School staff decided what the firms could do for them then approached them with their request.

- The Partnership Office in St. Louis, Missouri worked with schools and educators to develop specific proposals to present to businesses. Proposals outlined the nature of the partnership activities and "the bottom line" of what would be required of the business and the kind of outcomes they could expect.

Business Partner Recruitment

Once the school system has accepted the idea of partnerships the schools must locate and recruit businesses to be their partners. Fortunately, businesses and other organizations (nonprofit entities, government agencies, universities, etc.) exist almost everywhere. Many of them have employees with skills that can serve well in science and mathematics partnerships. Businesses do not have to be primarily engaged in science, math, or computers to have employees with skills in these subjects. For example, banks, utilities, and manufacturing firms with large engineering components are good sources of volunteers comfortable with mathematics. Business organizations such as Chambers of Commerce or local chapters of the various medical, science, engineering, and mathematics associations, are potential sources for business partners and volunteers.

Business organizations likely to have scientific and technical personnel who can serve as volunteers include:

- o Utilities, particularly electric and telephone companies
- o Hospitals and other medical or veterinary organizations
- o Banks (for practical applications of math)
- o Research organizations
- o Computer firms, both hardware and software
- o "High technology" manufacturing firms - electronics, chemicals, specialty metals, refineries, aerospace and defense, advanced technology equipment manufacturers, etc.
- o Government facilities: military bases, laboratories, monitoring stations, etc.
- o Universities, colleges, technical institutes, and community colleges

Persons promoting partnerships should identify the benefits to potential business partners and prepare a formal "marketing" plan. Obtaining a commitment requires selling the partnership concept. Major selling points for presidents/CEOs/facility managers are: (a) a partnership with schools is a way to contribute to the community in which the business resides; (b) it can help build the corporate image; (c) it can, in the long run, improve the availability of qualified technical employees in the region; (d) it would help improve the school system that employees' children attend, which helps attract and retain employees; (e) it can use the volunteer program as a benefit or "perk" for employees; participation in partnerships gives employees a sense of social participation and responsibility, and provides additional outlets for creativity (some businesses have felt this is sufficiently important to employees that they mentioned this when recruiting new employees); and (f) in some cases, the business can obtain direct quid pro quo from the school system, such as use of facilities or continuing education programs for employees.

Examples of the above include:

- o ARCO in Los Angeles and Rainier Bank (now Security Pacific Bank Washington) in Seattle developed videotapes featuring employee participation in partnership activities, and used them to inform new and potential employees about the benefits of employment in their firms.

- The West Point, Virginia School District provided its business partner with the use of facilities outside of normal school hours--gyms, media centers, auditorium for annual stockholders meetings; and use of school busses for transportation at annual meetings. The school system also developed recreation programs for the business, including aerobics classes staffed by school personnel.

- Honeywell Corporation in St. Louis Park, Minnesota, received staff development training from School District personnel for its employees on topics such as career development and listening skills. The school gave Honeywell access to facilities such as gyms, pools, athletic fields, and auditoriums.

- In Cincinnati, Rockdale Elementary School held an annual benefit concert whose proceeds were donated to the Children's Hospital (the school's partner) Research Fund. The school provided gym facilities and aerobics classes taught by school staff to its partner's employees. It also made students available for participation in hospital training procedures (e.g., mock evacuation drills).

Some hints about recruiting business:

- Select businesses as close to the school buildings that need the partnership help as possible--to minimize travel time for volunteers.

- Avoid firms that are having financial difficulties, are in the throes of reorganization, or are expected to have such problems in the near future. Even if they agree to participate, their participation could well become undependable.

- Try to get several businesses involved to reduce dependency on a single firm.

Making a Formal Commitment

A formal, preferably written, commitment from business and school leadership (superintendents, school boards, principals) to support the partnership is highly desirable. It should describe as precisely as possible: what is to be accomplished; how the partners will work together; how coordination is to be effected; what resources are to be committed; how long the partnership will last; and how it will be reviewed.

A formal commitment helps assure: attention, continuity, funds, staff resources, and volunteer participation. It helps provide direction and reduces possibilities for misunderstanding between partners.

Examples of written documents include:

- The Superintendent of Schools in West Point, Virginia and the chairman of the Chesapeake Corporation signed an agreement establishing the partnership, specifying the terms, and providing for yearly evaluation and procedures for terminating the agreement.

- In Tulsa, a letter of agreement was signed by the partners laying out the goals and objectives of a three year program, a precise description of the project, and what each party was to provide. A steering committee of representatives of the business community, the schools, and of participating civic organizations was established to direct, monitor, and evaluate the project.

Resource Commitment

Resources have to be committed to the partnership. Some resources are needed before partnership activities actually begin; some are needed throughout the life of the partnership. Though these programs generally do not require much "out-of-pocket" funds, schools and businesses must understand that, like the proverbial free lunch, there is no such thing as a free partnership!

School resources are needed for:

- Staff assistance to coordinate and support on-going partnership activities, to develop training materials and programs, and to publicize the program and provide recognition for participants.

- Reproduction and distribution of training and orientation materials and newsletters or other forms of communication within the school system, with business partners, parents, and the community at large.

- Release time for teachers to attend training and orientation sessions, off campus visits, local travel, and substitute teachers to take regular teachers' classroom duties during these times.

- Teacher (or school coordinator) supervision of the volunteers' activities.

- Incidental expenditures for supplies, recognition events (lunches, dinners, etc.).

- Transportation for student field trips and other off-campus partnership activities where school busses are used.

The major need is likely to be the school system's partnership coordinator. Communities with extensive partnership efforts involving the entire school system often establish a partnership office, perhaps with several staff members who work only on partnership-related activities. Less extensive efforts might be

handled by one full- or part-time school system coordinator. A partnership program involving a few classes in a single school might be able to function adequately with a few hours of time each week from a teacher, guidance counselor, or administrator. The coordination function is discussed further in the next chapter.

The major resource that businesses allocate to partnerships is the volunteer time of their employees. Most businesses expect their employees to maintain their regular workload and responsibilities while serving as a volunteer but allow them flexibility in working hours to facilitate participation in the partnership. Thus, there is little or no direct cost to the business.

However, some businesses have been enthusiastic about partnerships and have committed resources in a variety of ways. For example, the firms may subsidize employee participation by allowing volunteers to bill time to community relations or another overhead account. The business may also subsidize school teachers to help develop materials needed for the partnership.

Some examples of business practices are the following:

- In Tulsa, AMOCO Research Center gave two scientists several days of paid release time to develop to train teachers and volunteers in experiment development for a science enrichment project. In addition, its corporate charitable and educational foundation provided a $25,000 grant for equipment to extend the curriculum to cover middle school students.

- In Springfield, Massachusetts, Digital Equipment Corporation (DEC) paid two teachers for two summer months to work with DEC's staff (who spent about three weeks of their time) to assess student needs, develop a plan, and develop and prepare educational materials for the partnership.

- In St. Louis, McDonnell-Douglas Corporation subsidized employee participation by allowing their volunteers to bill time to "community involvement" overhead accounts.

- In West Point, Virginia, the Chesapeake Corporation hired entry-level engineers to work half-time for the firm and teach half-time in the public school system.

The businesses might also provide more modest levels of resources in support of the partnership, such as supplies for partnership activities, reimbursement for transportation, t-shirts and other rewards for student participation, as well as recognition dinners for volunteers.

- In Los Angeles, Chevron budgeted a modest amount of money to pay for supplies used by their volunteers in the Cowan Avenue Elementary School partnership. Chevron also reproduced a

small manual for volunteers, providing introductory material about the school, the nature of the partnership, and teaching tips.

- o ARCO in Los Angeles provided transportation reimbursement or use of a company car for volunteer use in getting to the 10th Street Elementary School.

- o Many business partners have provided annual field trips to their facilities as part of the partnership experience.

Business-School Committees

Some communities have found that formal committees are helpful in initiating partnership programs, particularly if there is strong business involvement on these committees. A committee can perform such functions as enlisting school officials and community business and community leaders to help recruit business partners (or to gain the support of the schools).

As part of these efforts the committee should compile a list of potential business partners and designate individuals, or committees, to recruit firms. It may be particularly helpful to have businesses involved in the initial recruitment for a new partnership program, particularly if it involves the entire school system, thus requiring numerous business partners.

The committee can continue functioning over the life of the partnership to act in an oversight capacity and to help maintain business involvement. Examples of such organizations include:

- o The Cincinnati Business Committee (an organization of Chief Executives of 24 major companies) and the Superintendent of Schools adopted the idea of promoting partnerships as a way of strengthening the school system. It established a Partners in Education program in 1979 to provide funding for a coordinator who performs the actual recruitment, as well as other coordinating responsibilities.

- o Los Angeles created an Adopt-a-School Council with representatives from 25 businesses that worked together to promote partnership programs. In conjunction with the School District's Partnership Office, the Council held a yearly workshop for current and potential business partners and school officials to promote partnerships. It distributed a newsletter, and conducted quarterly orientation meetings for new firms to meet with "veteran" firms for advice and insight. The Council also prepared some partnership-related materials (brochures, etc.) to encourage school and business involvement.

- o The Indiana Partners in Education Program, a statewide partnership promotion effort that provided grants to promote partnership development, required each grant recipient to form a

partnership advisory council with strong business membership. The councils played a leadership role in partnership development and implementation, and helped insure continuation of business involvement.

These business-school committees can also act as industry-education councils or be alliance initiators. Alliances and industry-education councils address a broader scope of concerns as well as take on a broader range of activities such as the revision of curricula, the upgrading of teaching materials and equipment, and the improvement of education management.

Further Suggestions

1. Seek support within the school system--from superintendent's officials, principals, the teacher association, and individual teachers, especially science and math department heads. Involve these parties from the start in partnership planning. Include them as part of the partnership planning process. Don't "go it alone." For school systems with substantial proportions of minority students, be sure to include school staff that can speak for these minority needs. Consider including one or two student leaders and parents in the planning process. All these participants can help gain support for the partnership as well as enriching the partnership design.

2. Assign permanent staff to coordinate the partnership. This typically occurs in conjunction with partnerships serving entire school districts, but can also occur within individual schools involved in partnerships.

3. Establish a line item in the school budget for partnerships (e.g., funding for a partnership or volunteer services office), such as done for the School Partnership Program in St. Louis, Missouri and the Partnership Office of the Los Angeles Unified School District.

4. Develop written guidelines establishing partnership activities and partnership-promotional materials such as video tapes and manuals to help orient and train volunteers.

5. Build partnership participation into the job descriptions of school employees. For example, performance evaluations of schools, principals, and teachers could consider their use of partnerships. In Los Angeles, regional superintendents of the school system included participation in partnerships among the performance objectives for school principals. This provided an incentive for partnership activities.

6. Consider coming up with attractive, catchy titles for specific partnership activities that can help sell them to students and outsiders (such as the "Tuesday Nite Live" tutoring partnership between Franklin High School and Rainier Bank in Seattle).

SECTION II

PEOPLE IN PARTNERSHIPS

The most important partnership ingredients are the people involved. This section provides suggestions as to the various roles, responsibilities, and needs of coordinators, business volunteers, teachers, school administrators, students, and parents. A theme emphasized throughout this section is the need for effective communication between all partnership participants to help ensure partnership success.

CHAPTER 3
COORDINATORS

A partnership coordinator, or in a program with many business partners, a partnership office, is an essential mechanism for coordination and communication.

A coordinator in the school system will almost always be necessary. Business partners that provide many volunteers should also designate an employee to serve as an in-house or business coordinator for the partnership(s). Reliable back-up/support persons should also be identified in both the schools and the businesses so that continuity is maintained and unexpected problems can be resolved promptly when the coordinator is not available.

The following guidelines generally apply, whether the partnership program is small and requires only one part-time person, or large and requires a coordination office and several staff persons.

School Coordinating Activities

The following are suggestions for establishing partnership coordinating mechanisms:

1. Select a school system partnership coordinator(s) and assign the functions listed in Exhibit 5. Depending on how extensive the partnership is, coordinators might be needed in individual schools as well as in a central school system office. Choose coordinators that work well with others and, preferably, are familiar with both teaching and with science or math. They also should be good "sales persons." The system-wide coordinator has to work closely with teachers, volunteers, school administrators, and sometimes parents. Former science or math teachers have often been used as coordinators.

2. Provide staff and resource assistance as needed for coordination. There is no set formula for determining the resources needed for partnerships involving the coordination of many schools. Clearly, large school systems with numerous individual partnerships will require greater staff commitments than more modest efforts. The coordination function could be provided in a small school district with a limited number of partnerships by an individual with at least one quarter to one half time available for partnership responsibilities. The same function can require a staff of perhaps five or six persons for large systems with many partnerships. In some systems, partnership staff have other responsibilities, such as recruiting and managing individual volunteers for a wide variety of activities; working with PTA's; and acting as a liaison with various community organizations.

A variety of arrangements have served the partnership coordination needs of different communities, such as:

- o The Springfield, Massachusetts School Volunteers Program administered partnerships for the 40 schools in the district. The department had six full time staff who worked on partnership activities as well as other volunteer activities. More than 200 businesses and organizations were involved in partnerships and other volunteer activities.

- o In St. Louis Park, Minnesota a part time volunteer coordinator was responsible for promoting, supporting, and assisting eight extensive partnership activities.

- o St. Louis, Missouri had a staff director and seven full time employees for 1,200 partnership activities of the city and county school systems. In addition, schools with extensive volunteer programs had their own partnership coordinators.

- o The volunteer coordinator for the Tulsa Public Schools had a staff of four.

- o The Volunteer Services and Training Branch (VSTB) of the Office of Special Services and State Affairs coordinated the Federal City Council Science/Math Education Volunteer Program in the District of Columbia. This Office reported directly to the superintendent. It had several persons on the office staff but coordinated a large array of volunteer activities.

3. Establish school-level coordinators. Coordinators at individual schools may be needed in addition to system-level coordinators when the program at a given school involves more than a few partnerships or teachers, or when a large number of volunteers are involved. The coordinator for individual schools serves as a contact point between the system-level coordinator and the school. The school coordinator should perform such functions as those listed in Exhibit 6. The distribution of responsibilities between the system-level and school coordinators needs to be worked out on an individual basis and can vary with the level of work, or time available, of the respective parties. Current teachers, the science or math department head, and guidance counselors have also commonly been used as partnership coordinators for individual schools.

Examples of various arrangements for school-level coordination include:

- o At Los Angeles' 10th Street School, which had an extensive partnership program with one business partner, the school-level coordinator was a school employee whose salary was paid by the business partner. She was a former teacher originally employed by the business to develop and coordinate its partnership program. Her primary office was at the school, and the bulk of her time was spent on coordinating its partnerships. However, she also was provided an office at the business, and performed coordinating functions for partnerships the firm had with other schools. In effect, she served as a coordinator for both the school and the business.

- o Coordination for the Osceola High School Tutoring Program, which originated at the school level, was handled as one of the responsibilities of the school's occupational specialist.

- o In Tulsa, parents served as school volunteer coordinators, working with all volunteer programs and activities in a particular school (including partnerships) and reported to the system-level coordination office. For the AMOCO Science Enrichment Program, an additional parent

coordinator, called a volunteer coordinator, helped recruit, train, and schedule volunteers to assist in the classroom sessions, and to prepare equipment used in the experiments. This coordinator reported to the school volunteer coordinator.

- In Springfield, Mass., the school coordinator was a math teacher who spent about 20 percent of her time coordinating the math lab partnership program.

Business Coordinating Activities

1. Establish business coordinators. A coordinator within the business is very desirable when more than a few persons from the business participate in partnership activities. The coordinator is typically an employee from public affairs or human resources. Large firms supplying many volunteers from more than one facility may need a central coordinator who promotes partnerships in general and additional coordinators for each corporate division, for each school the business is working with, or for each partnership activity.

2. Assign responsibilities to the business coordinator such as those listed in Exhibit 7. The business coordinator has important tasks, especially in recruitment and working out procedures with various parts of the business, such as volunteer release policies. When the partnership is long-standing and involves many of the same volunteers over a period of years, less time is likely to be needed for some of the coordination functions, such as training, orientation, and recruitment.

The following list, drawn from the Cowan Avenue School-Chevron partnership, a long-standing program involving one school and a small number of seasoned volunteers, provides an example of "good practices" for business coordinators:

- Send a letters to "old volunteers" to see if they want to continue and if they know others who want to join, and also send letters to other potential volunteers.

- Prepare the schedule of partnership activities (involving different volunteers presenting classroom demonstrations).

- Prepare or update and distribute an "orientation packet" for volunteers before the first partnership sessions each fall. This should include the schedule of partnership activities, a "fact sheet" with orientation information about the school, and teaching tips.

- Send reminder notes to volunteers a week before they are scheduled to participate.

- Send copies of correspondence with volunteers to their supervisors to promote recognition of volunteer efforts.

- Meet with the principal at the end of the school year to review partnership performance and plan for the coming year.

Business coordination might also be handled by some community-wide business organization such as a Chamber of Commerce rather than by the individual firms. For example, the partnerships in Cincinnati, Tulsa, and the District of Columbia had business coordinators within organizations of businesses. This is especially appropriate where a number of businesses are involved with the partnerships and each business provides only a small number of the volunteers. In such cases, the coordinator functions are shown in Exhibit 8.

Joint School and Business Coordinating Activities

Some activities can be shared by school and business coordinators.

1. Establish and maintain an oversight committee to help with overall guidance, planning, promotion of new activities, and implementation problems. The committee might consist of such persons as: the system-level coordinator, and one or two school-level coordinators, business representatives, teachers, and perhaps students and parents. The committee should also help assure continued involvement and support of businesses and schools.

   - In St. Louis Park, Minnesota school staff and business representatives usually met three times a year to coordinate partnership activities. About five science and math teachers, the business coordinator and two scientists, two high school students and the school volunteer coordinator met in August or September to develop goals and objectives and to target activities for the partnership. The group met again in January to decide on continuing activities and to sustain momentum for the partnership. They reconvened at the end of each school year to review accomplishments and to plan for the coming year.

   - In Elkhart, Indiana, a science mentor advisory committee composed of teachers from each of the schools and representatives from mentor businesses met about once a month to plan, set policy, and work out problems.

   - In Springfield, Massachusetts a steering committee composed of staff from the business partner, the school principal and three 4th grade teachers was established to plan the math lab. Committee members met at least once every three weeks for 3-4 hours for a semester, ultimately deciding to set up a program to increase math scores by focusing on using volunteers to help teach problem-solving skills.

   - In Tulsa, a steering committee of representatives of the business community, the schools, and participating civic organizations was created to direct and monitor the project. The steering committee met at least twice a year for this purpose.

- o In Seattle, a steering committee of business leaders, educators, administrators, and business persons who actually implemented the TIE program met quarterly for the purposes of determining program direction, funding, and operation.

2. Make a detailed schedule schedule for the forthcoming school year (well in advance of the school year). The schedule should indicate when the following activities will occur:

   - o Recruitment of volunteers, teachers, students
   - o Training sessions
   - o Sending of notices or reminders of activities
   - o Partnership activities
   - o Publicity or promotional events
   - o Recognition events
   - o Monitoring and evaluation of partnership activities

3. Survey teachers and principals periodically as to partnership needs for future semesters--to identify opportunities for partnership activities.

   - o In Tulsa, the school system's partnership coordination office sent out needs assessment surveys to all faculty in mid-August of each year. The responses were tallied and attempts made by the office to match these needs through recruitment of volunteers and establishment of appropriate partnership efforts.
   - o In St. Louis, Missouri, a member of the partnership office staff spoke to a school's principal, asking him or her to identify teachers who could best utilize partnership activities in their classes. A meeting was arranged for the partnership staff person, the principal, and the identified teachers to discuss the needs of the school and individual classes. Subsequent to this meeting, the partnership office staff person helped the teachers write specific proposals to present to businesses.

Effective Communication

A partnership is a team activity and needs a great deal of communication to help get everyone together at the right time, in the right place, and with the needed information to carry on the activities properly. Poor communication has plagued many partnerships, at least temporarily. Communication can be

difficult: volunteers spend most their time at other facilities; teachers have tight schedules and usually are difficult to reach by telephone; students are not always dependable.

Coordinators can take the following actions to reduce communication problems:

1. Give teachers, volunteers, and, when appropriate, students, home and office telephone numbers and hours when participants can usually be reached. Alternatively, the school and business coordinators might serve as "go-betweens" for communication purposes. This may be necessary in cases where participants are generally unavailable for telephone communication. The participants needing to transmit a message (e.g., that a session has to be cancelled) can then leave that message with the coordinator's office.

2. Contact each volunteer and teacher periodically to review progress, to give encouragement, and to find out if there are problems to address. In large partnerships, the school coordinator should be responsible for these contacts. The system-wide coordinator should encourage school coordinators to have these contacts. Similarly, business coordinators should periodically contact their volunteers to encourage them, and to identify and address problems.

3. Be accessible to volunteers, teachers, students, administrators, parents, etc.--to address problems and give advice or help. One approach is to designate a regularly-scheduled time and place when the coordinator will be available. For example, in Springfield, Massachusetts, the coordinator set aside time on Friday afternoons for meetings and calls from teachers or volunteers.

4. Give ample notification to teachers and students about the availability of partnership activities for the next semester. The system coordinator and school coordinator should work together to assure timely, full information.

5. Exchange information with other coordinators on problems and progress, and work out any corrective actions needed. In a Seattle tutoring partnership, the business coordinator and the school coordinator met about every other week. This partnership also had a planning/brainstorming meeting early in each semester for the business coordinator, volunteers and school representatives to discuss ideas and issues for the coming semester (fund raising, publicity, etc).

6. Document the various partnership policies and procedures. Since staff changes occur frequently among school and business partners, good documentation can save many hours that might go toward reinventing the wheel. "Putting it in writing" proved to be a very useful mechanism for one partnership in St. Louis, Missouri. The original plans and curriculum developed for a math-skills-in-banking partnership were so well-documented that the partnership was easily re-established after a year's hiatus due to personnel changes at the bank. The participants in the revived program included a new teacher and a new principal, as well as new volunteers.

System-wide coordinators should:

7. Maintain regular contact with each school coordinator. The coordinator at individual schools in the larger partnership may be science or math department heads, or guidance counselors, with other duties. They are likely to let some communications slide.

8. Develop and distribute a regular newsletter or other publication to inform the business, school administrators, teachers, and the public and to give recognition to partners and schools/teachers. Include schedules as well as who is doing what and where. Example of these include: "The Adopt-A-School News," published by the Adopt-A-School Council in Los Angeles; "PipeLines," published by Seattle Partners in Public Education; and the newsletter, "Creative Link," and the annual "School Partnership Program Progress Report," published by the St. Louis (MO) School Partnership Program.

9. Be accessible to individual teachers who are having difficulties with the partnership process and who have not been able to resolve the problem with the coordinator at their own schools.

Tips and Tasks for Coordinators

The following suggestions have been culled from the experiences of many partnerships.

1. Establish formal notification procedures to use if a volunteer, teacher (in an activity where the teacher's presence is needed), or student (in one-on-one activities) has to be absent or late. The procedures should be in writing and given to all participants. The procedures should cover who to call and what to do if the volunteer does not arrive at the scheduled location, say, within 15 minutes of the scheduled time. For example: students are to return to their regular classes; if the volunteer arrives later than that, the volunteer goes to their classroom to get them. Volunteers should be asked to call the school coordinator if they have to cancel a session. The coordinator then would notify the teacher(s) involved not to send their students to the session. If the student has to be absent on the day of a tutoring session, the student should call the school coordinator, who would contact the volunteer to prevent a volunteer's unnecessary trip to the school. This was done in many of the one-on-one tutoring efforts we reviewed.

2. Provide a "sign-in" book in the coordinator's office for volunteers to sign upon arrival, as was done in Osceola and Tulsa. This helps keep track of who is in the school building and also serves as a "message center" for the volunteers, e.g., to let volunteers know that a test is scheduled, or that students are having problems with a particular topic.

3. Monitor attendance and performance of the volunteers. This also provides an opportunity to keep in touch with volunteers, for volunteers to ask questions, etc. If absenteeism or performance becomes a problem, the coordinator should communicate with the volunteer and determine what corrections are needed. It seems best not to give the teacher the burden of tracking and correcting volunteers. Preferably the teacher should report such problems to the coordinator for corrective action.

4. Provide continuity between school years. Recruit volunteers and teachers that have had successful partnership experiences to repeat at least once or twice. Don't switch school coordinators yearly. Multiple years of coordinating will alleviate excess time and effort required to recruit, orient, train, and work out problems with large numbers of new volunteers and teachers.

Provide support and/or additional compensation to the coordinator(e.g., reduced classroom responsibility.

If the coordinator is appointed for multiple years, appoint an assistant -- the next coordinator -- to learn the job before the current coordinator's term expires. This will enhance continuity and quality of services.

5. Match volunteers with teachers and volunteers with students--so that interests and personalities are reasonably compatible. For example, the Howard County, Maryland partnership coordinator worked with students to obtain considerable detail on the particular types of projects students wanted to undertake in their mentorship. The coordinator then sought mentors to match these interests.

6. Provide orientation and training for new volunteers prior to the start of the partnership activity. Volunteers often will not be natural teachers and may be unfamiliar with the special aspects of the school environment and working with students. This orientation should be done at least annually. Group training is most practical. However, if and when individual volunteers without previous experience are brought in, the coordinator should provide at least some informational orientation and training. Tulsa, St. Louis, and Washington, D.C. all provided reasonably comprehensive training experiences for volunteers and teachers.

7. Work with volunteers and school personnel to schedule courses that are as convenient as possible for the volunteers. Volunteers might prefer working at the school around the lunch hour or at the beginning or end of the day to reduce disruption of their work schedule and reduce transportation needs.

8. Keep abreast of developments affecting major business partners which are likely to affect partnership activities. A number of partnerships have floundered when a key business partner moved its facility to another location, had a major reorganization, cut back its work force, or went out of business. With advance notice, the school coordinator might be able to locate a replacement partner, or at least take steps to minimize the disruption and possible disappointment to student and teacher participants.

9. Pay special attention to the need to attract volunteers that can serve as role models for minority youth--such as by special efforts to seek black, Hispanic and female scientists, engineers, and other technically trained personnel. It is generally much easier to find "majority" volunteers. However, minority, disadvantaged youth are likely to benefit even more from volunteers that can serve as role models and perhaps better empathize and understand their problems and needs.

EXHIBIT 5: RESPONSIBILITIES OF SYSTEM-WIDE COORDINATORS

- Plan, schedule, and develop goals for partnership activities.
- Initiate and promote partnership activities.
- Recruit schools, individual school coordinators, and teachers.
- Recruit business partners when needed; work with businesses and business coordinators to promote and develop partnerships.
- Work with businesses to recruit volunteers.
- Provide, or arrange for, volunteer orientation and training.
- Help teachers and volunteers structure individual partnership activities.
- Match volunteers to specific school/teacher/classroom needs.
- Arrange transportation for partnership activities.
- Assure recognition of participants.
- Establish and implement procedures for monitoring individual partnerships and provide trouble-shooting assistance as needed.
- Provide progress reports and publicity (such as newsletters).
- Establish a process for evaluating the partnership; give feedback; assist in developing and implementing changes to improve them.

EXHIBIT 6: RESPONSIBILITIES OF IN-SCHOOL COORDINATORS

- Recruit teachers, students, and volunteers for partnerships
- Serve as contact point for communication between system-wide coordinator and school administration, teachers, students, and volunteers.
- Serve as contact point for communication within the school among teachers, students, and volunteers.
- Provide orientation and assistance to volunteers.
- Perform on-going coordination for school partnerships, including trouble-shooting.
- Arrange for use of any school facilities or equipment, or any transportation needs associated with school partnership activities.
- Work with system-wide coordinator in performing responsibilities outlined in Exhibit 3-1, or performing some of those functions in place of the system-wide coordinator.

EXHIBIT 7: RESPONSIBILITIES OF BUSINESS COORDINATORS

- Work with the school coordinator, and possibly directly with teachers, to design and develop an appropriate partnership program.
- Act as contact point between volunteers and school coordinator, teachers, and/or students.
- Recruit volunteers from business firm.
- Help with training and orientation.
- Help volunteers and their supervisors work out volunteer schedules that are mutually acceptable to the school and the business.
- Assure back-ups in the event the volunteer has to miss a session.
- Help secure money for incidental expenses (supplies, transportation, awards, etc.).
- Maintain contact with the school coordinator about on-going performance of the partnership and help perform trouble-shooting role.
- Provide recognition for volunteers.
- Assist in providing recognition for participating school teachers and students, such as sending out letters of congratulations or arranging for awards, luncheons, etc.
- Obtain publicity for the business.

EXHIBIT 8: RESPONSIBILITIES OF COMMUNITY-WIDE BUSINESS COORDINATORS

- Promote partnerships in the business community and recruit firms to participate in partnership activities.
- Develop partnership activities.
- Publicize successful partnerships and provide recognition and incentives for businesses to participate.
- Recruit and train volunteers.
- Provide political support to the school system to promote partnerships and devote school resources to helping them continue.

CHAPTER 4
BUSINESS VOLUNTEERS

Business volunteers are the new "ingredient" that makes the partnership approach to improving science and math different from other approaches.

By and large, school systems and business personnel are unfamiliar with each other and have different perspectives. Thus, the process of working with each other is of major concern. In addition, both schools and businesses are relatively new to the partnership game. Therefore, all sorts of things can go wrong. Eight key issues related to volunteers should be addressed to minimize the potential for volunteer-related partnership problems. These are:

Recruitment
Matching volunteers with students and/or teachers
Orientation and training
Planning the volunteer activities
Reliability
Helping volunteers perform well
Feedback for volunteers
Recognition/incentives for volunteers

Each of these issues is discussed in the following sections.

Recruitment

How Can Volunteers Be Recruited?

Recruitment can be a joint responsibility of the school (or school system) and business coordinators, although it can be performed by the business coordinator alone. Some of the techniques you can use to recruit business volunteers are shown in Exhibit 9.

Examples of recruitment methods that have been used successfully are:

- In Los Angeles, ARCO recruited volunteers twice a year, distributing brochures and letters to all employees and inviting them to a special lunch where employee volunteers and students talked about their partnership experiences, and teachers and principals also spoke. A video about the partnership program was also shown.

- In Washington D.C., the Federal City Council (an organization of leaders from government, business and education aimed at improving community life in Washington, D.C.) placed advertisements in periodicals directed toward math and science professionals in the area.

- In St. Louis, McDonnell-Douglas Corporation maintained a computerized listing of the special talents and skills of employees who had expressed an interest in serving as volunteers for a variety of community activities. Their names were retrieved when the business coordinator sought volunteers for specific tasks.

- In Elkhart, Indiana, Miles, Inc., a local professional organization of scientists, was actively involved in recruiting members to serve as mentors for the Science Fair Mentorship Program. A recruitment announcement was mailed to members in addition to announcements at meetings and word-of-mouth recruiting among members. The organization also sponsored an information meeting for potential volunteers at one of the major participating businesses.

- Recruitment for the Osceola High School tutoring partnership involved the local chapter of General Electric's community service/volunteer organization, The Elfun Society. A call for volunteers was made at the regular chapter meeting and through the Society's newsletter. The chapter chairperson followed this up with individual contacts with employees expected to be good tutors, especially young, recent engineering graduates. Paradyne, the other major business partner in the Osceola partnership, posted signs on employee bulletin boards and sent letters to all employees. The business coordinator also approached previous volunteers, as well as any employees she personally felt would be good at tutoring. These efforts generated a list of potential volunteers who were invited to a recruitment meeting. This meeting included presentations by the school and business coordinators, providing more detail on the nature of the tutoring program and the level of involvement expected of volunteers.

- Minority volunteers needed as role models for the Rainier Bank (later Security Pacific Bank) tutoring partnership were initially targeted for recruitment through the bank's computerized personnel files. The business coordinator invited prospects to a recruitment meeting. Continuing recruitment efforts included mailings to all employees at the start of the school year, monthly announcements about volunteer opportunities in the bank's newsletter, and bulletins on the bank's "volunteer callboard." Satisfied volunteers also recruited their friends - including some who were not bank employees.

Who Should Be Recruited?

Not everyone in business is appropriate as a volunteer. Persons with the following characteristics should be sought:

1. Knowledge/skills in subject matter.
2. Good "people skills".
3. Enthusiasm and interest in working with students/teachers.
4. Reliability.
5. Past experience in teaching or working with youths.
6. Good role model.

Knowledge in subject matter. Recruiting should be targeted toward employees who can provide the skills and/or experience that partnership objectives require. For many partnership activities, the volunteers should be people who actually apply the math or science skills in their work.

Good "people skills". Good "people skills" and the ability to establish rapport with students and teachers are very important. People with highly advanced training sometimes have difficulty interacting with students at a level that students can understand.

Enthusiasm/interest. Partnerships require commitments of time and energy on the part of volunteers. Volunteers with a genuine personal interest in, and enthusiasm for, working with students and teachers are most likely to sustain this commitment. These traits are also helpful in establishing rapport with students, and in generating their enthusiasm for the subject matter. "Volunteers" who are unilaterally assigned to the partnership by management are less likely to be enthusiastic or interested than true volunteers.

Reliability. The volunteers have to be reliable and dependable. Persons with substantial and unpredictable travel or meeting schedules are not good candidates. Persons in business near the schools in which they are to work are likely to find it easier to meet the school schedule.

Past experience in teaching or working with youth. Persons with teaching backgrounds (for example, as teaching assistants in college) are likely to find the adjustment to working with students and/or teachers easier and enable them to be more effective more quickly. There are likely to be a few such persons in

many businesses. Persons with experience in youth-oriented activities (for example, Big Brothers or Sisters, Scouts, etc.) will likely know how to work with young people. Although prior volunteer or teaching experience is desirable, this should not be required of volunteers.

Good role model. Volunteers are likely to be looked up to and emulated by students. People should be sought whose lifestyles are respected by managers and co-workers. For working with racial/ethnic minority students, or with a particular gender, volunteers of similar characteristics are generally preferable.

Matching Volunteers to Student and Teacher Needs

One way to promote successful partnership activities is to make good matches between volunteers and students or teachers. One aspect of this process is to ensure that the volunteer has the appropriate background or skills to "teach" the subject matter that is desired. Another is to develop a comfortable "fit" in terms of personalities, interests, and the ability to communicate and establish rapport. This is particularly important in partnership activities where there is direct one-on-one involvement between the volunteer and the student, such as mentorships and tutoring arrangements. A good fit is also particularly important for attempting to help minority students--by providing a role model. Female, black, and Hispanic scientists and engineers are likely to be especially difficult to find and attract as volunteers. However, this should be attempted.

To develop good matches, the school coordinator should obtain information about volunteers and students (and teachers, in those cases where volunteers work in the classroom with the teacher) before deciding on matches. Ways to gather this information include:

1. Interview the volunteers, students, and/or teachers about skills, interests, and personality.
2. Ask volunteers, students, and/or teachers to fill out "applicant" forms, providing information on interests, background, and partnership needs or preferences.
3. Hold preliminary meetings with the key parties, i.e., volunteers, teachers, and, when appropriate, the students.

Examples of efforts to produce good matches include:

- In Osceola the coordinator interviewed volunteers to get a sense of their outside interests and what subject they wanted to tutor. She tried to find commonalities with students who needed tutoring, e.g., a mutual interest in karate. This helped establish rapport and made students feel more comfortable with the volunteer. The coordinator also interviewed students participating in the program to determine their interests so that a match could be made.

- In Indianapolis, the matching process between volunteer mentors and students included interviews of both students and volunteers by the school coordinator. Students were also given forms to complete to identify career and school interests, hobbies, courses taken, etc. to help produce a good match.

- For the Elkhart, Indiana science fair mentorship, volunteers were asked to fill out screening forms identifying their fields of scientific interest. They were then matched with students who had expressed interest in doing science fair projects in that field. (Students identified their science fair topics prior to their first meeting with the mentors so that appropriate matches could be made).

- In Howard County, Maryland the school mentorship program coordinator required student applicants to be quite specific about the aspect of science or math each student wanted to pursue in the mentorship. The coordinator then sought mentors with those experiences from appropriate types of businesses and institutions within the region.

Orientation and Training

Volunteers need:

- Orientation regarding the administrative aspects of their participation, such as familiarization with the school facilities, schedules, parking, security, and any student evaluations/grading they are to do, etc.

- Information relevant to the subject matter they are presenting. This should include orientation to the curriculum, and to the approach the teacher is taking in the class.

- "Training" as to how to incorporate their scientific and technical skills into the classroom context. This should include orientation in working with students at the particular grade and age level involved in the partnership. Many volunteers do not have experience with children of the same age as those in the partnership, or are not familiar with the abilities, behaviors, and attitudes children exhibit at different ages. They may also be inclined to expect too much from the students and talk "over their heads." They may need to be familiarized with basic teaching techniques, such as use of chalkboards or handouts to emphasize key points, or asking questions to get students involved.

Development of orientation and training programs is usually one of the responsibilities of the school or school system coordinator, but the business coordinator might also participate in developing or sponsoring development of training materials. Suggestions for training and orientation are:

1. Hold training/orientation meetings for new volunteers (conducted by school or school-system coordinators).

2. Schedule a meeting with the volunteer and the teacher to discuss course objectives, how the partnership is expected to fit in with the class, and needs, abilities and interests of students.

3. Develop a volunteer handbook describing the program, curriculum, partnership goals and objectives, and presenting tips on being an effective volunteer.

4. Provide video-taped training sessions on what is expected of volunteers, how to deal with students, etc.--perhaps obtained from another school system.

Training and orientation approaches used by some successful partnerships include:

- The Office of Volunteer Programs in Tulsa prepared a handbook for volunteers on how to be effective in the classroom environment - and a separate handbook for teachers on how to use volunteers. Volunteer training sessions were video-taped. This gave volunteers more freedom in scheduling the training and reduced the need for people to conduct training sessions.

- In Osceola, the initial recruitment meeting at the business site included a brief orientation. The school coordinator explained the program and the type of commitment needed. A packet of material was distributed with a curriculum guide and a school information brochure. The school coordinator also provided an individual orientation at the school to familiarize volunteers with the building, introduce them to the principal and other staff members, and show them the room they would use for tutoring. They were also given background information on the students they would be tutoring. A separate meeting was held with the teacher of these students to discuss the objectives of the class, level that students were working at, etc. The volunteers were given copies of the course syllabus and text.

- In Los Angeles, ARCO provided training sessions at its offices where the school coordinator and selected teachers talked about curriculum/educational concepts and provided overviews of the school, students, and the community the volunteers would be working in. Volunteers visited their assigned schools for an orientation day, where they met the school staff and observed the class they would be working with. Volunteers had a planning session with the teacher before they began their assignments. Material was provided giving suggestions on ways of working with students and on classroom management. Mid-assignment workshops were also held as refresher sessions on lesson planning, teaching techniques, etc.

- In September the school coordinator in Springfield, Massachusetts conducted a training program for new volunteers, although "old" volunteers usually attended also. The purpose of the 2-3 hour session was to familiarize the volunteers with the materials used in the math lab and to discuss expectations for volunteers and students. Issues such as partnership coordination,

student friendship and discipline were also discussed. The task cards used in the math lab in this partnership also gave volunteers guidance about the teaching level to be used, and provided explicit instructions as to what should be covered in each session.

- In St. Louis, Partnership Office staff brought teachers and volunteers together for program development and planning activities, usually during the summer before the program began. The staff discussed the classroom environment and partnership goals with volunteers and teachers to orient both parties, and gave them copies of the Partnership Office's orientation package. This included material explaining teacher and volunteer responsibilities, and provided suggestions on working together. The principal or teacher subsequently showed the volunteer around the school, explained check-in responsibilities, etc.

- The business coordinator at Chevron in Los Angeles provided a comprehensive package of materials to its volunteers. The package included a fact sheet about the school, schedule of partnership activities, directions to the school, names and contact information for school staff and teachers involved in the partnership, school "etiquette" rules (i.e., checking in with school office), and teaching tips.

- In Indianapolis, the school coordinator sent mentors a one-page student profile, identifying science/math courses taken and career interests, hobbies, awards received, etc. This familiarized the volunteer with the student prior to their first meeting and helped them establish rapport.

- In Springfield, Massachusetts the business partner paid a school coordinator and two other teachers for two months of work during the summer to plan and develop a training program for DEC's volunteers. Teachers subsequently spent about 30 hours training DEC employees in how to tutor students in math, emphasizing the newly developed curriculum.

Planning the Volunteer's Activities (Volunteer Activities Plan)

Each partnership should have a formal written plan. Copies should be kept by the teacher, volunteer, school coordinator, and student, when appropriate. This will help assure that all parties know their responsibilities. The plan, in effect, can be used as a formal agreement that periodically reminds the various parties as to their obligations. It also will be useful as a guide in subsequent years, especially as a starting point or model for new teachers and new volunteers.

Each volunteer should be involved in planning his/her activities. In general, the teacher should also be involved in the planning process. School coordinators should be responsible for initiating the planning

process. They can help in developing the plan if the teacher and volunteer wish. The plan should cover the points shown in Exhibit 10.

- In St. Louis, the partnership staff worked with the volunteer and teacher to develop written program plans. The plans clearly defined the nature of the partnership and the commitments expected.

- In the Indianapolis partnership, which involved mentoring at the volunteer's workplace, the school coordinator provided a planning worksheet for volunteers to complete before the mentorship began. The worksheet called for descriptions of the kind of experiences the student would have; tools, instruments, procedures, etc., the student would learn to use; time and dates for visits; dress code for students; lunch arrangements; etc.

- In St. Louis Park, Minnesota a group of about five high school science and math teachers, two students, the school and business coordinators, and two Honeywell volunteers met before school began to develop goals and objectives and to plan and schedule partnership activities. Minutes of this meeting were sent to all partnership participants.

Reliability

Absenteeism or lateness on the part of volunteers--especially unannounced--leads to frustration, disappointment, and even distress on the part of students and teachers who depend on the appearance of the volunteer. The need for a serious commitment to participation should be stressed to volunteer candidates during the recruitment process. Volunteers unable to keep such a commitment should not be recruited for activities requiring involvement at specific times, although there might be other volunteer roles they can perform on a less regular basis.

Even reliable volunteers may have to miss an occasional session. Back-up or substitute volunteers should be recruited to provide coverage for absences of regular volunteers, or loss of volunteers due to changed assignments, etc. More dramatic changes, such as corporate takeovers, reorganizations, and economic downturns affecting a particular industry or firm, can have serious impacts on volunteer availability for partnerships. Some partnerships have experienced significant cutbacks in their programs as a result of such changes.

Suggestions for reducing problems due to missed sessions and late arrivals include:

1. Recruit volunteers with reputations for reliability, and whose work-related travel and meeting requirements are not severe.

2. Assign the volunteer to a school as near as possible to the volunteer's work or home site.

3. Obtain a commitment from all levels of management at the volunteer's facility to provide the volunteers the flexibility to leave the workplace during the day to participate in partnership activities. A policy statement on partnership participation can articulate management commitment to supervisors and volunteers. In some cases, volunteers have encountered resistance from their immediate supervisors even though top management supports the partnership. Top management should be asked to make this clear to lower levels of management. The volunteer's supervisors should probably also be briefed by the school system and encouraged to support the volunteer assignments of their personnel.

4. Obtain the volunteer's input and agreement before scheduling partnership activities; consider scheduling activities at the start or end of the school day, or around the lunch period to make it easier for volunteers.

5. Establish guidelines for times when the volunteer finds that he/she will be absent or late. Who should the volunteer notify? When? How? Be sure that telephone numbers of contacts are provided to the volunteer.

6. Encourage volunteers to arrange for a back-up volunteer to cover the activity.

7. Recruit a group of substitute volunteers for the program to cover absences or loss of volunteers due to changed assignments, etc.

8. Have contingency plans so that the teacher, or another person, can fill the void if the volunteer is absent or late.

9. Provide volunteers with a copy of the school calendar so that they know which days the school is open and which days it is closed.

10. Develop contingency plans identifying stand-by sources of volunteers, such as other firms, professional organizations, organizations of retired professionals to replace volunteers who must drop out.

11. Involve more than one firm in each partnership wherever possible.

Some examples of efforts to deal with reliability are:

- In Los Angeles, ARCO developed a specific release time policy for employees involved in partnerships. It specified that one hour plus half an hour travel time are permitted per week.

- In Tulsa, Oklahoma, AMOCO's Science Enrichment Program involved parents as school and program volunteer coordinators. The program coordinator worked with a pool of volunteers

with whom she maintained regular contact. If a volunteer had to be absent, the coordinator was often able to obtain a substitute quickly from the pool.

- In the Osceola High School tutoring partnership, most tutoring sessions were scheduled near lunchtime. Most volunteers preferred this because they could perform their partnership duties during the course of a slightly-extended lunch break. This school also made an explicit effort to accommodate individual needs in scheduling--one volunteer tutored at 7:30 a.m. because this was the best time for the volunteer. This school deliberately initiated partnerships with nearby firms (within about three miles of the school) to encourage volunteering.

- In the Franklin High School-Rainier Bank partnership in Seattle, tutoring sessions were held in the evenings. (Although this facilitated volunteer participation, it created problems for student participation.)

- In the Los Angeles-Chevron partnership, the business coordinator sent volunteers a reminder note the week before their scheduled participation. Five volunteers were also designated as volunteer coordinators. They were responsible for finding replacements for volunteers who had to miss scheduled sessions.

- In Osceola, volunteers were instructed to call the school coordinator if they could not make their scheduled tutoring assignment. The school coordinator then notified the teacher not to send the students to their assigned tutoring appointment.

- The Elkhart, Indiana mentorship program for science fair projects recruited one substitute for every ten mentors.

- In St. Louis, Missouri the partnership between Southwest High School and Monsanto was organized around teams of 2-3 volunteers. Each team had a leader who was responsible for finding a replacement if one of the volunteers was absent. Since many of the classroom demonstrations were presented by teams, rather than individuals, team members were often able to "fill in" for each other.

- In Springfield, Massachusetts the school coordinator developed a "buddy system" for Digital Equipment Corporation volunteers. Each volunteer had to designate a substitute from another department (because work pressures that prevented one engineer from attending a partnership session would probably also prevent another engineer in the same department from substituting). Substitutes were introduced to the students at the initial partnership sessions so that students would be familiar with them if they filled in for volunteers at a later time.

- In St. Louis, Missouri, a math skills in banking partnership initiated by Boatmen's Bank involved one volunteer providing a series of classroom presentations. When Centerre Bank developed a banking partnership program for use in another school, it was structured so that a different volunteer presented each topic. This was done to diffuse responsibility and avoid placing excessive demands on an individual volunteer.

Helping Volunteers Perform Well

Here are some additional suggestions for helping volunteers be as effective as possible in helping students:

1. Encourage a teacher, or past volunteer, to act as a "buddy" to help each volunteer, especially new ones, become adjusted to the school environment and to become an effective teacher.

2. Encourage volunteers that are involved with teacher-like duties to meet and converse with other teachers. Likewise, encourage other teachers to meet and converse with the volunteers. This will build the morale of the volunteers and make them feel more welcome.

3. Do not discourage volunteers from using unusual teaching approaches/tasks, such as games, simulations, field trips, guest lectures/demonstrations, etc. Make sure such devices are carefully planned by the volunteer to provide a learning function.

4. Provide the volunteer with timely and regular feedback from the students and teacher to encourage corrective action, when needed, by the volunteer. This is discussed further below.

5. Hold sessions once or twice a semester for volunteers to meet each other and share material, problems, and solutions. These can be sponsored by the business if the business provides multiple volunteers. If the partnership draws one or two volunteers from each of many businesses, the school coordinator should arrange these meetings.

6. Provide substantial assignments to volunteers. Avoid using volunteers as substitute teachers or as teacher aids with few important responsibilities.

7. Recruit enough volunteers to keep workloads at reasonable levels to avoid volunteer burnout.

Feedback for Volunteers

Volunteers generally are not skilled teachers. They may talk over the heads of the students, lecture excessively, or otherwise use poor teaching practices. Volunteers need feedback about their performance to make their help as effective as possible. While this particularly applies to new volunteers, experienced volunteers also need feedback, if only to indicate that they are still on the right track. School coordinators should use tact to discuss problems with volunteers and offer constructive suggestions. Some feedback should be provided very early in the partnership activities semester. Positive feedback at the end of the

activity, such as on student accomplishments, can encourage volunteers to re-enlist. (Note: monitoring and evaluation of partnerships are discussed further in Chapter 15.)

Suggestions for feedback mechanisms include:

1. Have the school coordinator and the teacher sit in during the first session(s) presented by the volunteer, or at least during part of those sessions. Subsequently, they can provide constructive suggestions to the volunteer.

2. Encourage the teacher and coordinator to obtain informal feedback from participating students (or the participating teachers, for teacher-focused partnerships).

3. Keep records of the attendance and punctuality of each volunteer. When a problem arises the school coordinator should discuss the problem with the volunteer.

4. Record or videotape part, or all, of one or more sessions if possible. Have the teacher or school coordinator review, identify constructive improvement suggestions, and provide these suggestions to the volunteer.

5. Encourage teachers to provide informal feedback to the volunteers before or after sessions. Encourage volunteers to chat with teachers before or after their presentations.

6. Provide periodic feedback to the volunteer on grades, or other aspects of programs. This information will be useful primarily for tutoring and special enrichment programs.

7. Encourage students to contact teachers or coordinators when there are problems or misunderstandings with volunteers.

8. After feedback or suggestions have been provided, check to determine whether sufficient corrections have been made. This is particularly important in situations in which the volunteer is having major problems communicating effectively.

9. At the end of each semester, ask students and teachers to formally assess the volunteer's performance and provide suggestions for improving it in later semesters. From this information, determine whether the volunteer should be asked to volunteer again. If so, provide the volunteer with improvement suggestions culled from all the assessments.

10. Ask volunteers to provide feedback on the partnership after their sessions have ended to help improve the program in the future. (The nature of this feedback is discussed in Chapter 15 on Monitoring and Evaluation.)

Some examples of feedback approaches are:

- Cincinnati held quarterly meetings between volunteers and the school and business coordinators to review partnership activities and progress and make recommendations for improvement.

- o There was a June meeting for the Honeywell-St. Louis Park partnership in which the school and business coordinators and a group of volunteers, teachers, and students reviewed the year's activities and made initial plans for the coming year based on this review.

- o The TIE board, in Seattle, met with program implementators subsequent to each of its three seminars. These meetings were used to discuss specific programs presented at the seminars and ways in which they might be improved.

Recognition/Incentives for Volunteers

While most volunteers indicate that their reward for participating in partnership activities is the sense of satisfaction from helping students, providing recognition for their efforts is bound to be appreciated and to encourage further participation. Volunteers indicate that any recognition they do receive--especially from the students themselves--is very meaningful to them. Schools and businesses should provide recognition to volunteers and their firms as a way of saying "thank you" for their efforts. Some recognition suggestions are:

1. Hold special volunteer awards luncheons or dinners, and perhaps issue plaques, certificates or small gifts of aporeciation.

2. Write-up partnership firms and volunteers in school newsletters, school board publications for the community, and reports from school partnership program staff.

3. Encourage thank-you letters from students, teachers, and parents.

Examples of use of school recognition techniques are:

- o Osceola High School held receptions, at which each volunteer was presented a certificate, and each business was presented a plaque.

- o The St. Louis, Missouri Partnership Office announced and described all new partnerships in its quarterly publication ("The Creative Link"). In-depth coverage of existing partnerships was included at least once a year.

- o The Seattle partnership office, Private Initiatives in Public Education, used its monthly newsletter ("PIPElines") to publicize and promote partnership activities and recognize business partners.

- o The Cowan Avenue Elementary School in Los Angeles provided a PTA-sponsored fall breakfast reception as a "get acquainted" function for teachers and volunteers as well as a recognition event. Volunteers were invited to the school Christmas party and graduation, where students gave testimonials. Students also wrote thank-you letters to the volunteers. Volunteers

at this partnership commented on how much their efforts appeared to be appreciated at this school, compared to some of the others where they had been assigned, and clearly valued the recognition given them.

- In Cincinnati, Rockdale Elementary School had an area called the "partner's corner" where names and pictures of volunteer mentors were posted and printed material about the partnership was available. The students also conducted an annual benefit program whose proceeds were donated to the research fund of their partner, Children's Hospital.

- In Elkhart, Indiana, the volunteer mentors for the science fair projects were provided with lunch at the school on the days they participated in partnership activities. This was intended to show appreciation and to provide an opportunity for teachers and school coordinators to interact with volunteers. The school also provided a dinner at the end of the year to show appreciation; students wrote individual thank-you letters, and teachers sent thank-you letters on behalf of their classes. Mentors also served as judges for the science fair.

- In St. Louis Park, Minnesota, the school district's newsletter included regular articles on volunteer programs and had a "volunteer of the month" highlight. The school district had an annual "volunteer night" banquet at a hotel, to which representatives of businesses were invited.

Businesses often provide some form of recognition for employees who serve in various volunteer capacities. These are usually similar to the forms of recognition schools typically provide. Businesses are also in a position to offer a different kind of incentive in terms of "rewarding" employees for partnership activities by including them in their employee evaluations. To provide recognition and incentives businesses can:

1. Hold volunteer recognition events such as luncheons or dinners, which can include small tokens of appreciation.

2. Include write-ups in company newsletters, annual reports, etc.

3. Send the volunteers thank-you letters from corporate leadership (company president, supervisors, etc.).

4. Encourage the volunteers' supervisors to compliment volunteers.

5. Include volunteer activities in employees' personnel records.

6. Consider the volunteer activities in annual employee evaluations.

Examples of business recognition for partnership activities include:

- AMOCO invited its volunteers and their spouses to a special dinner to which physics teachers and their spouses were also invited.

- Chevron invited volunteers to a lunch with the president at the end of the year where a token gift (such as a pen) and a framed certificate were awarded. The business coordinator also sent copies of correspondence with volunteers to their supervisors as reminders of their efforts.

- Washington, D.C.'s Volunteer Service and Training Branch held annual recognition ceremonies for its volunteers.

- In St. Louis Park, Honeywell paid for one engineer to attend a national conference on partners in education in Washington, D. C. .

- Digital Equipment Corporation recognized its volunteers through acknowledgment in employee performance reviews.

- ARCO provided certificates of participation to volunteers, as well as involving them in recruitment luncheons. Occasional articles on partnership activities were included in ARCO in-house publications.

- Rainier Bank volunteers received thank-you letters from the chairman of the bank and were invited to a recognition luncheon with the president.

- In Cincinnati, names and pictures of mentors appeared in the Children's Hospital bi-weekly newsletter.

EXHIBIT 9: VOLUNTEER RECRUITMENT TECHNIQUES

1. Prepare and disseminate printed materials. Place announcements in newsletters or post on bulletin boards. Mail announcements to prospective volunteers.

2. Hold special recruitment meetings. Use volunteers and students from current partnerships to help at these meetings.

3. Use personal contacts, especially by past and current volunteers to recruit others.

4. Use computer searches of employee lists to target potential volunteers. This may be particularly useful in obtaining minority volunteers.

5. Provide video presentations.

6. Maintain a list of persons that have inquired about, or expressed interest in the program.

7. Encourage past volunteers to repeat. Past volunteers whose work was of good quality should be considered a major source of future volunteers. Their previous experience should make them even more productive.

8. Contact business organizations and professional societies, perhaps by inserting announcements in their newsletters.

EXHIBIT 10: ELEMENTS OF VOLUNTEER ACTIVITIES PLAN

1. Program goals and objectives.
2. The number of sessions.
3. The location and time the sessions will take place.
4. The topics to be covered in each session.
5. The nature of activity the volunteer will perform.
6. Equipment and supplies needed as well as responsibility for their provision.
7. Notification requirements and contingency plans to be put into effect if the volunteer has to miss, or be late for, a session.
8. Specification of responsibilities of volunteers, teacher(s) and student(s).
9. Procedures for evaluating the partnership activity.

CHAPTER 5
TEACHERS

Teachers are a major part of most partnerships. (Partnerships focused on teacher training are discussed in Chapter 14.) Teacher participation, oversight, and enthusiasm are vital to providing successful partnership experiences for students and volunteers.

In most cases, business volunteers are helping and working for teachers. The volunteers may give lectures or demonstrations in the teacher's class, or tutor or mentor some of the teacher's students. Therefore the teacher plays a major role in planning and overseeing the volunteers' efforts and in preparing the students for these activities. In some cases, the teacher participates in the activity as well.

For partnerships in which the student participates in a mentorship or voluntary, out-of-class activity, the teacher may not be directly involved. Here, teachers should probably be asked to act as advisors to the students to help students get as much as possible from the activity.

Even if the teachers are not directly participating in the partnership, it is highly desirable to have teacher awareness and support of partnership activities. Indifferent or opposed teachers can discourage students and other teachers from participating, or at least adversely affect the environment in which students, volunteers, and participating teachers work. In the sections below, we provide guidelines for:

Recruitment and motivation
Orientation
Teacher-volunteer communications
Feedback and evaluation by participating teachers

Recruitment and Motivation

Partnerships are often a new concept to teachers. Teachers initially may resist the idea of using business employees to help them with their students. Teachers are sometimes concerned that volunteers

may undermine their status; that the activities take precious class time better spent covering the assigned curriculum; or that partnership involvement may cause additional work for them.

Thus, school coordinators will probably find it necessary to encourage and recruit teachers. This is particularly so when partnerships are new to a school. Established partnerships will likely require less recruitment because teachers who have previously participated generally continue their involvement. Also, these participating teachers are likely to informally help with recruiting other teachers through word-of-mouth endorsements of the partnership.

School systems might need the support, or at least concurrence, of the local teachers association for the partnership. Partnerships using business volunteers in teaching roles may be considered threatening. Teachers, possibly through their association, should be asked to participate in the initial formulation, planning, and implementation of the partnership.

Following are actions to help recruit teachers:

1. Put posters on school bulletin boards.

2. Send flyers or letters to teachers.

3. Place announcements in school newsletters, school district publications, etc.

4. Make announcements at science and math department meetings or other school meetings.

5. Undertake individual recruitment through direct contact with individual teachers by coordinators, principals, science and math department heads, and by teachers that have been previous participants.

6. Inform and involve the local teachers' association to gain their acceptance and assistance.

7. Encourage principals to help recruit teachers by providing information on partnerships and encouraging teachers to take part. This might include allowing release time for partnership involvement, recognizing it in teacher evaluations, and publicizing and endorsing it in school meetings, school newsletters, etc. The business partners in one west coast partnership felt it was particularly important to "sell" the principal on the partnership, because, in turn, the principal would then "sell" the teachers on it.

Partnerships should be presented to teachers as a way to help them meet their existing needs, not as another layer of work. Recruiters should stress the benefits of business resources and how they can help

teachers with their jobs. Benefits (See Exhibit 2) and positive aspects of partnerships should be emphasized to overcome their concerns. For example,

If some students leave the class to attend partnership activities, that means the teacher can provide individualized attention for those who remain.

If teachers are concerned that not all students will benefit from the partnership, they can have students who participate report on their activities to benefit the whole class.

If teachers are afraid partnership activities may detract from the curriculum or other goals, they should be encouraged to work with volunteers to structure the partnership to ensure that it <u>does</u> tie in with the curriculum. Coordinators should also provide examples of <u>how</u> partnerships can fit in.

- In Los Angeles, the Adopt-A-School office sent teachers and principals lists of partnership activities grouped under activities the School District had identified as priorities to illustrate how partnerships fit in with school goals.

- The District of Columbia sponsored meetings to brief school administrators, department heads, and instructional coordinators concerning the purpose and workings of the Science/Math Education project.

<u>Orientation</u>

This appears to be an underdone, neglected activity in some partnerships. Most teachers will not be familiar with the best ways to use partnership resources, nor with the perspectives, constraints and experiences of business volunteers.

They will need orientation on such topics as:

1. How to establish good relations with volunteers and get the most out of them.

2. How to plan with volunteers as to the schedule, material to cover and integration of partnership activities with the regular curriculum.

3. What are reasonable and unreasonable expectations from partnerships and volunteers.

4. How to communicate effectively with volunteers and how to spot and deal with problems.

5. What information and material volunteers need--location, schedule, curriculum, text, student backgrounds, and teaching tips (i.e., how to maintain discipline and interest).

The specifics of the orientation will need to be tailored somewhat depending on the type of partnership.

Orientation is needed for teachers whose students will be involved in partnerships, especially when the partnership program is new to the school or the teacher. Orientation approaches include:

1. Orientation meetings (individual or group).

2. Written materials explaining the partnership.

Examples of teacher orientation efforts are:

- The Office of Volunteer Programs in Tulsa prepared a handbook for teachers on how to make the best use of volunteers in the classroom.

- Washington, D.C. partnership staff held a training program on the use of volunteers at a summer institute for teachers. Teachers studied and developed prototype lesson plans incorporating volunteers and devised a partnership request/reporting form. The program included past volunteers talking about the skills they brought to the classroom and the types of activities they viewed as appropriate for volunteers to perform. The program coordinator also conducted teacher-awareness programs at schools and at the Instructional Resource Center to increase awareness and enthusiasm for the program.

- In Indianapolis, teachers were sent a document describing the goals and activities of the mentorship program, even though it did not directly involve teachers.

Teacher-Volunteer Communications

Teachers involved in a partnership need to communicate with volunteers for numerous reasons, including to plan and schedule activities, to deal with unexpected changes in schedule, and to provide feedback.

Approaches to foster communication with teachers include:

1. Allocate adequate time before partnership activities begin for the teacher and volunteer to plan the volunteer's activities.

2. Schedule regular meetings among coordinators, volunteers, and teachers to review progress and be sure that the partnership is productive. Encourage informal meetings (over a cup of coffee) between volunteers and teachers.

3. If the volunteer works in a separate classroom (or lab), put the volunteer's class in a room close to the teacher. In Osceola, for example, volunteers tutored students in classrooms close to the teacher. This enabled volunteers and teachers to talk informally before and/or after class and helped the volunteer keep track of what the teacher was covering in the course, how the students were doing, etc.

4. In situations where the teacher is able, and it is appropriate, encourage the teacher to remain in the classroom during the partnership presentations (as was done by the partnership between Southwest High School and Monsanto in St. Louis, Missouri). This enables the teacher to provide informal feedback quickly to the volunteers during the day (In St. Louis, the partnership was structured so that the same presentation was made to several classes during the course of one day). The teacher's "instant feedback" can help the volunteers prepare for future classes.

5. Ask the volunteer to report on student progress to the teacher for partnerships outside the classroom. In Elkhart's science fair mentorship, keeping science teachers informed of student progress was built into the partnership in several ways. Mentors filled out a student progress report after each meeting. This was left for the teacher to review, along with a "To do" list of items the volunteer had asked students to do between meetings. Teachers were responsible for monitoring students' progress in accomplishing the "To do" list objectives between meetings with the mentors.

6. Arrange occasional informal get-togethers perhaps over lunch, as schedules permit. For example, in the Elkhart mentorship program, volunteer mentors were scheduled to have lunch at the schools in order to meet informally with the teachers and school coordinators.

7. Have teachers and volunteers develop communication procedures and contingency plans for volunteer absence or lateness. At a minimum they should exchange home and work telephone numbers. Contingency plans might include: the teacher taking over the class; placing the absent volunteer's students with another volunteer's group; asking either another teacher or the school coordinator to act as a substitute (if they have the appropriate background); calling a substitute volunteer; or cancelling the session and notifying the students if the session is not a regular class.

Feedback and Evaluation by Participating Teachers

Teachers should be asked to both (a) monitor the volunteer's effect throughout the semester in order to provide timely, constructive, feedback to the volunteer; and (b) evaluate the partnership at the end of the effort to help make decisions regarding the future of the partnership and the future use of the particular volunteer (see Chapter 15 on monitoring and evaluation for a detailed discussion of this topic). Teachers are able to observe changes in students' knowledge, interest, and enthusiasm for science and math resulting from participation in the partnership activities. In some partnerships, teachers have the opportunity to observe partnership activities that take place in the classroom. Their input on the "teaching" performance of

volunteers in such cases will be extremely valuable for evaluation purposes. Thus, teachers should be given a significant role in the evaluation process.

CHAPTER 6
SCHOOL ADMINISTRATORS

School administrators, such as the superintendent, principals, and instructional coordinators play important roles in establishing partnership programs, and in encouraging and supporting teachers involved in partnership activities.

On the whole, once partnerships are underway, administrators should not have any special obligations. Actions which school administrators will likely need to take are as follows:

<u>During Partnership Introduction (discussed in Chapter 2)</u>

1. Participate in partnership marketing and planning. The superintendent in particular has a vital role in sanctioning the partnership, getting it underway, attracting businesses to participate, and giving clear signals as to the school system's support.

2. Encourage individual schools, science and math department heads, and teachers to participate.

   - o Some regional superintendents of the Los Angeles school system built participation in partnerships into performance objectives for school principals, giving strong incentives for participating in partnership activities.

3. Provide the needed staff, facility, and supplies to get the partnership underway. This includes selecting school coordinators (both the overall school system coordinator and any needed coordinators at individual schools); providing needed secretarial and clerical support for such activities as disseminating information about the partnership program, arranging meetings, etc.

4. Provide full, timely information for everyone with a potential interest or stake in the partnership effort, including administrators, science and math department teachers and heads, guidance counselors, and the teachers association in order to obtain support for the effort and alleviate anxieties.

5. Give approval to conduct partnership activities in the schools (this is especially important for principals).

<u>Throughout the Partnership Period</u>

1. Provide continued support for partnership activities.

2. Approve special procedures and activities needed for certain categories of partnerships, such as release time for students in special mentorships held at the mentors' facilities during regular school hours.

3. Sponsor recognition events for volunteers and teachers.

4. Give credit for successful partnership activities in performance evaluations of teachers, school coordinators, and others participating in partnerships.

5. Resolve issues that were not considered when the partnership program was designed.

Needs of School Administrators

School administrators need information on partnership activities and student progress. In particular, school principals should be kept informed of partnership activities in their schools. This might be done through brief reports or memos each semester. The principal should receive full descriptions of partnership activities and processes. School coordinators should also provide principals with regular feedback on partnership activities, including copies of partnership evaluation reports.

In large schools with school district administrators, these administrators should also receive regular information on partnerships in their school system--both from the system-wide coordination office and from individual schools within their districts.

Administrators can be expected to have some special concern with some categories of partnerships. They will be particularly concerned with liability issues, especially in partnerships that involve transportation to off-site facilities or that require individual students and volunteers working in one-on-one settings, such as in mentorships and tutoring programs.

CHAPTER 7
STUDENTS

Partnerships exist to provide educational benefits to students. Students will receive greater benefits and satisfaction from the partnership experience if the following issues are explicitly addressed:

Orientation of students
Motivating students
Recognition
Feedback

Although recruitment of students is also important, it is only an issue for certain categories of partnerships that are voluntary or restricted to particular students (for example, tutoring, mentorships, special classes). Therefore it will be discussed in the chapters covering those types of partnerships.

Orientation of Students

Like volunteers, students will generally be newcomers to the partnership experience. Therefore, they need an orientation to the partnership. Some recommended steps are the following:

1. Provide orientation for students. Have the teacher or coordinator explain what will be involved in the partnership and what is expected of students in advance of the first session with the business partner(s). The orientation should cover such points as the following:

   - o Learning objectives for the partnership.
   - o Activities to be performed in the partnership.
   - o Partnership expectations of students regarding discipline, attendance, promptness, homework or special assignments, and reporting.

2. Provide students with written materials which explain partnership goals, activities, and requirements. (These can be used for recruitment as well as orientation.)

3. Introduce the students to the volunteers (including any back-up or substitute volunteers). For example, the teacher or school coordinator might use the first meeting between students and volunteers as a "getting acquainted" session. This should be jointly planned, or at least discussed, by the teacher (or school coordinator) and volunteer(s).

4. At the first meeting, have the business volunteer(s) present an overview of what will take place over the course of the partnership at the first meeting. The volunteers should also make clear to the students what they expect from them, such as preparation of specific projects, completion of assignments, and participation in field trips. Time should be allowed for a question and answer session. (These expectations should have been discussed with the teacher/coordinator beforehand.) The teacher/coordinator preferably should be present during this meeting. Partnerships have used a variety of approaches to student orientation:

   - In Seattle, Rainier Bank, as part of its tutoring partnership with Franklin High School (held in the evenings), held a pizza party for participating students during the first session. This created a relaxed atmosphere that facilitated the getting acquainted and orientation aspects of that meeting.

   - In Elkhart, Indiana, students received orientation to the partnership and to science fair participation from their science teachers during the first few weeks of class. During the first partnership session, the mentors also reviewed partnership procedures and activities as well as their expectations of the students. The initial meeting was also used as a get-acquainted session.

   - In St. Louis, Missouri the partnerships between Southwest High School and Monsanto and between Carr Lane Elementary School and Centerre Bank was structured to involve teams of volunteers. The entire team was always present for the first class so that they could all meet the students and jointly provide an introduction to the scientific or mathematical topic.

   - The MESA (Math, Engineering, Science Achievement) Program in Seattle held an orientation session once a year on a Saturday at the University of Washington for prospective students and their parents. An orientation to the MESA program was provided and motivational talks were given by various role models, such as minority board members from business/industry or former MESA students who were current University students. After the presentations, students and parents met with the MESA advisor from their school, current MESA students, and members of the parent support group to receive further orientation to the program.

   - In the Indianapolis mentorship program, the school coordinator provided orientation to the mentorship during interviews with potential participants. Letters were sent to students informing them of their placement and containing information of an orientation nature, such as the schedule of visits, transportation logistics, and reminders of student responsibilities.

Motivating Students

While some students will be self-motivated to get the most out of the partnership learning experience opportunity, others will not. Some students will be in the partnerships involuntarily, or will be at least pushed by teachers or parents. Note that although a number of partnerships have made efforts to use one or more of the motivational techniques discussed below, partnership activities themselves can motivate

students. Teachers and partnership coordinators often comment that attendance is particularly high on days when partnership activities are scheduled and that students seem very interested in these activities. Partnership activities can be inherently motivating, perhaps because of their novelty, change of pace, and coverage of different topics. The use of more of a "hands-on" or experiential approach to learning and job-related examples also tends to motivate students.

Motivating students is particularly likely to be important when partnership activities require additional efforts or time commitments outside of regular school hours. Following are suggestions on how to motivate students:

1. Involve students in planning partnership activities, particularly individualized partnerships, such as mentorships, tutoring, and those involving special projects or classes (examples will be provided in the relevant chapters).

2. Encourage the use of peer support groups.

   - The Seattle MESA program encouraged students to form study groups to help each other with their school work, and motivate each other to achieve.

3. Use constructive competition. This is the approach used in various science fairs where awards are made for selected science fair projects. Partnerships that involve undertaking science and math projects can use this approach, whether or not formal science fairs are scheduled. Many categories of partnerships could adopt this approach. For example, awards could be made to those tutored students making the most progress in their science or math work. Such competitions could be structured so as to provide group rather than individual awards. This task would also foster cooperative learning within groups of students providing not only for academic achievement but social learning as well. Students tutored by one volunteer might be pitted against those tutored by another, or the students might be allowed to group themselves into teams.

4. Provide tangible rewards. The rewards might be based on attendance, performance, or both.

   - In Tulsa, students who attended the Saturday sessions of the Physics Enrichment Program received a complementary light breakfast at each session. Students who attended at least two thirds of the Saturday sessions in the program received a one year subscription to the scientific magazine of their choice.

   - The Seattle MESA program provided a variety of incentives. Students with B+ averages in their science and math classes received incentive awards of $50. Six college scholarships were available for MESA students on a competitive basis.

   - In the Rainier Bank program in Seattle, small "rewards" (such as key chains, T-shirts) were periodically distributed to all students present at a session. Various types of attendance and

achievement rewards were also provided by the bank. One year, the bank provided $50 bonds for students who maintained their grade point average; $100 bonds for improving it; and $50 bonds for good attendance. Similar criteria were used for sporadic rewards, such as being taken to the bank dining room for lunch. The bank president also sent congratulatory letters to students with good attendance or performance.

Such incentives are likely to be particularly helpful for students from low-income families.

5. Use "performance contracts." Some partnerships have used some form of written agreement, signed by the student, specifying key responsibilities or targets such as attendance and science and math grades. This motivates students by having made them explicit commitments to partnership activities. For example:

   - In the Seattle-Rainier Bank tutoring partnership, students signed a "contract" committing themselves to raising their own grade point average by a specified amount, raising the group grade point average by a specified amount, and attending four out of every five tutoring sessions.

   - In Elkhart, Indiana, students completed a project planning form or "To Do" list at each meeting with their mentors. This list specified the activities the students were to perform prior to their next meeting with the mentors.

   - In Howard County, Maryland, students in the mentorship program developed detailed plans, similar to a performance agreement, identifying what they planned to accomplish in their mentorship.

Although use of contract-like mechanisms can be helpful in motivating students, follow-up or "enforcement" is needed to maximize their usefulness. Provisions should be made for monitoring the "terms" of the contract. There should be penalties for failure to meet its provisions.

6. Provide recognition of students' participation during the partnership activities. Including announcements and descriptions of specific students or groups of students in student newsletters, and other school media seen by students, can provide added encouragement to participants.

7. Hold social functions for participating students. Social functions, such as pizza parties and picnics, can motivate students by making partnership activities fun and enjoyable.

   - Business volunteers from Rainier Bank in Seattle sponsored irregular, unannounced social events (e.g., pizza parties, volleyball games) at their evening tutoring sessions to motivate students to attend.

   - MESA, in Seattle, held some social events during the course of the school year, such as picnics and ice-skating parties, that served as motivational functions as well as contributing to peer group cohesiveness.

8. Involve parents. Keeping parents informed or involved can help motivate students. This will be discussed further in the next chapter.

Recognition

Recognition of students successfully completing a partnership, as well as of the volunteers and teachers, is desirable. This after-completion recognition is likely to be welcomed by the participating businesses and parents as well as the students themselves. Recognition usually involves special events, such as awards ceremonies, dinners, receptions, or "graduations" at the end of the activity, most often at the end of the school year. The special events might be sponsored by the school system, individual school, or by the business partners.

- o MESA sponsored a year-end awards banquet to recognize MESA graduates and students, as well as a reception for graduating seniors.

- o In Indianapolis one of the businesses participating in this program held a graduation ceremony for students assigned to mentorships at that business.

Feedback

During and at the end of the partnership activity, the business volunteers should be asked to provide feedback on student attendance and performance Students should also be asked to provide feedback on the volunteer and on the partnership.

1. Ask the volunteer to keep absenteeism and lateness records of students and to periodically submit such information to the teacher or school coordinator, especially if there is a problem.

2. Have the volunteer provide whatever information the teacher/coordinator needs for grading each student (if applicable). For some partnerships, the volunteer may actually do most or all of the grading (such as where the volunteer is teaching a regular class or is the mentor for a for-credit mentorship program). Volunteers should be encouraged to discuss with the teacher or school coordinator any problems they are having with one or more student(s).

3. Have the teacher/coordinator check periodically with students about the partnership activities.

4. Encourage students to provide informal feedback to the responsible teacher or coordinator regarding any problems with the volunteer or partnership. This, and the previous step, is needed so that corrective steps can be taken if the partnership is not functioning properly (for example, if volunteers are not communicating clearly or if the material is presented at an inappropriate level).

5. At the end of the partnership activity, ask each participating student to complete an evaluation form about the partnership and the volunteer. This information is needed to determine (a) what, if any, corrections or adjustments are needed for future partnerships and (b) whether the particular volunteer needs to be provided assistance to improve future presentations, or whether the volunteer should be invited back at all.

   More detailed suggestions about feedback are presented in Chapter 15 on monitoring and evaluation.

CHAPTER 8
PARENTS

Parents of student participants should be informed of the partnership and the role of the business. Whenever possible, they should be given opportunities to communicate with partnership coordinators and volunteers and to participate themselves in the partnership. Knowing that their parents are aware of, and/or involved in, partnership activities can help motivate students.

Parental approval is generally desirable, if not necessary, for one-on-one partnership activities such as tutoring and mentorships (especially mentorships held partly or totally away from the school facility) and for activities conducted outside regular school hours.

Parents can serve as a lobbying group for partnerships, encouraging teachers, principals, and school administrators to use them. They can provide support for partnership activities and can be involved in volunteer recognition activities. Parents can also serve as volunteers themselves.

The following steps should be considered to inform and involve parents:

1. Provide information about partnership activities to parents.

2. Provide mechanisms for parents to communicate with partnership coordinators, volunteers, etc.

3. Involve parents in specific roles in the partnership.

Examples of these elements of parental involvement are the following:

- In Cincinnati, parents were sent literature on partnership activities. The school newsletter sent to parents also publicized partnerships.

- Parents had to sign a form granting permission for their child to attend the Osceola tutoring partnership sessions. Since exchange of volunteer-student telephone numbers was common in this program, sometimes parents called volunteers to ask about helping their child with homework, etc.

- In the Rainier Bank tutoring program in Seattle, the recruitment process included sending letters to parents of students whose grades indicated they would benefit from participation in the program, and subsequent letters to parents of participants. These provided information about the program and included telephone numbers of bank volunteers so that parents could contact

them. The letters also urged parents to encourage their child to attend tutoring sessions and invited their suggestions for improving the program.

- The Indianapolis mentorship program invited parents to attend the orientation meeting held for students at the workplace of their mentors. Parents were sent a document explaining the program and a letter outlining their child's responsibilities and his/her visitation schedule, as well as transportation and lunch arrangements. Parents were also required to sign a permission slip, allowing their children to participate.

- In Hammond, Indiana, parents and students were invited to an orientation meeting to explain the nature of the advanced chemistry class partnership and to outline the degree of commitment required of students.

- The MESA program in Seattle invited parents and students to its half-day orientation session (held on a Saturday). Parental involvement was built into this program through parent support groups, which met regularly with MESA's Seattle coordinator and the MESA advisor of each school. Parent groups organized telephone trees to provide information to parents. Parents also had sporadic involvement in MESA activities, such as recognition/social events, and were occasionally called upon to "lobby" schools (for example, to be sure there were sufficient advanced science and math courses available).

- In the Chevron-Cowan Avenue School partnership, PTA members hosted a fall breakfast that served as both a recognition and get acquainted event for volunteers. Parent volunteers at the school also greeted volunteers when they arrived for Wonderful Wednesdays, and escorted them to the room where their classes were held.

Partnerships that involved parents heavily in their program include:

- The Hartford-Aetna Saturday Academy partnership required parents to participate in at least four of the nine sessions. Parents observed their children in classroom sessions. Parents were also expected to participate in workshops for them on topics such as parenting, health, the importance of positive recognition for performance, and computers.

- In Tulsa, the AMOCO Science Enrichment Project was designed so that most of the volunteers would be parents. More than 400 volunteers were needed, many of them parents who received special training to help students with a series of 24 "hands-on" experiments. Some parent volunteers for this program lobbied for its adoption when their children moved to different schools.

Informing, getting signed slips, and involving parents of disadvantaged youth can present extra difficulties. There may be difficulties in reaching parents by telephone or mail, and once they are reached, there may be language barriers to overcome. In such instances the school system (e.g., school coordinator or teacher) will need extra effort to communicate with these parents. Staff able to converse in the parent's

foreign language will likely be needed. Written communication may need to be translated into other languages for parents unable to read English.

SECTION III

TYPES OF PARTNERSHIP PROGRAMS

Partnership activities take on many different forms. Each chapter in this section focuses on one type of partnership approach or format, describing it, discussing its applicability and benefits, providing suggestions for its successful implementation, and finally discussing its specials limitations and/or benefits regarding disadvantaged students. While each chapter stands on its own, Chapter 13, the chapter on mentorship programs, highlights many points that are relevant to all types of partnership activities.

CHAPTER 9
CLASSROOM DEMONSTRATIONS AND LECTURES

Description

In this frequently occurring category of partnership, one or more volunteers work in the classroom during regular school hours. Volunteers provide lectures and demonstrations, and help students conduct experiments. The demonstrations/lectures are usually on a specific topic or series of topics that fit within, or are related to, the normal curriculum. The presentations often provide practical applications of principles that the teacher has already presented, although new material can be covered. This format can include more project work or "hands on" activities for students than provided by a regular class. The volunteer might bring equipment or materials not available in the school. The volunteer, or team of volunteers, might provide only a small number of sessions (e.g., 3 or 4) per year, or provide them as often as every week or every other week for a semester or the entire school year.

Examples of specific activities that can be performed in this type of partnership include:

- Special lectures by experts and practitioners on topics of class interest (e.g., factors in designing dams and bridges).
- Short courses, often to cover technical topics where the teacher may not be current on science/math applications (e.g., 10 course session on actuarial sciences).
- Experiments and demonstrations to illustrate industrial applications of the science or math principals being covered in the classroom (e.g., how pH measurements are made in the chemical industry).
- Special experiments and demonstrations that the school system and the teachers don't have the time or knowledge or equipment to develop and put on (e.g., series of life sciences experiments involving elementary school students dissecting animals).
- Special applications of computers and computer software (e.g., use of spreadsheet programs, computer aided design programs).

This category of partnership activity generally takes place in the regular classroom, although some sessions may occur in a separate science or computer room. "Field trips" to the business site may be

included. The school may need to provide or facilitate any special requirements, such as storage space, school supplies, and equipment (tables, projectors, etc.).

The presentations could be given to a number of classes, perhaps even in different schools. In a St. Louis partnership the volunteers developed special chemistry and biology demonstrations that were presented to all classes taking that course in that high school, repeating the same demonstration as many as four times during the day.

Examples of partnership activities described in Appendix B that have used the demonstration/lecture format include: Long Middle School-Boatmen's Bank, Carr Lane Elementary School-Centerre Bank, The St. Louis Academy of Math and Sciences-McDonnell-Douglas, The St. Louis Academy of Math and Sciences-General American Life Insurance Company, Southwest High School-Monsanto, all in St. Louis, Missouri; Cowan Avenue Elementary School-Chevron, Los Angeles, California; Tulsa Public Schools-Amoco Science Enrichment Project, Tulsa, Oklahoma; portions of 10th Street Elementary School-ARCO, Los Angeles, California; and Hammond School System-Inland Steel, Hammond, Indiana.

Applicability and Benefits

This type of partnership is widely applicable. Classroom lectures and demonstrations can be effective at all grade levels and can benefit both advanced and remedial students. This format is also less demanding on the volunteers than the other formats.

This type of partnership can enable teachers to cover very up-to-date or highly specialized math and science topics which would be very difficult for the teachers to present themselves. Volunteers providing lectures/demonstrations, even if only for a few sessions, create a fresh learning environment. This can stimulate students to become more interested in science and/or math, and possibly to learn more. While neither course grades nor student scores on standardized tests may increase as a direct result of such limited

exposure, the initial increase in interest, if reinforced, may be used as a basis for continued interest and growth in academic areas.

This type of partnership activity may also encourage students to learn by showing them real-world applications of the seemingly abstract material the teacher has been presenting. These can include career- or work-related applications, but the topics can also have applications outside of the workplace. Two partnerships in St. Louis, Missouri focused on using banking skills (writing checks, balancing checkbooks, calculating interest) to underscore basic math concepts and their uses in everyday life. These lectures and demonstrations can provide, in effect, a mini-course on technical topics within the framework of the regular class.

Although it is not generally a primary purpose of these partnerships, some career information is likely to be provided, at least indirectly. Since volunteers are frequently demonstrating career-related applications of the material, they are providing insights into science and math careers as well as the nature of the workplace. The volunteers can also be seen as role models for minority students, if minorities and/or women in science/math fields are involved.

Teachers noted that working with volunteers and planning for classroom-based partnership activities takes time. Rarely do these activities reduce teacher workload. However, teachers generally felt that their time spent on these partnerships was well worthwhile. If the same teacher and the same volunteer or set of volunteers work together for several semesters and refine the partnership activity, the extra time demands on the teacher are minimal.

Suggested Actions for Successful Implementation

1. **Arrange for close coordination between teacher and volunteer to ensure that the lectures/demonstration fit in appropriately with the curriculum and lesson plans for that class. Teachers have an established curriculum to cover in a short time and are not anxious to allow volunteers to introduce material that is extraneous to the curriculum. The teacher and the volunteer(s) should work together to plan the volunteers' sessions so they do fit into the curriculum. Care should be taken to schedule volunteer presentations to integrate them into the classroom lesson**

plans. Meetings and telephone conversations need to be held to develop the schedule and content and, before each session, to confirm dates and to make modifications or changes as appropriate to fine-tune the presentation. Volunteers should be given a copy of the textbook, course syllabus, classroom notes, worksheets, exercises and any other relevant materials to help them understand the context for the presentations.

2. Emphasize the presentation of experiments and/or material that are unique or different, particularly those the teachers and schools would not likely be able to cover on their own.

3. Stress hands on experiments and practical or enjoyable applications of materials and concepts covered in school—to build student interest.

   - In the 10th Street Elementary School-ARCO partnership in Los Angeles, volunteers worked with students in a garden to teach/reinforce concepts from biology and nutrition, and a photography lab to teach/reinforce concepts from chemistry and math.

4. Provide enough experimental set ups, props, etc. to enable all students to become actively involved in the hands-on aspects of the sessions.

   - In AMOCO's elementary school-level science program in Tulsa, the goal was to have at most four students working with a volunteer and one experimental set up, so all students would be actively involved and were not simply observers. Students performed experiments, made observations, and subsequently posed questions in a small group setting.

5. Encourage volunteers to make their presentations as interesting as possible. For example, encourage the use of visual aids. Many businesses have graphics and video production capabilities far better than those classroom teachers have regular access to for preparing classroom presentations.

6. Build in experiments or activities where students can take things home to keep and to show to parents. This has a reinforcing effect on what students learned and gets parents involved, at least tangentially, in the students' education. This technique was adopted by Tulsa's AMOCO Science Enrichment Program.

7. Be sure that volunteer presentations are made at an appropriate level for students to understand. Volunteers tend to overestimate the background knowledge and intellectual capabilities of students and talk over their heads, selecting material too complex for their age and grade level. This problem can be avoided by coordination between teacher and volunteer in developing curriculum, careful review of the proposed curriculum, and feedback from the teacher and the students after the volunteer's initial presentation.

8. Encourage teachers to stay in the classroom during volunteer presentations. This enables teachers to provide informal feedback to the volunteers to help avoid teaching over the heads of students. It also helps maintain discipline. Teachers may help students with experiments if they break into small group sessions. In addition, teachers may learn new material of interest from the lectures or demonstrations.

9. Encourage teachers to reinforce the volunteers' presentations, clarifying the more difficult aspects. This will maximize the usefulness of those presentations for students.

- o In the St. Louis Math Skills in Banking partnership, the teacher conducted follow-up exercises to reinforce what was presented and better incorporate it into the curriculum. The teacher also used examples similar to those used by the volunteer on tests, further reinforcing the material presented.

10. Provide a number of sessions (e.g., 5 to 7) with the students. Sufficient intensity and duration of the partnership effort is needed so that: a significant amount of new information can be shared; students can get to know volunteer(s) and appreciate them as role models; reasonably complex materials can be covered; and the volunteer(s) can get to know the students and teachers.

11. If more than one volunteer is participating in a series of interrelated presentations, encourage the volunteers to coordinate their presentations to assure that they fit together. Without this, the presentations are likely to be disjointed and less effective. Coordination will assure that the series of presentations: made the point; did not unduly overlap; and reinforced each other on major science and math principles.

Special Issues Regarding Disadvantaged Students

Partnership activities involving classroom demonstrations can be particularly beneficial to disadvantaged students for a variety of reasons:

- o These students are often concentrated in schools that are unable to provide much equipment or materials for experiments or demonstrations which volunteers are likely to incorporate into their sessions.

- o Because of their disadvantaged background and environment, these youth may benefit most from non-traditional learning materials. Concrete, hands-on experiences concerning real world applications may benefit disadvantaged youth the most.

- o The home environment of disadvantaged youth is not likely to provide opportunities for exposure to math/science activities or experimentation, thus making the additional exposure provided by volunteers more important.

- o Minorities and women volunteers can serve as role models for disadvantaged youth.

CHAPTER 10
BUSINESS PROVIDING TEACHERS FOR CREDIT CLASSES

Description

In this partnership format, the business provides an employee to teach one or more regular credit-bearing classes. This employee is not supplementing the work of another teacher; the employee is the teacher of those classes. The employee is not generally a volunteer since the teaching responsibilities are built into his/her employment arrangement(s). In effect, the teacher/employee has two jobs: teaching a specified number of courses (which may or may not be less than the teaching load of a full-time teacher); and working as a business employee. Thus, this employee is shared by the business and the school.

This type of partnership arrangement is useful in dealing with the shortage of science and math teachers, particularly those qualified to teach advanced classes. It can provide skilled practitioners for teaching assignments in districts that have been unable to attract sufficient numbers of qualified teachers.

The following examples of applications of this format illustrate these uses, as well as showing how these activities can be arranged:

- In rural West Point, Virginia, the school system and the major employer, the Chesapeake Corporation, jointly perceived a problem of attracting teachers for higher level high school math and science courses. They developed a partnership in which the business hired an entry level engineer for the combined purpose of teaching at the high school 3-4 hours/day during the school year (lecturing and preparation time) and working for the business the rest of the time.

- In Hammond, Indiana, a high school science teacher had held a part-time and summer position as a chemist at Inland Steel. The teacher approached the school and the business to develop an arrangement to remain a full-time teacher but to reschedule his teaching assignments to end at noon, thus allowing half-time work for the business during the school year. Part of this arrangement involved teaching an advanced chemistry class in the company's laboratory on Saturday mornings. This class was available to qualified students from all of the district's high schools. The Saturday class, combined with four weekday morning classes, amounted to a full teaching load.

Classes in this type of partnership can take place in the school or at the business facility. Classes held at the business facility might have to take place after regular school hours or on Saturday. Other business

employees could also teach some classes as guest lecturers (as in the classroom lecture and demonstration partnerships discussed earlier).

Applicability and Benefits

These partnerships offer significant returns. They offer an alternative way to deal with teacher shortages in science and math, particularly for instruction in advanced subject matter. This arrangement may be particularly useful in poor and rural areas, where it is difficult to attract qualified science and math teachers. It is also useful in cases where student enrollments may not justify hiring full-time teachers for advanced courses.

The Hammond arrangement represents a unique approach to the problems of science or math teachers leaving education for better paying positions in business. Rearranging this teacher's class schedule enabled the school to retain him as a full-time teacher. The revised schedule allowed the teacher opportunities for learning and application of advanced skills, as well as additional earnings from the part-time business position. In combination, these factors enabled him to continue teaching full-time. In effect, this person held 1-1/2 jobs, which may not be manageable for many people. However, developing arrangements that facilitate teachers' ability to supplement their salaries may help schools retain qualified science and math teachers, who might otherwise be lured away from teaching by higher paying jobs in business. The opportunities to keep up-to-date and to use advanced skills in an applied setting may also increase teacher satisfaction, thus contributing to retention.

Although classes taught by business-provided instructors do not have to be advanced, these arrangements provide an opportunity to offer more advanced content than that available in "regular classes." Teacher/employees can focus on science/math applications and use of specialized skills and/or equipment in either advanced or regular classes. If some or all classes are taught at the business, students will have access

to state-of-the-art equipment that most school systems cannot match. In these cases, classes can be targeted to advanced students, thus improving their scientific and technical educational opportunities.

The insights offered by a practitioner-teacher can provide students in regular and advanced classes with better perspectives on career opportunities in science and math fields.

The business partner may also be willing to donate equipment or supplies for the teacher/employee's classes, or even for other classes. For example, in Hammond, Inland Steel donated a variety of obsolete equipment to the high school. Although it was obsolete to the firm, it was more up-to-date than the equipment the school had. The teacher/employee is in a better position to know about what is available than a regular teacher, and to know whom to ask for it.

These arrangements can provide teaching staff at little cost to the school system. They might be designed so that the school provides some kind of quid pro quo to the business, such as occasional use of school facilities. The business partner can gain high visibility and community good will for its participation.

Special Issues

These partnership programs also have draw backs. They require very substantial commitment of time from the "teacher" to develop the course and then to teach it. In the West Point partnership, individuals who taught were paid salaries equivalent to those of others in the firm with similar backgrounds and experiences but with no teaching responsibilities. In the Hammond partnership, the teacher/employee effectively held 1-1/2 jobs. He also received 1-1/2 salaries.

These partnerships can be relatively expensive, particularly if the business pays the teacher/employee a full-time salary but receives only about half-time work for. However, this is not the case for programs in which the employee's salary for the time spent teaching is paid by the school, as in the Hammond program.

There is also likely to be opposition and resentment from some teachers and possibly the teacher's association or union if non-certified teaching personnel are used.

Finally, these arrangements require considerable time and effort: for planning; for getting approval from all affected parties; developing the curriculum; and possibly for recruiting students.

Suggested Actions for Successful Implementation

1. Obtain the full support of the business leaders, state and local school administrators, and the teachers' organization up front. These partnerships are expensive and involve a significant commitment by the business, the individual teacher, and the school system to develop and implement. Explicit commitments of support should be obtained from all parties so that the partnership can be established without opposition and continue to run for at least several years to "recoup" investments in curriculum development, training, and set up.

2. Work out teaching credential issues.

   - In the West Point partnership, the State Department of Education approved the proposal for the arrangement, and granted a waiver to teacher certification regulations to allow the teacher/employee to teach and give grades.

3. Have both the business and the school jointly select the teacher/employee, since that person will be working for both parties. The school system will need to assure that the person is adequate for teaching credit courses (and will have state acceptance). The business will need to feel that the person can function adequately as its employee. Select teacher/employees with prior teaching backgrounds (particularly with primary or secondary level students) and, if possible, current certification. Although this is not a necessary condition for success, it is helpful. It will reduce the amount of special orientation and advanced "training" likely to be needed if the person has not had teaching experience.

4. Provide orientation and training for business persons new to teaching. Business employees who have never taught before, or who have not taught at the elementary or secondary school level, will need some instruction in teaching at these levels. They will also need orientation to school operations, rules, and paperwork requirements. One or more teachers assigned as "buddies" can help the teacher/employee.

   - The West Point school system provided special training with a school math consultant before teaching responsibilities began, as well as in-service training at weekend education workshops. The Assistant Superintendent was also available to provide advice and additional training, as needed.

5. Encourage the teacher/employee to interact with other teachers and perform regular faculty functions to prevent resentment and hostility on the part of other teachers. Existing teachers may feel that the teacher/employee is receiving special treatment and/or higher pay than is justified. Such feelings can be alleviated if the teacher/employee assumes regular faculty duties, such as participating in committee meetings, acting as a coach or advisor to a student team or club, etc. The teacher/employee should socialize with faculty, for example, by having lunch at the school at least some of the time and by attending teacher meetings (especially science/math department facility meetings) whenever possible.

Regular teachers may need to be reminded that the teacher/employee is carrying two jobs and is (probably) working 12 months a year.

- o In Hammond, union representatives and school officials who received complaints about the arrangement pointed out that the teacher/employee worked many more hours in the combined position than was required for a regular teaching position, and that the arrangement included working a half day on Saturday during the school year. Teachers were also told that any teacher could develop a similar arrangement and submit it for consideration.

6. Obtain advance approval from the teachers association or union, especially if special arrangements involving teaching hours, salary or other issues generally included in union contracts are involved.

   - o In Hammond, the union contract had clauses allowing for "building management" and for partnership participation. The former allowed the school flexibility in class scheduling that enabled the teacher to hold a full-time teaching position as part of the partnership arrangement.

7. Have the teacher/employee teach courses for which no other qualified teachers are available. Teachers may be concerned that these arrangements will be used to replace full-time teachers or to reduce them to teaching lower-level courses. Good communication and cooperation with teachers can help alleviate these concerns.

8. Provide orientation to the business for teachers who lack business experience. Some persons hired for the teacher/employee role may have had teaching experience but little or no business experience. If so, this person will need help in adjusting to the business environment. This might be handled by having the teacher begin work for the firm during the summer if the partnership starts in the fall. Orientation to the business should include introductions to other people in the business who might contribute to the course as occasional guest lecturers.

9. Arrange the assignment of the teacher/employee in the firm to accommodate the demands of the teaching schedule.

   - o Experience in West Point revealed that the time demands for teaching were so extensive that the teacher/employee could not hold a line position and teach part-time during the day. Arrangements were made to assign this person to the Human Resources Division to provide greater flexibility.

10. Make arrangements that enable students to contact the teacher/employee. Since the teacher/employee does not spend a full day at the school, students may find it difficult to contact him/her. Try to arrange for the teacher/employee to be available to students for a time before and/or after class. Provide students a business or home telephone number, perhaps with instructions about appropriate times to make calls.

11. Encourage teacher/employees to commit themselves to at least two years or more in the joint role. Some persons in these joint teacher/employee roles are likely to decide they prefer returning to one or the other role full time. Because of the "investment" likely to be needed in the teacher/employee, the school system and business should seek persons that are likely to remain in the dual roles for a few years, to avoid the problems inherent in frequent turnover.

12. Address liability issues if classes are held at the business facility. The school and business partner should provide mechanisms to deal with issues of liability.

    - In Hammond, the business partner had its legal department check into whether special arrangements were needed. It was decided that existing coverage was adequate. The school also felt its current policies provided sufficient protection.

13. Provide, or make arrangements for, transportation if classes are held at the business facility.

    - In Hammond, the school system provided for a bus to pick up the students from downtown locations and take them on to the site. (The business partner did not want students driving on the industrial facility.)

14. Extend enrollment in advanced/specialized classes to all schools in the school district, or to neighboring districts, if feasible. The demand for advanced or specialized courses may be low, particularly in smaller schools. Expanding enrollment opportunities will help assure a sufficient supply of students as well as reduce the perception of favoritism toward a particular school.

15. Recruit and screen students for advanced classes with limited space availability. Classes held at the business facility may have to be limited in size due to the space available.

    - The teacher/employee in the Hammond-Inland Steel program contacted science/math teachers, guidance counselors, and principals for nominations for the Saturday advanced class. The teacher/employee called all nominees to explain the course content and requirements, and to ascertain their interest in it. His selection criteria included interest in math/science careers, as well as grades and advanced coursework in math. Maturity was also stressed.

16. Select mature students for classes that are held at the business site and provide orientations for them. Mature behavior patterns are needed to avoid damaging equipment as well as to prevent injury to students. Classes held at business sites may also require sacrifices of free time and other activities.

    - Students in the Saturday class in Hammond sacrificed sleeping late on Saturdays and participation in some sports in order to take a class that exposed them to state-of-the-art laboratory equipment. These sacrifices were made clear to them in an orientation meeting that included their parents.

17. Provide an explicit return on the investment for the business partner. The business partner can make a substantial contribution in providing employees for teaching purposes. Providing some type of return to this investment serves as "insurance" that the arrangement will continue during periods of economic downturns or busy periods when the firm might need the teacher/employee on a full-time basis.

    - In West Point, the business partner received the following services from the school system:

        - A physical fitness program using school personnel and conducted at school facilities, for which employees pay a fee.

- -- Access to school grounds and facilities (such as the gymnasium, auditorium, telecommunications studio, and classrooms) by prior arrangement, and to school busses under a mutually convenient schedule.

- -- Help with the business partner's in-service training.

Special Issues Regarding Disadvantaged Students

Areas with primarily minority and/or low-income populations, particularly rural areas, often have the greatest difficulty attracting qualified teachers. This kind of partnership arrangement can be particularly helpful in such cases.

Disadvantaged students often do not receive much exposure to information about careers, especially those involving science and math. Having practitioners as teachers can be particularly useful for these students.

On the other hand, disadvantaged students may be less attracted to, or less able to take advantage of, advanced science and math class, especially those held on weekends (due to their holding jobs) or those requiring their own transportation to the business facility. The school and business partner may need to pay special attention to the needs of such students, such as arranging transportation.

CHAPTER 11
OUT-OF-CLASS VOLUNTARY PARTNERSHIPS

Description

Some partnerships are designed to provide enrichment experiences to groups of students who participate voluntarily in the partnership activity. These partnerships generally take the form of special sessions that may provide school credit. They may be held at the business facility, or in a special classroom or laboratory in the school. In these cases, they often provide opportunities for exposure to, or use of, equipment or materials not available to regular classes. These activities may take place outside of regular school hours, including on weekends or during the summer. Their content is usually not closely linked to that being covered in "regular" science and math classes. Because of this, teachers tend not to be as directly involved as in other partnerships. Volunteers perform most of the teaching in these types of partnerships, although they can be designed so that teachers share this role.

Most of these partnerships' activities are more advanced or applied than the regular curricula, cover different topics, and/or include more hands-on opportunities for students. They are often oriented toward high-achieving students and/or those with strong interests in science and math. The activities can also be designed for reinforcement/remediation purposes for students who are low achievers, or who are considered high risk in terms of dropping out, failing, or not performing to their capabilities. The program might use a competitive process to select student participants for these programs.

Partnerships with voluntary participation can vary considerably in their format, as indicated by the following examples:

- In Tulsa, AMOCO provided a nine-session program twice a year to help above-average high school students "learn and appreciate some of the wonders of science." The three hour sessions were held on Saturday mornings at its research facility. About 20 business volunteers were involved in developing experiments and presenting lectures focused on physics/geophysics. A hands-on approach was stressed, often using the facility's equipment. Material presented was comparable to first year college level. Approximately 50 juniors and seniors were accepted for each program.

- In St. Louis Park, Honeywell helped develop and equip a high school science resources laboratory, and provided two volunteers who each spent one-hour per week there. Teachers staffed the lab during the school day and after school. Students used the lab on a voluntary basis to work on projects individually or small groups. Since lab use and project work was voluntary, students who chose to participate were generally high achievers with a strong interest in science. Business volunteers helped the students with their projects.

- The MESA program in Seattle was designed for voluntary participation of high school students interested in math/science fields in college and careers. It provided several special classes, including an advanced for-credit science class taken instead of a regular 10th grade science elective by all MESA students. This was taught by a high school teacher involved in the MESA program, but included demonstrations/lectures by business volunteers on more advanced/applied aspects of the material.

- MESA students also could voluntarily take a six-week summer science course held for them at the University of Washington campus. The daily half-day sessions focused on computers, physics, and math, and was taught by University faculty and graduate students. MESA students received an elective science credit for this course from their high school. There was also a two-week long, non-credit, live-in, summer program for MESA students at the University. Faculty exposed post-11th grade students to various engineering disciplines in day-long sessions. These two programs were limited to 40 students each.

- In Hartford, Connecticut, Aetna Institute for Corporate Education and the Hartford Board of Education established a special Saturday Academy targeted for inner-city seventh graders and their parents. The curriculum supplemented regular classwork. It was more hands-on/experiential than the weekday curriculum. The half-day sessions were taught by teachers from the school system with the assistance of Aetna volunteers. The sessions were held at Aetna's training facility. Two nine-week sessions were offered each year, each involving about 75 students. Aetna volunteers held workshops for parents on topics such as parenting, computer use, and mediation.

- In Hammond, Indiana, a teacher employed both by the school district and Inland Steel, taught an advanced chemistry class on Saturdays which met at the business facility.

Applicability and Benefits

Partnership activities involving voluntary participation provide some of the same benefits as other partnerships: exposure to volunteers' perspectives on science and math, and use of specialized equipment or materials. A benefit specific to the voluntary nature of these programs is that the material included can be adjusted to the abilities and interests of the students. If participation is limited to high achievers with strong science and math interests, volunteers can work at a more advanced level than they would be able to if they

were provided demonstrations for an entire class. This can be particularly motivating and encouraging to high achievers, who may not receive enough stimulation and challenge from their regular classes.

Similarly, participation can be focused on low achievers or at-risk students. Activities can then be designed to reinforce regular classwork. Volunteers and equipment can help create a more interesting and lively environment than the regular classroom, thus helping to motivate students whose interest or abilities may be low.

Holding some or all partnership sessions at the business facility provides extra stimulation and learning opportunities for high- and low-achieving students.

The voluntary aspect of these activities allows participation to be open to students in more than one school, particularly if the activities occur at the business facility. This spreads the benefits of the partnership further in the school system. Opening the activities to more than one school may also be necessary (in addition to being beneficial) in order to generate a sufficient number of students who meet the criteria specified for participation.

Suggested Actions for Successful Implementation

1. Make the content and presentation stimulating and interesting, and include a lot of hands-on opportunities for students. As these activities are frequently held outside of regular school hours when there are competing activities for students--from relaxing, sleeping in on Saturdays, or hanging out to extracurricular activities and jobs. These partnership activities need to be especially appealing to attract students (other than possibly the most strongly motivated achievers).

   Providing well-developed lectures by technical experts and hands-on experiments for students generates interest. Students expect and appreciate lectures and experiments that are developed specifically for them. This appears to be one of the attractions for coming, but it places a significant demand on the volunteers. Scientists at the Tulsa research organization spent anywhere from 3 to 10 days developing lectures and special demonstrations and hands-on experiments targeted to the students.

2. Arrange the program to serve as many qualified students who want to participate as possible. Sometimes activities designed for specific groups are perceived to be exclusionary, especially if only a small number of students participate. Efforts should be made to recruit sufficient volunteers to provide the program to all eligible students who want to participate. If this is not possible, other alternatives might be made available for students who are not chosen as participants. For example, a lectures series

such as that provided by Grumman volunteers could be provided for all students (on a voluntary basis) in addition to a voluntary program that cannot serve all interested students.

- In Hammond, a modified version of the class taught at the Inland Steel facility was provided by the teacher/employee at one of the high schools. This was done to make advanced chemistry available to those who could not participate in the Saturday class. Consideration was also given to providing two classes on Saturday, but there was insufficient student interest in this to do so.

3. Make criteria for student selection explicit. Programs for high achievers or talented science/math students often request nominations from teachers, principals, guidance counselors, etc. If specific criteria are not provided, these individuals may be reluctant to identify some students as "best" or as in need of reinforcement, or to single some out for benefits that are not available to all. Specifying criteria such as grade point averages, or other readily identifiable characteristics (such as taking specific science or math courses) will help assure that appropriate recommendations are made. Maturity and reliability could be included in the criteria, particularly for activities held at the business facility. Candidates might be asked to complete a brief questionnaire or application, explaining why they are interested and what they hope to accomplish.

4. Interview nominees to be sure they really want to participate and are appropriate candidates, and make sure students (and their parents) know at the start what will be expected of them. This includes making clear expectations regarding attendance and behavior, as well as what sacrifices might be involved in terms of participation in sports, extracurricular activities, or jobs. This can be done at an orientation session for students and parents, through personal interviews, letters, phone calls, etc.

5. Open participation in off-campus programs to all interested/qualified students in the area, regardless of what school system they belong to. It may be difficult to get enough highly motivated, well qualified students to participate in advanced enrichment courses. Attendance may be enhanced by opening participation to all students in the area, regardless of whether they attend public or private schools, or of what school system they belong to. Alternatively, the pool of potential students may be enlarged by not aiming the program at high academic achievers, but instead at average to above average students with interest in science and math.

6. Provide incentives for participation in non-credit activities. If the activities are both voluntary and not for school credit, the students will find many temptations to not attend or to not undertake the needed preparation. The best incentives are stimulating presentations. Incentives can also include such elements as awards and certificates; refreshments at each session; or other tangible awards provided by the business. It may be necessary also to set up punitive measures, such as dismissal from the program if the student misses a set number of sessions.

- In Tulsa, students attending two-thirds of the Saturday sessions received a one-year subscription to the scientific magazine of their choice. Light refreshments were also provided at these sessions.

- Students who missed three of Hartford's Saturday Academy sessions were asked to withdraw from the program.

7. Develop a regular schedule of activities to increase participation. Programs that adhere to a regular schedule--for example every Saturday over a set number of weeks--appear to be easier for students to schedule, and thus increase participation.

8. Keep homework assignments pleasant and to a minimum for non-credit classes. Students participating in non-credit classes after regular school hours are already making sacrifices to attend. Requiring more than small amounts of reading or other work assignments may discourage participation and lead to poor attendance. To the extent, however, that such assignments can be made fun or entertaining, these assignments can be lengthened.

9. Recruit a sufficient pool of volunteers to avoid overload or burnout of individual volunteers. Partnership activities can be designed so that different volunteers are responsible for different sessions. This avoids placing excessive burdens on a small number of volunteers, particularly if sessions occur on Saturdays or outside regular working hours. This may also facilitate serving larger numbers of students. However, in activities involving multiple volunteers, volunteers should be encouraged to plan and coordinate their sessions so they fit together coherently.

10. Provide, or make arrangements for, transportation of students if sessions are held at the business facility. This could be a problem and expense, especially if the facility is in a far-away, difficult to reach, or unsafe location. Help with transportation arrangements is likely to be needed, particularly for low-income students.

11. Work out liability questions in advance if sessions are held at the business facility.

12. If for-credit classes are involved, make arrangements to enable non-certified teachers to give, or at least contribute to, grades as necessary.

Special Issues Regarding Disadvantaged Students

Partnership enrichment activities with voluntary participation can be particularly beneficial to disadvantaged students if they are designed to provide reinforcement or remediation for at-risk or low-achieving students. The Hartford partnership provides an example of this approach.

Particular concerns or suggestions regarding these students include:

- If transportation to the business facility is not provided by the school, low-income students may not have access to cars or be able to afford their own transportation. Alternative arrangements should be made for students in this position. These could include provision of passes for public transportation, vouchers for taxis, pick up and return by business staff or other students, etc. The coordinators of the Physics Enrichment Program in Tulsa encouraged carpools and offered assistance if these could not be arranged.

- Low-income students may have difficulty participating in after-school or Saturday programs because the income generated by part-time jobs may be necessity. Efforts should be made to provide opportunities to participate in such activities without conflicting with employment

opportunities. A "scholarship" concept might be developed to compensate low-income students for lost wages, thus enabling them to take advantage of such opportunities.

- Minorities and women should be recruited as volunteers, wherever possible, to serve as role models, especially for partnerships serving high proportions of minority youth.

CHAPTER 12
TUTORING PARTNERSHIPS

Description

In tutoring partnerships, volunteers help students having problems with regular curriculum content. Most tutoring partnerships are designed for voluntary participation by students. Tutoring can take place during, or outside of, regular school hours. It generally takes place at the school, in locations other than the regular classroom; although in some programs, volunteers have tutored students in the back of the classroom during class sessions.

Tutoring partnerships can use a one-on-one format (one volunteer with one student), or match small groups of students with each volunteer. Groups can consist of students from the same or different classes. An entire class could even be the focus of a tutoring partnership. Tutoring partnerships can also be developed to help students prepare for events such as tests or competitions. In these cases, participations would not have to be limited to low-achieving students.

Examples of different tutoring arrangements include:

- In Osceola High School, in Pinellas County, Florida, tutoring occurred once each week, generally during the class period in which the student was having difficulty, but sometimes during other classes, such as physical education. Most tutoring was done in a small group format (4-5 students), with all students in the group from the same class. Some one-on-one tutoring was also arranged.

- In Seattle, the tutoring program for high school students was offered one evening each week for about two hours. A group of volunteers from the bank went to the school and provided one-on-one or small group tutoring, depending on the number of students attending and their needs. Participating students were from a variety of classes. The bank volunteers were supplemented by one or two high achieving students who served as "peer" tutors.

- In Springfield, Massachusetts, tutoring took place in a "Living Math Lab." Entire classes of third and fourth grade students attended tutoring sessions in the lab each week for about an hour (in place of one session of their regular math class). Tutors worked with students in a small group format. All students in these grades received tutoring because of a perceived need to increase math scores on standardized tests and a belief that many students had math anxiety. The partnership used "job cards," detailed instructions printed on index cards for the volunteer to use at each session. The cards provided subject matter assignments, featuring realistic hands-

on activities that increased in difficulty over time. For example, to learn measurement, students worked with measuring cups to measure popcorn into a container; and play money was used to practice making change to help students learn addition and subtraction.

- In Los Angeles, some ARCO volunteers tutored individual elementary school students or small groups in the back of the classroom while the teacher worked with the rest of the class. Tutoring in math problem-solving skills was also provided for a selected group of high-achieving students to help them prepare for an annual, city-wide math competition. Both forms of tutoring involved weekly sessions lasting one hour. Students selected for the math competition team received an additional weekly tutoring session for about three months prior to the competition.

Applicability and Benefits

Volunteers are able to give more individualized assistance and explanation to students than are teachers who must deal with entire classes. They can cover selected material at a slower pace than normal classroom conditions allow, going over the same material in a variety of ways until it is understood. Students feel less threatened by volunteers, since volunteers do not grade. Volunteers can use examples from business to help explain material and to demonstrate the use of what is being taught in school, all of which helps to motivate students.

Tutoring can be used at any grade level (beginning about third grade) but is probably most applicable for high school students who can take the most advantage of volunteers' professional experience.

Tutoring partnerships are particularly useful in helping disadvantaged students improve their science and math skills and keep up with the rest of the class.

Volunteers in tutoring partnerships, particularly minorities and women, can serve as role models for students and can provide career related information as an additional benefit. Because of the close individual contact between tutors and students, volunteers may serve as sources of friendship, stability, and encouragement.

- A business volunteer in Washington, D.C. worked intensively with one student during and after school; the student's truancy declined and his grade performance increased from near failure to a C average for the year.

Tutoring partnerships can demonstrate that the larger community (represented by the business volunteers) cares about young people and has a commitment to their future. This can be particularly important for students who are doing poorly in school, many of whom may be low-income or minority students who frequently feel alienated from, or rejected by, society.

Suggested Actions for Successful Implementation

1. Establish tutoring schedules that facilitate both student and volunteer participation. Finding the best time to schedule tutoring can be challenging. One partnership that provided evening tutoring (a good time for volunteer participation) found that participation of high school students declined dramatically as students got older. Sports, extracurricular activities, and/or jobs competed with tutoring in the evening hours. Another program rejected the idea of after-school tutoring because it would cause transportation problems for students (school busses would not be available to take them home afterward), and because it would compete with extracurricular activities.

   - The Osceola program scheduled tutoring during regular class periods. Students were excused from the class in which they were having problems to be tutored in that subject. In cases where teachers did not feel this was appropriate, arrangements were made to excuse the student from another course, such as gym, driver education, etc. Most tutoring was done in the late morning or early afternoon because volunteers preferred tutoring near lunchtime. Their absence from work caused fewer problems then, and they did not have to make up the time that would normally be taken as lunch. The school coordinator was also flexible in scheduling to meet the needs of volunteers; one tutoring session was scheduled at 7:30 a.m.

2. Create a comfortable, supportive environment for the tutored students. Students who need tutoring often have experienced multiple failures at school, and may have social and family problems as well. They may feel uncomfortable because they need tutoring and fear that they will not improve. Efforts should be made to reduce student anxieties and create a relaxed environment.

   - Rainier Bank volunteers incorporated social activities, such as occasional pizza parties and volleyball games, into their regular tutoring sessions. These helped develop rapport between students and tutors, which contributed to a relaxed environment. The name of the program, Tuesday Nite Live, also helped set a non-threatening tone to the program.

3. In general, use a small-group format for tutoring rather than one-on-one approach. Students may feel intimidated by tutors in a one-on-one setting or feel embarrassed about asking questions or showing lack of understanding. Osceola, for example, found that a small group facilitated communication with tutors and helped reduce tension. Groups also add an element of competition that may make students work harder and achieve more. Group formats also alleviate concerns about cancelling sessions because of student absence (which is necessary in one-on-one formats), since it is unlikely that an entire group would be absent on the same day. In addition, peer pressure is likely to encourage members of the group to be present at sessions.

4. Carefully match students and volunteers, especially in one-on-one tutoring formats. Match students and tutors in terms of personalities and interests to help create a comfortable atmosphere and to motivate students.

   - o To match students with volunteers for one-on-one tutoring, the coordinator in Osceola held 30 minute interviews with volunteers to obtain a sense of their outside interests as well as what they wanted, and were able, to tutor. She also interviewed students about their interests and needs. She attempted to find some commonalities between students and volunteers, for example, a shared interest in karate.

5. Provide volunteers with background information about the student. It will help volunteers to know something about the students before they meet them. Information should be provided about the student's academic abilities and problems, as well as some personal information (e.g., involvement in extracurricular activities or sports, hobbies or special interests) that can be used as an "icebreaker" during the initial meetings.

   - o In Osceola, as part of the orientation program, the school coordinator told volunteers about the students with whom they would work.

6. Make arrangements for student-volunteer communication. The school coordinator should introduce the volunteer and the student(s), either at an orientation session or at the first tutoring session. Students and volunteers should exchange telephone numbers so that students can call volunteers if they are having particular problems or if they are going to be absent from a session. The latter is particularly important in one-on-one tutoring arrangements, since it can prevent an unnecessary trip to the school by the volunteer (or to the tutoring location by students if the volunteer has to be absent).

7. Monitor student attendance. The volunteers should provide regular reports on attendance to the responsible teacher or coordinator. If students are not showing up regularly, corrective action should be taken.

   - o In the Osceola program, the school coordinator frequently "dropped in" to be sure all students were present at the tutoring session. If any were missing, she checked the regular classroom to see if they had forgotten to attend. Volunteers were also told to check with the teacher if students did not show up as scheduled and had not notified the volunteer of an expected absence.

   - o If students did not attend the Tuesday tutoring sessions in the Rainier Bank Program in Seattle, volunteers frequently called their homes from the school or had the school coordinator ask them in school the next day about their absence.

8. Provide volunteers with orientation to tutoring. Volunteers need to be given an understanding of what they will be doing as tutors. They also need help in developing "realistic" expectations about the impacts they are likely to have on grades and performance. Volunteers also may need information about student abilities/behavior patterns at different ages to help them tutor at an appropriate level.

9. Help the volunteer to become familiar with the curriculum. Volunteers may be highly skilled in science or math, but they are not necessarily familiar with the classwork with which students need help. There are several ways to deal with this:

(a) Provide orientation to the curriculum.

- In the Osceola program, volunteers met teachers before the first tutoring session to be briefed on course content and syllabus, and to receive a copy of the text and other materials (worksheets, homework assignments, etc.).

(b) Facilitate communication between teachers and volunteers. Have them exchange telephone numbers and set up a system to meet both formally or informally.

- In Osceola, tutoring took place in a classroom near the teachers' regular class so that to make it convenient for volunteers and teachers to talk before or after tutoring sessions. Telephone numbers were also exchanged so volunteers could be kept up date on class content.

(c) Provide training in tutoring for volunteers.

- In the Springfield tutoring partnership, teachers developed a task-focused approach to tutoring and trained volunteers in its use.

(d) Provide tutors with curriculum-related materials to use in tutoring sessions.

- In Springfield, a series of "job cards" were developed that provided instructions about what material to cover and what exercises or tasks to use in covering it.

(e) Supplement volunteers with peer tutors.

- In Seattle, in the Rainier Bank program, honor students were recruited to act as peer tutors during the volunteer tutoring sessions, helping out when volunteers were unfamiliar with curriculum content.

10. Provide a comfortable room with a chalkboard for tutoring sessions. Tutors need to have access to a chalkboard just as teachers do. In addition, teachers or coordinators can conveniently leave messages for volunteers on the chalkboard of the tutoring room.

11. Recruit students through a variety of mechanisms, such as nominations by teachers and guidance counselors. Some students with academic problems will ask teachers, guidance counselors, etc. how to get help, or will readily respond to announcements about tutoring programs on bulletin boards, in newsletters, etc. Others may need to be "nominated" for participation. Letters should be sent to parents of low achievers. Teachers and guidance counselors should be made aware of the program through memos, posters, and personal contact. Persons responsible for extracurricular activities and sports teams should be asked to require that students with academic problems enter the tutoring program in order to participate in extracurricular activities.

12. Provide incentives/rewards for participation and accomplishment.

- In Seattle, in the Rainier Bank program, good attendance was rewarded in various ways, such as the presentation of a $50 savings bond or involvement in special events, like taking students to the executive lunchroom, to a company Christmas party, or to the World's Fair. The occasional unannounced pizza parties were also intended to encourage good attendance. Students were also rewarded for improved performance. The bank sometimes provided $50 bonds for maintaining grade point averages, and $100 bonds for improving them.

- In Seattle, the Rainier Bank program also had students sign a contract committing themselves to specified increases in their own grade point average and in the group average, and to attending four out of every five sessions. The contract was intended to motivate students. Rewards were provided for accomplishment, as indicated above, but no penalties were imposed for failure to meet the contract's goals.

13. Establish specific, obtainable goals for student performance. Students and volunteers should jointly set goals for student improvement. Some of these goals should be related to tests and grades, others should be related to behavior such as attendance. Both short and long-term goals should be set, periodically being reviewed and adjusted in light of the performance to date. For example, one goal might be to increase a student's performance on the next math quiz from a C to a C+; while a longer-term goal would be to get a B in the course. Students could set goals of studying for a specific amount of time each day or each week, etc. Goals should be realistic in terms of the student's potential and current level of performance. Volunteers may need to consult with the teacher or coordinator to determine what goals are realistic or appropriate for a given student(s). First-time business volunteers are likely to be overly optimistic regarding performance improvement goals, leading to unnecessary disappointment on the part of the student and volunteer.

14. Be sure that volunteers give and receive feedback on student performance. Although volunteers work closely with students in tutoring programs, students are not always good at providing information about how their performance in regular classes is affected by the tutoring. Teachers and/or coordinators should provide volunteers with science and math test or grade information to help volunteers assess their impact and make adjustments in their tutoring approach if necessary. In turn, volunteers should report to teachers regarding attendance, attitudes, and accomplishments of students.

15. Encourage students to create study groups and perhaps develop a peer tutoring system. Meeting with other students to study can encourage students to put more time into studying. Students can also benefit from each others' understandings of the subject matter. Honor students could be recruited as peer tutors to help in study groups or in one-on-one arrangements with other students.

    - The Seattle MESA program encouraged student participants to form study groups to help each other with classwork and to provide support and motivation.

16. Provide for students and volunteers to extricate themselves from relationships that are not working. Inevitably, some matches between students and volunteers will fail--for a variety of reasons: personality conflicts, problems with communication or behavioral styles, etc. Coordinators should make it clear to both students and volunteers that changes can be made to deal with major differences. This can help prevent negative feelings created by unhappy pairings and encourage participation in future partnership activities.

17. Establish a buddy system or some mechanism to deal with volunteer absences. Volunteer reliability is particularly important in tutoring programs since there may not be a viable alternative use of the students' time during the scheduled tutoring session. It is also important because students in tutoring partnerships need tutoring. And in one-on-one sessions, the absence of the volunteer can badly disturb the student, especially disadvantaged students already suffering from low self-esteem. One partnership that focused on minority youth reported great disappointment by tutored students when unexplained volunteer absences occurred.

Special Issues Regarding Disadvantaged Students

Tutoring partnerships are particularly important for disadvantaged students because these students frequently have problems with academic performance and need assistance to improve their grades. Tutoring partnerships can be even more helpful if minorities are recruited as volunteers, because these volunteers may be able to establish rapport with minority students more readily and serve as role models. The type of personal, supportive relationships that typically develop between tutor and student are particularly helpful for some disadvantaged students, who may not have many relationships of this type.

Tutoring partnerships can also be helpful in showing that the business community cares about the education and future of low-income/minority students.

Some issues of particular concern to disadvantaged students include:

- Scheduling of partnerships. Low-income students in particular may need to have after-school jobs. Tutoring that is scheduled to take place outside of regular school hours creates a conflict between academic and financial needs that is particularly burdensome to these students. Therefore, tutoring should be scheduled to take place during normal school hours to facilitate their participation.

- Providing additional time for tutoring or study through use of peer tutors and study groups can also be particularly helpful to this group of students. Their home environments may not always be conducive to study, and they may need more assistance than can be provided in the typical hour-long tutoring session with a volunteer. Study groups also convey the message that academic effort and achievement is acceptable to the peer group; this can help motivate students.

- Tutoring programs designed to provide reinforcement or remediation for entire classes, such as the one in Springfield, can be helpful in low-income/minority schools. This approach does not single out students who have already had academic problems but views an entire class as being "at risk."

- Small-group formats, rather than one-on-one tutoring, may be helpful in reducing feelings of failure or of being singled out. They may be particularly important in facilitating communication with tutors, especially non-minority tutors.

CHAPTER 13
MENTORSHIP PROGRAMS

Description

Mentorships involve matching students with business volunteers who serve as their advisors or coaches in one-on-one or small group situations. The intentions of mentorships are to expand educational experiences by having students work closely with volunteers on a particular project, such as a science-fair entry, and/or to expand career awareness through observation and hands-on experiences at the mentor's workplace.

Mentorship programs can take place in the workplace, school, or in both. Mentorship meetings can be held during regular school hours, after school, or some combination of these. Students may be excused from their regular or elective science or math classes to participate in mentorships. They may even be excused from other classes to provide a sufficient block of time to for participation.

Mentorships may be required as part of an elective class for which students receive credit or may carry credit as an elective class on their own. Mentorships may also be treated as enrichment activities for which no additional school credit is provided.

Mentorships can involve substantial amounts of student-mentor interaction--up to five to ten hours each week for a school year. They can still be useful with as little interaction as a few hour-long meetings over the course of a semester or year.

The following examples illustrate the range of mentorship partnership programs:

- In Howard County, Maryland (in the Washington, D.C.-Baltimore, Maryland suburban area), 11th and 12th grade students participated in a for-credit mentorship at the mentor's workplace. This mentorship involved science and engineering research projects intended to increase career awareness as well as provide substantive knowledge. Students spent five to ten hours per week at the workplace--the amount of time that would normally be required for a one- or two-credit elective course. They were released early from school to participate.

- In Indianapolis, students in science and math magnet programs at junior and senior high school levels could participate in mentorships held at the workplace on a not-for-credit basis. Students

spent a half-day (morning or afternoon) at the workplace during each visit. The number of visits per school year varied from 6-12, depending on the availability of the mentor. The focus of this program was career awareness and exposure to math and science applications in the workplace. Some mentorships involved students working on specific projects.

- In Elkhart, Indiana the mentorship program was part of a science fair elective course available to 7th and 8th grade students in all middle schools. Students were assigned to work with mentors on developing and preparing science fair projects. Credit was given for the course, but not for the mentorship alone. Students who were not registered for this course but who wanted to work with mentors on their science fair projects were also allowed to participate. Students met with their mentors in small groups at the school for four one-hour sessions held near lunchtime during the fall semester.

- In Cincinnati, 5th and 6th grade students met individually with mentors at the school, generally meeting once or twice a week over a four-month period. Meetings were held during regular school hours for about an hour. (Mentors were required to meet with students for a minimum of once a month for 40 minutes, but they chose to meet with students more frequently.) Students also made at least one visit to the mentor's workplace to "shadow" their mentor to develop greater career awareness. No credit was provided for this mentorship.

Applicability and Benefits

Mentorships held at the workplace are generally restricted to older students, primarily high school level.

The districts most appropriate for mentorship programs are areas where there is a large enough pool of potential volunteers within reasonable traveling distance (about a half-hour or less) to match the interests of applying students.

Mentor programs can provide greater insights and realistic information about career opportunities. Students often have the chance to observe what people in specific occupations do on a day-to-day basis, which can help them make career choices (including changing their minds about careers they had previously thought they wanted to pursue). They also receive information from their mentors about the kinds of courses to take in high school and college that will help prepare them for this career. If students have the opportunity to participate in mentorships more than once, as was the case in Howard County and

Indianapolis, they may be able to explore several potential careers before leaving high school or to pursue one science or math area in depth over several years.

Mentors serve as role models to students. This can be particularly helpful if women or minorities are included among the mentors. Observing mentors in the work setting provides students with information about how adults interact on the job, and about appropriate workplace behaviors, attire, etc.

Participating in mentorships allows students to see how science and math are applied in the workplace. Students often have the opportunity to use materials and equipment that are not available at the school as part of their mentorship experience. Project work enables students to pursue topics of special interest to them and to develop an in-depth understanding of these topics.

Mentorships that involve project work give students experience in developing projects and using scientific research methods. Students are typically required to specify the hypothesis they will test; design experiments to test it; observe and record data obtained from their test; and reach a conclusion and write up their findings. They may also have to do background research on the subject matter. This experience can provide excellent preparation for performing research and writing reports in college.

Mentorship experiences can also be a useful addition to a student's resume when applying for college or future jobs and can lead to summer and after-school job opportunities.

Mentorships can also lead to spin-off benefits for non-participants.

- In Elkhart, Indiana, the hands-on nature of the mentorship program was sufficiently impressive to school personnel that a project to redesign all science curriculum to incorporate more project work was undertaken.

- Also in Elkhart, middle-school students who had worked with mentors on science fair projects acted as mentors to help fourth grade students develop science fair projects in a format similar to the one used for their own mentorships.

Suggested Actions for Successful Implementation

Suggestions applicable to all types of mentorship are presented immediately below, followed by suggestions specific to mentorships held at the mentor's workplace, those in which students are assigned specific projects, and mentorships for credit. Note that some mentorships will have several, or all, of these characteristics.

1. Carefully match mentors and students. Obtain detailed information about the student's specific interests and find a mentor who has similar interests. By their nature, mentorships involve close associations between students and volunteers, often directed toward accomplishment of a specific project or conveyance of specific career information. Therefore, a good match to assure that the student is connected with a volunteer working in the specific areas of the student's interest is critical to the success of these partnerships. Coordinators should obtain very specific information about the nature of the student's proposed project or experiment, career interests, etc. Coordinators also need specific information about the mentor, such as area of expertise, interests, and if possible, personality.

   - Howard County found that if a student only identified a general subject area, such as biology or mathematics, this was not sufficient to permit an adequate match of student and mentor. The school coordinator required students whose descriptions were overly general to research the topic and return with more specific details as to their area of interest (for example, robotics).

   - In Cincinnati, students were matched with volunteers on the basis of responses to an interest survey administered by teachers. Students were paired with mentors who shared similar interests and could provide a learning experience in a particular area.

   - In Elkhart, students were asked to identify their science fair project topics prior to matching them with mentors. Volunteers completed a form indicating subject areas in which they could provide mentor assistance. These two sets of information provided the basis for matching students and mentors.

   - In Indianapolis, the school coordinator interviewed students about career interests, prior science and math courses and favorite subjects. Students ranked their interest in potential types of mentor experiences (e.g., in hospitals, engineering, computers, physical sciences) as part of the interview process. This information was used to match students with firms and mentors that had previously been recruited. The coordinator also made efforts to locate suitable mentors for students whose interests were not covered by the mentors already recruited.

It is preferable to identify student interests first, and then find mentors who match those interests, rather than recruiting mentors and then trying to "fit" students with mentors whose abilities or position may not be sufficiently close to the student's interests to meet the student's needs. This may not always be practical, but with the latter approach the risk of an unsatisfactory experience for both student and mentor is greater. It is possible to recruit potential mentors first, asking them to specify projects they are interested in working on with students. Students can then make selections from the list of available topics, provided they have sufficient background to work constructively in these

areas. This approach may be particularly helpful for students who do not have fully developed interests.

For off-site mentorships, especially ones for credit where the student will spend a lot of time at the mentors' workplace, the program coordinator needs to determine the following:

(a) Will it be a real project keeping the student busy and extending the student's knowledge and experience?

(b) Is there enough support from the mentor's organization so that the student will be welcomed and helped at the facility?

(c) Will the mentor have sufficient time to guide and help the student?

(d) Does the mentor recognize that these are high school students who lack extensive academic work and are not familiar with laboratory/research techniques (as might be expected from college or graduate students)?

2. Select mature students with real interests in the project or the mentor's profession. Mentorships are more loosely structured than classes, whether they are held at the workplace or in the school. Inevitably, students will on some occasions find themselves with little supervision by their mentors. Students should be sufficiently mature to behave responsibly and complete tasks as expected in the mentorship environment. Mentors have limited time for, as well as little experience in, motivating students uninterested in fulfilling their mentorship obligations. This can lead to frustration on the part of mentors and difficulties in recruiting mentors in the future.

Maturity can be assured, to some extent, by targeting older or advanced students for participation. For example the Howard County, Maryland program targeted high school juniors and seniors who were recommended by teachers and the Indianapolis program targeted students in its science and math magnet programs.

3. Allow ample calendar time for recruiting mentors, interviewing them, and making matches. Making good matches between students and mentors requires considerable time and effort on the part of the coordinator. Much of this work may need to be done during the summer months, particularly if the mentorship functions as a for-credit course that begins in the fall.

4. Search for mentors from a variety of sources. Once topics have been identified by students, coordinators should consult business directories, telephone directories, professional organizations, etc., to try to locate appropriate firms. Organization charts from firms should be used to identify specific offices and individuals within them who match particular skills. Personnel offices may also be helpful in identifying persons with specific skills and positions. A variety of sources for mentors should be considered. These include universities, government facilities, and hospitals, as well as businesses. Science, engineering, and computer firms are excellent sources (including the many computer stores, such as Radio Shack). However, do not neglect businesses whose major function is not science, engineering, or computers. These may not have many employees proficient in science or mathematics but may have a few. For example, banks, insurance companies, and manufacturing facilities are each likely to have at least a few potential mentor candidates.

Factors to consider in selecting mentors include:

(a) Recognized technical expertise of the mentor in the topic the student wishes to pursue--this establishes credibility of the mentor and of the program.

(b) Willingness and ability of the mentor to spend the time with the student on the student's agenda, not on that of the mentor. Several students in two mentorship programs complained that their mentors were so busy that the students spent their time running errands or waiting for something to happen.

(c) Reasonable access of the student to the mentor if there are activities at the mentor's facility. For elementary or junior high school students, this probably means a short ride by school bus, or possibly taxi, to the facility to reduce the amount of time spent away from school. For older high school students, this might mean selecting mentors that can be readily reached by public transportation (unless the school provides transportation or unless most interested students have their own means of transportation).

(d) Previous experience of the mentor in working with students. This is particularly important in more intensive mentor programs, such as a for-credit program.

(e) Racial or ethnic group membership. If the student represents a minority racial or ethnic group, teaming him or her with someone of the same race or ethnicity may help establish rapport between the mentor and the student and may provide a role model for the student to emulate.

5. Make mentorship goals and responsibilities clear and specific, preferably putting them in writing. This should include a detailed schedule identifying days and times that mentors and students will work together, as well as expectations and deadlines (such as completing a specific portion of a project by a specific date). This helps the mentor and the student keep their focus during what may be a long-term involvement. It also facilitates monitoring of the mentorship to ensure that it is accomplishing its objectives, and evaluating its success upon completion.

6. Provide orientation for both students and mentors. While orientation is advised for all partnerships, it is particularly important for mentorships, especially those held at the workplace. Since mentors and students will work closely together, it is desirable to provide an opportunity for them to get acquainted and discuss the specifics of the arrangement, either at the first meeting or prior to it.

   - In Indianapolis, the school coordinator sent mentors a one-page student profile prior to the mentor's first meeting with the student. The profile identified science and math courses the student had taken, career interests, hobbies, awards received, etc. The school coordinator provided individual orientations to students during their initial mentorship interview. The first session at the workplace was also used for student orientation, with parents invited to attend.

   - In Elkhart, students received orientation to their mentorship during class sessions in the science fair elective course. Prior to the first meeting with students, an orientation was held at one of the participating schools for volunteers from all the firms.

- o In Cincinnati, the coordinator developed a mentor handbook that described the program and expectations for participants. In addition, the first session of these meetings was used as a get-acquainted and orientation opportunity.

7. Monitor mentorship activities closely, particularly those at the workplace, to ensure that mentorships are being conducted as arranged and that student interests are adequately served. Check on absenteeism and lateness of both students and mentors. Request such information on a regular basis from the mentor. Check with the students to determine whether they are being provided with meaningful activities to do. The latter is particularly important for mentorships held at the workplace, where mentors may leave students waiting or performing trivial activities in order to meet their own work demands. Monitoring should also be used to determine whether projects are progressing as scheduled.

   Students should keep school coordinators or teachers informed of the progress and problems of their mentorship experiences. Therefore, regular meetings should be scheduled or regular reports provided for this purpose. In addition, students should also be asked for their views at the end of the mentorship.

   - o In Elkhart, both students and mentors filled in a brief progress report form after each mentorship meeting. The teacher for the science class reviewed these to determine whether appropriate progress was being made on the science fair projects.

8. Provide a back-up system for mentors, or provide for rescheduling of missed meetings. Mentors may occasionally have to miss a session because of travel, work demands, emergencies, etc. A pre-arranged system of substitutes can allow partnerships to continue as scheduled. This is particularly important for mentorships held at the workplace. In some instances, the mentor may be able to arrange for a substitute. If not, the mentor, of course, should notify the student in advance to prevent a useless trip to the workplace.

   - o In Elkhart, where mentors work at the schools, one substitute was recruited for every ten mentors. This system was initiated after early experiences with the program indicated that absences were likely to occur.

   - o In Indianapolis, mentors were encouraged to arrange to have colleagues in their offices substitute for them if they could not be present for part, or all, of a scheduled mentorship meeting.

9. Require students to provide periodic written reports on their mentorship progress. Mentorships provide a break in school routine and opportunities for hands-on project work that are more enjoyable to students than most regular classes. Students may get so caught up in the "fun" aspects of these activities that they lose track of the mentorship's educational goals. Therefore, provide some kind of mechanism, such as requiring written reports or diaries, that, at least periodically, reminds students of such goals.

   - o In Indianapolis, students were required to write a report at the completion of their mentorship experience. The report included descriptions of the mentor's job; the project the student worked on; instruments or procedures learned; new words added to the student's vocabulary; most

interesting aspects of the mentorship; and what helped the student decide whether or not the mentor's work continued to be a career interest of that student.

- o Students in Indianapolis were also encouraged, but not required, to keep a diary of each workplace visit. It was recommended that the student record what was done during that visit; what tools, instruments or procedures were used; new words or definitions learned; the most interesting aspect of the visit; and what was planned for the next visit.

- o In Elkhart, students prepared a "To do" list after each session with their mentors. The list identified things students should do before the next mentor visit, as well as what was planned for the next visit. This was intended to help keep projects on track between sessions.

- o In Howard County, students were required to maintain a log notebook which included: date and time of each meeting; purpose of activity; procedures followed; results; and comments.

10. Arrange for contact between mentors and teachers. Since mentorships generally occur outside the classroom such as at a lab or other locations, arrange other opportunities for teachers and mentors to communicate, such as scheduling regular meetings before or after the mentor works with the students at the school. This enables mentors to get information about their students' performance and the effects of the mentorship. It also allows teachers to make suggestions, reducing the likelihood that the teacher will feel left out of the process.

- o In Elkhart, mentorship meetings were scheduled around lunchtime, and mentors were provided lunch at the school. This gave them an opportunity to meet informally with teachers to discuss student progress on science fair projects.

- o Elkhart also asked mentors to complete a brief progress report/evaluation form after each meeting. The report included a "grade" for student performance in areas such as: having a realistic project and a well-thought out goal list; keeping on schedule; showing interest in the project; promptness; and courtesy. The report was provided to teachers so they could help keep students on schedule as well as provide feedback about the quality of student work and behavior.

11. Allow students to drop out of the mentorship program or change mentors if the original match is unsuccessful. There is little to be gained from having students remain in a mentorship that is not serving their needs. If mentors are unable to live up to their responsibilities, or if the match is not working for any reason, it is better to terminate it than to maintain an unproductive relationship.

Specific Suggestions for Mentorships Held at the Mentor's Workplace

Mentorships for which students journey to the mentor's workplace have some special needs:

1. Obtain parent approval for student participation in the program and provide them with periodic progress reports. Mentorships involve sending students away from the school building to work with a stranger at the stranger's organization. Parents will need to give their written approval for the mentorship. Subsequently, they should be kept informed about their child's progress, for example, by being provided copies of the mentor's and coordinator's evaluation of the student's work.

2. Address liability concerns when students are in transit or at the workplace. Parental certification will likely be needed that automobile insurance covers students driving to the workplace. The school coordinator should check with each business involved to determine the liability-insurance needs and coverage (e.g., whether the business needs a specific waiver or agreement signed by parents). In Howard County, Maryland parents were required to sign a statement releasing the school from liability and attesting that they had adequate automobile insurance coverage.

3. Make transportation arrangements for students. Transportation to the workplace can be handled in different ways. If enough students leave school at the same time and are going to the same site or direction, it may be possible to use a school bus to transport them. Older students may be able to drive or carpool with other students. Public transportation systems or taxis can be used. Transportation might be provided by the firms involved in the mentorship, by PTA members, or by school staff for some or all students.

   - In Indianapolis, a local taxi company picked up groups of students going to, or leaving, the same workplace. The school coordinator notified the taxi company of specific pick-up times and locations. The taxi company billed the school system for its services. (The school system used the same arrangement for transportation of handicapped students.)

   - In Howard County, students were responsible for their own transportation; most students drove cars to the work sites.

   Transportation arrangements should also be monitored to be sure they are operating as they should. Students, mentors, and business coordinators should be given clear instructions about what to do, and telephone numbers for who to call, if previously arranged transportation, such as taxis, fails to arrive as scheduled.

4. Be flexible in scheduling to accommodate mentor and student time constraints. In some cases, have more than one mentor if one person is not able to commit the full amount of time needed. In these cases, however, the mentors will need to coordinate the sessions carefully among themselves so that the student is able to benefit fully from the mentorship.

   - In Howard County, students and mentors were free to arrange their schedule to avoid the necessity of meeting on a daily basis. Students could spend longer periods of time at the workplace two or three days a week instead of a daily arrangement, as long as they were there for the specified number of hours each week. For example, a one credit mentorship requiring five periods of work could be scheduled for two days a week at 2-1/2 hours each day. This accommodated mentors who found it difficult to commit to being available each day and reduced the travel burden on students. It also enabled students to participate in extracurricular activities on those "free" days.

   - The Indianapolis program offered three different arrangements to meet the time constraints of mentors. The basic arrangement involved the same mentor for all visits. One variation involved a small number of mentors (two or three, for example), each of whom was responsible for some of the visits. The third arrangement used a different mentor for each visit. This flexibility in scheduling not only allowed them to utilize mentors who had limited time available, but exposed students to a variety of related careers in these firms.

5. Provide explicit procedures students and mentors should follow if they are unable to make it to a scheduled session. Students and mentors should exchange telephone numbers and be given clear instructions about how and when to notify each other, or a third party (such as the coordinator, teacher, or guidance counselor) if they must miss a session. It may also be possible for mentors to arrange for one of their colleagues to substitute for them if they must miss a session unexpectedly. Prior arrangements should be made with the coordinator to determine whether substitutes are acceptable, or whether missed sessions need to be rescheduled.

6. Make sure mentors have realistic expectations for the students. Problems have arisen in mentorships because too little, or too much, work was required, or because the work was either too demanding or too trivial (e.g., running errands for the mentor). Coordinators should work with mentors regarding expectations about what type of work will be assigned and about how much work should be required. They should also discuss what, if any, "homework" or outside assignments are appropriate for the particular mentorship. Students should also be given this information so they can provide feedback to coordinators if their mentors are not following these expectations.

7. Be sure that students understand what is required of them in the mentor program and what they may have to forego to participate. Students should understand the amount of time to be spent at the workplace and the kind and amount of work to be performed during the mentorship. They should also understand that they may have to make some sacrifices to participate in the mentor activity. The student may, for example, have to forego participation in sports and extracurricular activities to the extent that the mentorship involves after-school commitments. The participating students may also need to forego taking another elective. If students are excused from other classes to participate in a mentorship program, they will need to make arrangements to make up missed work.

   - In Indianapolis, students were excused from classes during the morning or afternoon when they were at the mentor's workplace. They were informed that they were responsible for making up all classwork missed while they were at the workplace and were expected to arrange with teachers or other students to pick up homework assignments or other materials distributed in the classes they missed.

8. Make arrangements for releasing students from school in a way that minimizes disruption of other classes or activities. Efforts should be made to schedule workplace visits to avoid having students miss required classes or classes that are particularly difficult to make up, such as science laboratory classes. Normally, the mentorships should be scheduled for the last period(s) of the day so that the student does not need to return to school after the mentorship period.

9. Provide school administrators and teachers involved with information about the mentorship program and its schedule. Mentorships often involve students leaving and returning to the school at odd times, or having free time on days when they are not at the workplace. This can cause concern on the part of school administrators who may feel that students are hanging around or leaving the school, instead of being in classrooms. Teachers might also mark students as absent or truant when they are really at the mentor's workplace. School administrators, science and math department heads, and teachers affected by the mentorship (such as teachers serving as advisors to the students or whose classes students will miss while participating in the mentorship) should be kept apprised of who is in the mentorship and be provided copies of the schedule of workplace visits.

Arrangements may need to be made about what students can do in their "free" time if they only go to the workplace a few days each week but are in school during that time period the remaining days. They might be assigned to go to the library or study hall, or be released to go home if it is near the end of the school day.

10. Assign each student a responsible staff member to oversee and act as an advisor for the mentorship. Normally, this will be a science or math teacher or the school coordinator. It might also be a school guidance counselor. This person should be responsible for obtaining periodic feedback on the mentorship from the student and from the mentor (probably at least monthly). This will help ensure that the mentorship is working satisfactorily and provide students (and mentors) with someone they know they can talk with if they encounter any problems during the mentorship.

Specific Suggestions for Mentorships in which Students are Assigned Special Projects

1. Be sure that projects assigned are within the capabilities of the students participating in the mentorship and are also capable of being completed within the time frame of the mentorship assignment.

2. Make it clear to students and mentors that the students are to do the project, not merely observe their mentors perform demonstrations or experiments.

3. Require a written schedule from the student, approved by the mentor, to ensure that students know what they are required to do to complete the project and when the different steps need to be taken. A schedule for completion of the various phases of the project, as well as overall project completion, should be prepared in advance and used by the coordinator or teacher to check periodically on the student's progress.

   - In Elkhart, students in the science fair mentorship prepared "To do" lists after every meeting with their mentors. The list specified the activities the students were to perform before their next meeting.

4. Students should be involved in designing the project, including developing the schedule for completion of the various steps, selecting and obtaining materials needed, etc. This will help increase their sense of responsibility and "ownership" of the project.

Specific Suggestions for Mentorships Involving Course Credit

1. Specify procedures for assigning grades to mentorship activities. Since mentors generally are not teachers and do not have the authority to give grades, a school official such as a science or math teacher or the school coordinator (if the coordinator can assign grades), will have to assign the grade.

   - In Howard County, the program coordinator for the school system, who was a certified science teacher, assigned grades.

As the person assigning grades is not apt to be an expert in all the subjects of the individual mentorships, he/she will have to rely to a considerable extent on information from the mentor as to

the quality of student work. Mentors should submit an evaluation report each grading period. The school should provide a format to the mentor for these reports, requiring information on performance and attendance.

Students should also be required to provide reports covering the same time period. These should describe their activities and what they believe they have learned and accomplished during that time. These materials should also be considered in grading. Oral reports on the projects from students to the teacher or coordinator can also be used to help in grading.

2. Keep science and math teachers informed and involved as much as practical. Science and math teachers might develop antagonisms toward the mentorship program if it attracts better students away from regular science and math electives. Mentorships, especially those for credit, can also be perceived as an indirect criticism of regular science and math teachers. Therefore, the coordinator should consider such steps as the following to gain the support of these teachers:

   (a) Keep teachers (science and math department heads in particular) fully informed about the program. This includes notifying them as to which students are participating, what subjects the mentorships are covering, and what firms and mentors are involved. Department heads should receive copies of the mentors' periodic evaluations.

   (b) Encourage science and math teachers to ask students in their classes who have been, or currently are in, mentorships to brief the class on their experiences. Since some mentorships may involve advanced applications of science and math, students (and possibly their mentors), could be asked to brief the teachers themselves on these topics, perhaps at special science and math teacher meetings. These steps can help both students and teachers to obtain current application-oriented information adding to class interest and to student and teacher knowledge.

   (c) Assign each student a science or math teacher to act as an advisor for the mentorship. This would provide a major role for these teachers. Responsibilities of advisors could include: helping students who run into problems with their mentorships; acting as an intermediary with the mentor if there are problems; periodically reviewing student progress; and grading the student. Since this advisory role would probably be beyond the teachers' usual duties, this assignment would probably have to be voluntary or be compensated in some way. This arrangement would reduce the role of the coordinator, who would still retain responsibility for matching students and mentors to avoid placing this time-consuming role on teachers.

Special Issues Regarding Disadvantaged Students

Mentorships requiring students to provide their own transportation to the mentor's workplace can be a major problem for low-income families. Low-income students may not have their own cars to use to get to the workplace, or if public transportation is required, they may not be able to afford it. Consideration

needs to be given to finding ways to subsidize or arrange for transportation of low-income students participating in this type of program.

Mentorship programs that take place during after-school hours may conflict with students' part-time jobs which may be essential for many disadvantaged students. Special arrangements, such as careful scheduling of the mentorship or, in some situations, financial assistance for needy students, should be made to maximize the number of students who can participate in the program.

Participation in mentorship programs might also require advanced academic preparation, which some disadvantaged students may not have. Furthermore, some minority or low-income students might reject this kind of partnership as being irrelevant to them, feeling that this type of career is out of reach for minorities or low-income people.

However, exposure to workplace mentorships can be particularly beneficial to disadvantaged students because they may have few opportunities for this kind of exposure. The role model aspects of mentorships can also be particularly useful if minority mentors can be found for minority students. This may be difficult, however, because of the relative scarcity of minority and female science and math professionals in some occupations.

School systems, and their business partners, should try to assure that low-income/minority students are not precluded from mentorship opportunities.

CHAPTER 14
PARTNERSHIP ACTIVITIES FOR TEACHER DEVELOPMENT AND TRAINING

Description

Partnerships for teacher development and training focus on increasing teacher awareness of current applications of science and mathematics in business and industry and on increasing teacher knowledge of recent developments in science. Increasing teacher enthusiasm for science and math is another common goal, both to make teachers more interested in teaching science and math, and to pass this enthusiasm along to students. These efforts could be particularly focused on long-time teachers whose own education is dated, or on teachers who did not specialize in science and math in college or who are not currently certified as science or math teachers but are now teaching it.

These programs may involve special summer job assignments or internships, conferences or workshops, special courses, and participation in professional lecture series. Conferences, workshops and special courses generally involve relatively brief time commitments; they may be arranged as a small number of day-long sessions held over the course of the year. Internships generally involve more substantial time commitments. Some of these can be full-time jobs over a period of weeks, or even over the entire summer. Internships generally involve a stipend or salary.

- In Berks County, Pennsylvania, teachers were provided a $1,200 stipend in 1988. Participating firms were required to contribute the amount of the intern's stipend. The school districts were also required to contribute toward the program's costs.

Partnerships for teachers can take a variety of forms:

- In St. Louis Park, teachers participated in a two-week Summer Teacher Academy. Honeywell employees used their expertise in math and science to upgrade and "retrain" math and science teachers from area high schools. Teachers toured different facilities of the partner, listened to presentations, and completed a project in a specific area (e.g., biology, chemistry, etc.) applicable to the classes they taught. Each teacher worked with at least one volunteer engineer on the project. Based on their experiences, teachers developed new curricula and shared ideas and lessons learned with other teachers.

- The Technology in Education (TIE) partnership involved about 25 Seattle area companies and a science museum. TIE's "Upgrade" program provided day long workshops three times a year for middle and high school teachers in Washington's Puget Sound area. The workshops combined half-day keynote lectures for the entire group, and half-day tours and lectures at one of the science or math related industries in the area. Teachers were thus exposed to current applications and developments in science and math as well as to career information. Teachers chose the industries they would visit, selecting ones related to their teaching assignments.

- The Berks County Educator Internship Program placed science and math instructors from junior and senior high schools from 18 school districts into six week summer internships with local technology-oriented industries. The teachers each worked at a host firm Monday through Thursday under the direction of "mentors." On Fridays, the teachers met as a group at various host firms for tours and presentations on education and training requirements for jobs in those firms. The teachers also developed lesson plans to incorporate their experiences in their classes.

- In Long Island, Grumman Corporation held annual staff development days for high school math, science, and technology teachers. On these days, teachers were given tours of Grumman facilities and were allowed to interact with Grumman employees. These interactions helped teachers arrange for tours, lectures, and demonstrations for their students. Teachers were also invited to attend a series of professional lectures given by experts in various fields and paid for by Grumman.

Applicability and Benefits

Although teachers are the target of these partnerships, students are the ultimate recipients of the benefits. Increasing teacher awareness of how science and math is applied in the workplace, as well as recent developments in these fields, has multiplier effects, such as increasing the quality, relevance, and magnitude of the information passed down to students. Teachers often develop new enthusiasm for these subjects as a result of partnership activities; this enthusiasm carries over to students. Teachers subsequently should be able to provide more up-to-date information to students on science and math and use more hands on teaching techniques learned through their partnership involvement. The teachers will be able to provide better responses to student questions, particularly to those questions related to applications of science and math theories and to careers in these subjects.

Participation in teacher-oriented partnerships also helps alleviate teacher isolation and "burnout." Teachers have a chance to interact with professionals who are not teachers and to be treated as professional

colleagues while doing so. This enhances their self-esteem and reduces the isolation of the school environment. Involvement in activities that are completely different from the classroom environment also help reduce burnout. An opportunity to learn new things is energizing and motivating.

Teachers may also benefit by making contacts with employees who might be sources of future help. This help might take the form of providing classroom demonstrations or workplace tours, donating material, helping teachers develop classroom projects or demonstrations, or answering technical or career-related questions teachers may have.

Firms also benefit as teachers involved in partnerships pass along information on job requirements, expectations, and career opportunities to their students. Teachers providing a positive image of the firm can help recruit future employees. The presence of teachers in the workplace and their enthusiasm for what they are learning and working on may also motivate the firm's employees. They may view their jobs as more important because of the interest of the teachers.

Firms participating in internship arrangements benefit from the fresh perspective teachers bring to their jobs as "outsiders." Firms may be able to use teacher interns to work intensively on special projects that do not fit the schedules or skills of their own employees.

Suggested Actions for Successful Implementation

The suggestions below are divided into two groups: those aimed at non-internship activities such as workshops and seminars; and those for internships.

Suggestions for Workshops and Seminars

1. Be sure that business-run, teacher development programs are not "over the heads" of the teachers. Teachers participating in this kind of activity may be generalists without advanced training in science and math. Seldom will they have the specialized skills possessed by science and engineering personnel working at specific businesses. Business volunteers involved in making presentations may not be aware of this, and may talk over teachers' heads, or select overly-difficult topics for individual projects, demonstrations, etc. A way to help assure that the material stays at an appropriate level are to give the presenters brief biographies of the participating teachers and relevant pages from school lab manuals, texts, curricula, etc. This way presenters can get an idea of the level on which teachers

are working. The program coordinator should also be careful to make this point when making arrangements with the presenters.

- o In Seattle, the TIE program initiated a feedback mechanism to guide and help refine program content. The TIE coordinator had participants fill out evaluation forms each year. Comments about overly-sophisticated presentations were conveyed to business partners, who modified presentations to better match the background of participating teachers.

2. Help participating teachers incorporate workshop experiences into their classes. Teachers who participate in these partnerships are not always able to readily relate the information they receive to their classes, or to take the time to modify curriculum, develop experiments, etc. This can be facilitated by providing teachers with, or helping them develop, "ready-to-go" materials for classroom presentation and application. These materials can include hand-outs explaining specific demonstrations, projects, problems or applications to use in the classroom. Provision of materials that can be readily incorporated into existing curricula helps assure that students will benefit quickly from their teacher's experiences.

   To encourage this, try to include sessions for all participating teachers on how the materials learned could be best adapted to the needs of the teachers' classes. During such a session, teachers could be asked to brainstorm ideas for classroom demonstrations or projects, curriculum ideas, etc. They might also be asked to prepare brief, rough outlines of lesson plans. Such a step preferably should be scheduled for the last segment of the partnership activities.

   - o In the Berks County internship program, teachers met as a group on Fridays to work on developing lesson plans utilizing their internship experiences. This provided an opportunity for teachers to help each other and discuss ideas for lesson plans.

3. Provide background reading materials to help teachers prepare for their training experiences. Copies of magazine or journal articles, or a short bibliography, and some information about the firms that participate in the workshop/tours should be sent to teachers in advance. This will help them better understand the perspectives of the business presenters and, thus, learn more from the experience because they will have already been exposed to some of the "basics."

4. Provide realistic career information that teachers can give to students. This should include information about opportunities in non-glamorous fields of science, as well as highly publicized ones (being an astronaut, for example).

   - o In the TIE program, some participants felt their exposure to a variety of jobs in the seminars, rather than just particularly interesting ones, was helpful in conveying a sense of the realities of careers using science or math.

5. Provide transportation or transportation reimbursement for workshops and tours that involve travel to business sites. Make arrangements for teachers to park at business facilities that may be crowded with employee cars. Allow sufficient travel time between sites if more than one site is involved.

6. Provide opportunities for teacher-teacher and teacher-business interaction. A luncheon or afternoon reception where all participants are brought together for an opportunity to talk about their experiences

and how they could be incorporated into the classroom increases enthusiasm and the likelihood that information will be used in classes.

- o Seattle's TIE program provided such luncheons at TIE workshops, allowing for interaction opportunities between teachers and between teachers and business employees.

7. Provide sufficient time for questions or interaction with business people who make presentations.

8. Provide "hands-on" opportunities for teachers, such as time to "play around" in labs or with computers--to increase enthusiasm and the likelihood of these materials being incorporated in their classes.

9. Include a variety of businesses, and match teachers with those that are related to their classroom assignments to maximize the usefulness of the training experience.

- o Business presenters for TIE workshops were chosen to assure adequate representation of firms related to biology, mathematics, chemistry, and physics, which were the subjects taught by participating teachers.

10. Provide opportunities for brief "training" or "updating" opportunities in addition to those involving more substantial time commitments. All teachers are not able to spend several weeks in internships or even to attend one or more day-long workshops held during the school day. In addition, such opportunities, particularly internships, are generally only available in limited quantities. Therefore, shorter opportunities should be provided to enable more teachers to be exposed to career-related uses of science and math. This might be accomplished by arranging for teachers to attend meetings sponsored by professional organizations, colleges and universities, or science and math-related businesses throughout the year.

- o In Long Island, Grumman invited high school teachers from partnership schools to attend a series of professional lectures they sponsored each year. Each year, Grumman held three or four staff development days, each devoted to a different subject area. Tours of Grumman facilities were given, emphasizing the ways in which the teachers' subject area was being applied in the workplace. Grumman also invited teachers to a technology forum held every other year for college professors.

- o Honeywell provided a Scientist of the Month lecture series at the St. Louis Park High School. Although intended for students, teachers could also attend.

Alternatively, arrangements could be made for short (1-2 hour) workshops or seminars designed specifically for teacher-training or updating. These might be held after school or on Saturdays a few times during the school year.

<u>Suggestions for Internships</u>

1. Allow plenty of lead time for recruiting teachers and businesses. Since most internships occur during the summer, it is important to recruit teachers before they make plans for summer jobs or family vacations that would prevent them from using the internship opportunity. Initial recruitment announcements should be distributed during the fall. Recruitment materials should be sent directly to

individual science and math teachers, not just to the schools which might not pass the information along quickly. Recruitment material should also be sent to principals and math and science department heads (who normally are also teachers), who should be asked to encourage teacher participation. Businesses should also be contacted in the fall in order to determine how many, and what kind, of internships will be available. This also allows sufficient time for developing the internship positions.

- o In the Berks County program, firms that had previously participated in the program, or that appeared to be good possibilities for participation, were initially contacted during the fall. They were asked to submit a general job description for the internship by January. The partnership coordinator matched these with applications from interested teachers. Finalists for the internship positions were interviewed by the coordinator during February; matches were reviewed by a steering committee before selections were finalized in April, when firms and interns were notified of the placements.

2. Match teachers to internships. The material learned during the internship should be usable in teachers' classes. Teachers can be frustrated if much of their internship experience cannot be used in the classroom because their teaching assignments are not in the same field as their internship . Information about the courses for which the teacher is responsible should be obtained prior to making internship assignments. The highest priority for matching teachers to internships should be the assignment's relationship to the teacher's courses. Teachers should be given the opportunity to review their assignments to see if they meet this criteria, and to receive different internships if they do not.

   Allow teachers to participate in the matching process by allowing them to express preferences for assignments based on descriptions of the firms and the internship assignments in them. Teachers could rank their preferences and identify those that definitely would not be useful to their classes. This information would be used to provide guidance for the matching process. Teachers can also be asked to indicate the area of expertise of the mentor that would be most helpful. Then the school coordinator would need to seek organizations with opportunities that are as similar as possible to the teachers' desires.

3. Recruit a variety of firms to maximize the likelihood of placing teachers in internships relevant to their courses. Use business organizational directories, especially for larger organizations, to identify units within the organization likely to be able to provide experiences requested by teachers.

4. Involve teachers in designing their internship activities.

   - o In Berks County, a joint orientation session was held for teachers and their internship mentors for them to work together on developing a comprehensive job description that considered teacher needs and abilities. (This meeting was held after an initial orientation session with each teacher.) Additional follow-up meetings to continue work on this could be scheduled, if needed.

5. Develop and articulate clear expectations of the firm and the teacher. Recruitment materials for businesses and teachers should include clear general descriptions of what is expected of each party in terms of time commitment, nature of work to be done, nature of training and supervision to be provided, costs and/or compensation involved, curriculum or reports to be prepared, etc. Specific job descriptions should be developed, and put into writing, after teachers are matched with firms.

Teachers should be involved in developing these. Coordinators should contact each teacher during the first week of the internship to be sure that the actual assignment agrees with the planned description.

6. Include names and telephone numbers of teachers who have previously participated in internships in the teacher recruitment material. An internship of several weeks duration is a major commitment for many teachers. Enabling them to hear directly from other participants might increase their enthusiasm which will increase the number of participants in these partnerships.

7. Be sure internships expose teachers to the entire firm, not just the portion where their internship is located. One of the goals of teacher internships is for the teacher to subsequently give students a sense of how science and math is used in the business context. To accomplish this, teachers should be exposed to the entire firm, not just a small part of it. Internships should include tours of the firm. They might also incorporate exposing the teacher intern to a variety of positions; however, this approach has the drawback of not letting the teacher dig into a project (which is usually more self-satisfying). Interviews with management and/or personnel officers should be arranged to provide teachers with a better perspective on the business.

   - In the Berks County program, to provide interns with greater exposure, all interns met at one firm on Fridays for a tour of that facility and a presentation on education and training requirements of that firm. Interns were also expected to visit the personnel office of their own firm to obtain information on its job requirements. This information was written up and shared with guidance counselors of all schools in the county.

8. Provide opportunities for interns to interact with each other. Interaction with other interns will help teachers focus on the classroom benefits of their internship. Hearing about how others plan to incorporate their internship experiences into their classes will help generate ideas.

   - In the Berks County program, the Friday meetings were also used to work on developing lesson plans utilizing their internship experiences and preparing progress reports required by this program. The program also included a follow-up seminar in November for them to discuss how they had used their lesson plans and internship experiences in the classroom.

9. Require teachers to develop lesson plans, classroom demonstrations, student projects, etc., incorporating their internship experience into their classes <u>while they are still participating in the internship.</u> Set aside specific time periods during the course of the internship to insure that this is done. Set aside the final sessions of the internship to work on ways to adopt what the teachers learned to their classroom lessons.

   - Teachers in St. Louis Park, Minnesota were assigned to work with Honeywell engineers to develop a project that would incorporate their experiences in the Summer Teacher Academy into their classes.

10. Provide incentives and adequate compensation for teacher participation. Most teachers have demands and responsibilities to meet in their hours outside school and might not be free to attend training programs, especially ones requiring take significant amounts of time outside school hours.

- Berks County offered teachers participating in its six week summer internship program a cash payment ($1,200 in 1988) and graduate credit, arranged through a nearby university. In-service credits had also been offered in previous years. This arrangement was not completely satisfactory to teachers, however. Some felt that the compensation was too low, less than they could find for better paying summer employment. Furthermore, graduate credits were of little value, except to younger teachers, because most of the tenured teachers had already achieved their highest pay ranking based on graduate experience.

Special Issues Regarding Disadvantaged Students

Partnerships focused on upgrading teacher skills in science and math can be of particular importance to schools in low-income/minority areas, especially if these schools have higher concentrations of science and math teachers who are not certified as science or math teachers. Such teachers are in greater need of this kind of partnership opportunity, and their students are likely to receive greater benefits from it.

Greater teacher awareness of career information regarding science and math is also likely to be of greater benefit to disadvantaged students, since they are less likely to be exposed to such career information outside of school.

Finally, because appropriate role-models can be particularly important to minority students, especially in low-income areas, the school system should make a special effort to recruit minority teachers for training opportunities. Participating businesses should make special efforts to recruit minority scientists and engineers to work with these teachers. The latter situation will enable the teachers to give more encouragement to the minority students about the opportunities available to them.

SECTION IV

SPECIAL OVERALL ISSUES IN PARTNERSHIPS

Some issues concern all types of partnerships. Questions all schoc and businesses involved in partnerships must ask are: "How is the partnership working?" and "What changes need to be made to make it a more effective relationship?" Chapter 15 details different monitoring and evaluation techniques which can help answer these questions.

Another common concern of partnerships is how disadvantaged students are being served by the various activities. Chapter 16 highlights some of the problems partnerships face with disadvantaged students and responds to these problems by providing suggestions for how to ensure that disadvantaged students are involved in and benefit fully from the partnership activities.

CHAPTER 15
MONITORING AND EVALUATION

It is vital that school and business personnel monitor and evaluate their partnership activities. Information is needed to identify the need for, and to suggest specific, corrective actions or improvements. It is also needed to indicate whether the effort applied is worthwhile and whether the programs should be modified, expanded, reduced, or terminated. This information can also be useful in obtaining continued support for partnership activities. Such information can also help recruit new schools and businesses to expand the scope of partnership activities. It also provides supporting evidence for potential funders, such as foundations, trusts, or the business community.

In this report the term "monitoring" means the process of obtaining regular feedback on whether the partnership process is working as it should and on how well individual key participants are doing. Feedback from monitoring provides early warnings of problems so that necessary improvements can be made. Monitoring should be done at regular intervals throughout the school year, at the end of each partnership activity (e.g., at end of each semester), and at the end of the school year. This facilitates prompt correction of problems and encourages program improvements that make partnerships successful.

The term "evaluation" refers to a more in-depth examination as to how the program as a whole has been doing, particularly in regard to the program's goals and objectives, such as improving student knowledge of, and interest in, science and math subjects and careers. This activity is is required once every two or three years.

Most partnerships we examined undertook a variety of informal monitoring activities. Some used more formal monitoring, and a few attempted to evaluate their programs in a systematic way. Virtually all partnerships could have strengthened these activities.

The sections below first provide suggestions on monitoring and then on evaluation. These suggestions provide a "menu" of methods that schools and businesses can use to monitor and evaluate their partnerships. Partnership coordinators should choose the methods that will be the most appropriate for their purposes, given their resources. We do not suggest that all these methods be applied in all cases, since most partnerships have highly limited resources available for monitoring and evaluation.

Monitoring

Monitoring activities may be informal or formal. Partnerships should use both. The distinction between formal and informal monitoring in this report is based on the format and use of monitoring "findings." Formal monitoring involves written submission and compilation of findings for use in some "official" way, for example, inclusion in a school coordinator's files or in a report on the partnership, or for insertion into student files or use in calculating grades. Informal monitoring primarily involves face-to-face or telephone contact. It can also involve written material that is not compiled or used in an official or formal way. For example, a volunteer might write a memo on student behavior or achievement to keep the student's teacher informed; or a student might keep a record of project activities for periodic review by the teacher. Both of these activities are informal if there is no compilation or official use of the written material involved. When an important problem is discovered through informal monitoring, the coordinator or teacher may then need to take more formal action to correct the problem.

Informal Monitoring

Throughout this report, obtaining regular feedback from the various partnership participants--the volunteers, students, and teachers--has been emphasized as a basic element of partnerships. Regardless of the category of partnership, the school system, (particularly the school coordinator) should establish

procedures to obtain feedback from the various participants at intervals throughout the school year. Informal contact should occur:

- o Between the school coordinator and the involved teachers.
- o Between the coordinator and/or teacher and the involved students (these contacts might be initiated by any of these parties).
- o Between the teacher or coordinator (whichever person is responsible for the student) and the volunteer.

Informal contacts should be used to find out whether the partnership activities are proceeding satisfactorily; what specific problems participants are having; whether the logistics and content of the activities are working well; and whether any changes are needed to improve the quality of the partnership. The coordinator or teacher should also check on absenteeism and promptness of students and volunteers to determine whether corrective action is needed. The coordinator or teacher should check on whether the partnership schedule is on track, and if not, they should determine how to get the activity back on schedule.

As indicated in earlier chapters, we suggest encouraging such informal procedures as the following:

1. Informal meetings or telephone calls. This includes brief meetings between teachers or school coordinators and volunteers immediately before or after partnership activities, over lunch. or after school. Telephone calls can take the place of some meetings, particularly if they involve checking material to be covered; schedules or schedule changes; or student understanding of materials. Telephone contacts should supplement, not replace, face-to-face meetings.

2. Observation of partnership activities. The teacher, school coordinator, or a member of partnership office staff, might sit in on all or part of one or more of the volunteer's sessions with the student(s), or "drop in" briefly during the activity to see that things are going as they should.

3. Informal written materials, including brief forms. This might include short check-lists that students or volunteers complete as progress reports, or materials such as student diaries, logs, or to-do lists.

One or more of these types of informal monitoring contacts should probably be required at least monthly.

Some examples are:

- The coordinator of the Osceola tutoring program arranged for tutoring sessions to be held in classrooms near the teachers of the students being tutored to encourage informal contact before or after tutoring sessions. Many teachers and volunteers found this to be very useful in providing informal feedback on student progress and information about topics in which students were having difficulty. The coordinator regularly dropped in on the tutoring sessions to check attendance. If students were missing, she went to their classroom to see if they had forgotten the tutoring session or if they were absent. She also frequently had brief, informal meetings with volunteers before or after their tutoring sessions.

- Students in the Indianapolis mentorship program were encouraged to keep a diary of each visit to the workplace to help them write their final report on the mentorship assignment. (If a teacher or school coordinator had reviewed these diaries during the course of the program, the diaries would have provided feedback as to whether the mentorships were functioning as they should, and whether appropriate matches had been made.)

- In the Elkhart mentorship program, volunteers completed a brief scorecard on student progress on science fair projects after each meeting. They used standard school grades (A, B, etc.) to rate students in six categories: realism of their project; well thought-out goals; schedule maintenance; interest in project; promptness; and courtesy. These were provided to teachers as feedback on student performance. In addition, lunch at the schools was built into the partnership to provide an opportunity for informal interaction between volunteers and the teachers and school coordinators.

- The "To Do" lists prepared by Elkhart students at each meeting with their mentor was also reviewed by their teachers between meetings to check that students were keeping on track in terms of progress with their science fair projects.

- In Osceola, the physics teacher checked with the students after tutoring sessions, especially early in the process, to be sure that the students were understanding and benefiting from the effort. If not, the teacher gave feedback to the tutors and worked with the students to get them prepared to work with the tutors. Students often reviewed their test results with tutors, thus giving them a sense of their effectiveness. Also, the coordinator informally checked student progress by looking over report cards and talking with teachers. This information was also conveyed to volunteers in an informal manner.

- Volunteers in the Osceola tutoring program "signed in" in a book in the coordinator's office each time they came to the school. This could be used to informally check on attendance and promptness. Teachers occasionally left notes for volunteers in this book; thus, it served as a communication device as well.

- Volunteers in the Los Angeles Cowan Avenue School partnership checked in at the principal's office and were escorted to the science/math lab. This, too, served as an informal check on attendance and promptness.

- In Seattle, if students were not at the Rainier Bank Tuesday night tutoring sessions, bank volunteers often called students' homes from the school to inquire about their absence. Alternatively, they would ask the school coordinator to ask about it during school hours.

- Many partnerships in the demonstration/lecture category, such as the various St. Louis partnerships, ARCO-10th Street School, Chevron-Cowan Avenue School, and others, had teachers present during the partnership activities. This enabled teachers to talk informally with volunteers, and to provide instant feedback about whether the activities were at the right level for students. In St. Louis, a member of the partnership staff as well as the teacher was on hand for volunteers' lectures and demonstrations. The partnership staff member served as a neutral party and provided another feedback perspective.

- AMOCO volunteers in Tulsa met as a group every other week for a combined training and debriefing session. This provided an opportunity for informal feedback about the preceding partnership session and discussion of any problems or suggestions for improvement raised by volunteers.

- A small group of teachers, volunteers and students from the St. Louis Park partnership with Honeywell met with the school and business coordinators three times a year. These meetings were used for informal feedback and discussion about how partnership activities were functioning, to make suggestions for improvement, and to plan and schedule activities for the next year. Minutes of these meetings were sent to all participants so that they too could benefit from the informal discussion.

Formal Monitoring

School systems will be tempted to rely solely on informal monitoring. Informal monitoring is easier, and many assume that informal contacts will catch all, or most, problems. This is not true. To indicate what can happen, we draw from one experience.

- The partnership coordinator and the teacher were very satisfied with a very technical partnership program. However, a survey of former and current students indicated significant difficulties with the volunteer's presentation style and ability to keep students interested and motivated.

Informal monitoring should be supplemented by more formal monitoring. Formal monitoring involves the use of questionnaires, checklists, or similar written materials to provide feedback about the partnership. Findings from both kinds of monitoring should be used to give a more comprehensive picture of the partnership's progress and problems.

Key aspects to consider in formal monitoring are:

Sources of information
Questionnaire development
Analysis of information
Dissemination and use of monitoring information
Obstacles to formal monitoring

Sources of Information. Formal monitoring provides some of the same information as informal monitoring, such as: whether volunteers and students are absent or late frequently; whether content, logistics, and scheduling of activities are being performed as planned; whether matches appear to be appropriate; and whether participants are satisfied. However, formal monitoring should also be used to obtain additional information, particularly about the impacts of partnership activities, such as effects on student performance and interest in science and math.

Items that can be used for formal monitoring include:

1. Records of absences and lateness of volunteers and students.

2. Written evaluation of reports or projects that were assigned to students (whether prepared by the volunteer, teacher, or school coordinator). The coordinator and teacher can use these items to ascertain a student's progress in the partnership.

3. Students' grades and standardized math and science test results--relevant to the subject matter of the partnership, and changes in these over the course of the partnership.

4. Feedback from students on questionnaires that ask students to rate various aspects of the partnership experience (including volunteer performance).

5. Feedback from volunteers on questionnaires that ask volunteers to rate various aspects of their experience with the partnership.

6. Feedback from participating teachers questionnaires that ask teachers to rate various aspects of the partnership. (These should be requested whether the teacher is the direct recipient of the partnership assistance or is monitoring student's participation.)

Structured questionnaires will help assure that monitoring efforts cover major issues. Seeking feedback from all participants will help assure that the findings are representative of all participants and are not only the opinions of a vocal minority who might be relied on for informal contacts.

Records of absenteeism and lateness should be made at each partnership session for formal monitoring. These records should be scheduled for submission to the coordinator or teacher periodically, such as monthly, throughout the partnership activity. Items 4, 5, and 6 in the above list normally should be required at the end of each partnership activity. However, if the partnership is a multi-semester activity, questionnaires should be completed at the end of each semester. Note that some people use the term "evaluation" to refer to formal monitoring activities, particularly use of questionnaires.

Questionnaire Development. Use of questionnaires to obtain feedback is a key feature of formal monitoring. Somewhat different questionnaires need to be developed for students, volunteers, and teachers in order to obtain the appropriate information from each type of participant. Examples of questionnaires for students, volunteers and teachers are included in Exhibits 11, 12, and 13, respectively. Schools can use these as starting points for their own monitoring questionnaires, adapting them to the partnership's specific characteristics.

Questionnaires for each group should include some questions that ask for ratings of various aspects of the partnership as well as some questions that are "open-ended." The latter include questions asking for comments and suggestions for improvement. Responses to these open-ended questions can help explain negative ratings and provide ideas for improving partnerships.

Analysis of Information. The findings from the various types of formal monitoring items should be both (a) examined for problems in individual cases (e.g., individual volunteers or students), and (b) tallied across cases, e.g., for each class and for all classes receiving assistance.

This processing should be the responsibility of the school or school system coordinators.

The school coordinator may be able to take advantage of the technical skills of the science and math departments in the participating schools if these faculty are interested in providing assistance on a voluntary basis. They could provide assistance with the following activities:

- o Helping design the questionnaire to produce information that is valid and reliable. (Teachers might use this design problem as a class project.)
- o Develop the software needed to tabulate the data.
- o Help analyze the data and prepare the report.

Such assistance should only be asked of science and math teachers on a voluntary basis, e.g., as an opportunity to apply their technical skills and for possible use as class projects. These tasks should not be imposed on the teachers.

Dissemination and Use of Monitoring Information. The primary purpose of informal and formal monitoring is to identify improvements that are needed. Interim monitoring, of both types, done during the partnership activity should be used for immediate correction of problems.

In order for this to occur, the information obtained needs to be disseminated promptly to those in a position to take corrective action Questionnaires and other information sources should be processed and analyzed promptly so that information can be converted into action in a timely way.

Dissemination can be done in a variety of ways. Brief reports or memos prepared by the coordinator can be sent to principals, teachers, business coordinators, and volunteers. Results can be summarized in regular partnership publications. Meetings with principals, teachers, business coordinators, and/or volunteers can be held to discuss the findings.

Coordinators and other responsible parties should be committed to acting upon problems. Helping participants and providing meaningful activities should be the primary goal of partnerships. Failure to act in order to avoid potentially embarrassing someone or appearing ungrateful to volunteers or business partners does not make sense.

- In one partnership, a few students who complained about the matches of students and volunteers were told by a school coordinator that changes in assignment could not be made. As a result, these students did not learn much from their partnership involvement and were frustrated and angry as well.

The formal feedback activities that come at the end of a partnership activity should be used to improve future partnership activities. For example, the teacher and student assessments of the volunteers should play a major role in determining: (a) whether the school should encourage the volunteer to participate again, and (b) whether the school system should provide special training for the volunteer to help reduce identified problems. Assessments of effectiveness of partnership activities or arrangements should be used to modify content or format of future activities.

Examples of partnerships that have used formal monitoring include:

- In Tulsa, volunteers were required to sign in whenever they entered the school. The sign-in sheets were sent each month to the school volunteer coordinator, who compiled and reviewed the data to make sure the program was active and receiving adequate volunteer support. The Junior League also monitored this partnership, keeping track of volunteer hours, expenditures, and problems. The League prepared an internal report each year that included this information and made recommendations for improvements.

- The Tulsa volunteer coordinator's office also surveyed school principals at the end of each year about the extent and quality of volunteer participation in their schools. School librarians were surveyed about increased requests for science related books and articles as an indicator of program success.

- In Indianapolis both students and their mentors were given questionnaires to complete at the end of the mentorship experience. In addition, students were required to write a report on their experience and were provided with guidelines as to the content of the report, including identification of: what was most interesting about the experience; what could have made the visits more beneficial or interesting; and whether the experience was worthwhile.

- Students in Seattle's MESA program were given questionnaires asking for ratings of each of the projects presented in the MESA class (on topics such as energy, structural engineering, artificial intelligence, and logic and problem-solving) on its completion and, later, a questionnaire asking for a rating of the entire MESA program for the year.

- Elkhart administered questionnaires to students, teachers, and mentors. This program also used a standard student attitude inventory to determine whether the science fair mentorship had an impact on overall attitudes. Information from the various instruments was compiled and reports sent to the Indiana Partners in Education Program, which had provided funds for development of this program.

- Teachers participating in Seattle TIE's teacher upgrade program were given questionnaires to complete each year. The program coordinator used the results to provide feedback to business partners that some presentations were overly sophisticated for the teachers. Adjustments were made by business presenters to better match the teachers' backgrounds. The forms were also used in selecting topics and presenters for the next year.

Partnership offices that serve entire school districts, or even entire states, often urge participating schools to conduct formal monitoring of their partnerships each year. The offices sometimes provide sample questionnaires for schools to use for this purpose. In some cases, partnership offices take responsibility for conducting yearly formal monitoring.

- The Los Angeles School Partnership Office sent principals of participating schools a "Summary of Activities" sheet each year. This form identified factors that strengthened partnership activities (such as recognition or appreciation of volunteers, publicity for the program). The form was recommended for use in planning activities for the coming year.

- The Partners in Public Education (PIPE) office in Seattle distributed questionnaires to be completed jointly by the school and business coordinators at the end of each year. These were completed at a meeting that PIPE sponsored for all partnership participants and were retained by the PIPE office to provide guidance for overall partnership development.

- The Indiana Partners in Education Program required that recipients of its grants conduct formal monitoring of their programs. They provided a variety of sample instruments that could be chosen for this purpose and also covered the topics of monitoring and evaluation in the partnership training programs they provided.

- The St. Louis Partnership Program sent questionnaires to teachers and school coordinators at the end of each program to get their opinions on the quality and helpfulness of the partnership and their views on the presenters and materials used in class. The program also sent forms to the business partners to collect data on hours of volunteer time and materials donated, and estimates of the value of volunteer services.

- The Monsanto partnership in St. Louis tried using tests of student knowledge to monitor partnership impacts. Students were given a brief, multiple-choice quiz on engineering concepts before participating in the partnership, and again after they had participated. Scores on the two tests were compared to determine the impact of the program.

Obstacles to Formal Monitoring. Formal monitoring procedures require added work to construct data collection instruments, administer forms, analyze data, and report results. School personnel, such as teachers, are not likely to want added administrative requirements, such as undertaking the ratings. Clearly,

the school coordinators should avoid burdening teachers with unwanted tasks such as processing the questionnaires.

Monitoring By the Business Partner

Thus far, we have talked about monitoring by the school system. The coordinator for business partners should also undertake monitoring. This involves such tasks as the following:

1. Hold periodic informal discussions with each volunteer as to progress, problems, and possible corrections for those problems. This information should be used by the business coordinator to help reduce problems, such as by the business coordinator relaying the problem to school coordinators and working with them to alleviate it.

2. Check periodically that volunteers are meeting their scheduled commitments to the schools. This can be done by checking directly with the volunteers or the school coordinator. Though this may seem excessively intrusive, some partnerships have had considerable problems with attendance of their volunteers. The business firm should be aware of this and help the volunteer take whatever action is needed to correct it.

3. Obtain feedback at the end of each partnership activity from each volunteer as to the volunteers' rating of the experience and their recommendations regarding the firm's continued participation in the effort. This should provide the business coordinator with information as to the benefits and problems that the volunteers found in working in the school system. The business coordinator can use this information to make corrections in the future.

The above activities can be undertaken informally by the business coordinator. However, for the third task, the business coordinator would do better to administer a formal questionnaire to volunteers. This would provide a record of partnership activities and their progress. The results from all volunteers can be combined to provide a more comprehensive picture of the partnership's progress and problems. The business can use this for making future decisions as to the nature of the support to be given to the partnership.

Evaluation

Ultimately the purpose of school-business partnerships focused on science and math is to achieve important goals and objectives such as those identified in Chapter 1:

- To improve student learning and capability in science and math subject matter.
- To increase student interest in science and math and encourage more students to seek careers in these fields.
- To raise interest in school and academic achievement in general and reduce drop-out rates.
- To enhance teacher enthusiasm in teaching science and math in elementary or secondary schools, and increase teacher knowledge of these subjects.

Evaluation is, however, inherently threatening to those in the programs being evaluated. Evaluations that indicate little or no progress can be embarrassing to participants, both to schools and business partners that have been promoting their participation in the partnership. Evaluation is inherently difficult, and comprehensive, in-depth evaluations can be quite expensive. If state, federal, or private resources are available, fully comprehensive, in-depth evaluations might better be undertaken by outside agencies such as universities or consultants. Discussion of these in-depth evaluations is outside the scope of this report. Here we make suggestions for more limited, and more feasible, evaluations that school and business partners are likely to be able to undertake.

Because of the time and effort required, evaluations of a partnership should probably be undertaken only once every few years. It might be done after the first two years of the partnership (to obtain early feedback but allow the partnership enough time to settle in) and, subsequently, perhaps at 3-4 year intervals. Full evaluations could also be undertaken if, and when, major problems arise.

Evaluations sponsored by the school system should have two purposes:

1. To assess the extent to which the partnership is accomplishing its goals and objectives.
2. To identify any significant problems and ways to improve the program.

Following are some actions the school system can take to obtain evaluative information. The focus of evaluation is on students (or teachers) at least several months after they have completed partnership activities, rather than during the period or immediately after completion of the activity.

1. Compile the information gathered from formal monitoring instruments, especially questionnaires for the time period covered by the evaluation.

2. Administer a questionnaire similar to that shown in Exhibit 11 to participating students who have previously completed partnership activities. The questions should be revised to obtain information as to the effects of the partnership after it was over. These students can be asked about their subsequent: grades, interest in science or math, choices of science and math electives, participation in extracurricular activities related to science or math, and career direction. These students should also be asked the extent to which these improvements or increased involvement in science and math activities has resulted from their partnership activity. For those students that have graduated at the time of the evaluation follow-up, the evaluators should consider administering the questionnaire by mail, or even telephone. (We found the Christmas holiday period to be a very good time to reach high school graduates by telephone.)

3. Administer to students, at both the beginning and the completion of partnership activities, a questionnaire asking them to rate their ability and interest in science and math class work, extracurricular activities, and careers. Exhibit 14 illustrates the questions that the students might be asked. Compare the pre-partnership responses to the post-partnership responses.

4. If possible, administer a questionnaire asking similar questions about interest in science and math to a sample of other students that are as similar to participants as possible except that they did not participate in the partnership. Their responses should be compared to those of the participants.

5. Similarly, for partnership programs aimed at teachers, administer a questionnaire to them asking about the extent to which they felt that the partnership activity contributed to their own: (a) knowledge of science and math topics; (b) ability to make their courses more interesting and more informative; and (c) interest in remaining as teachers in science and math.

6. Interview science and math teachers to assess the partnership activities, including their perceptions of the extent to which the activities seemed to have increased participating students' achievement and interest. Interview both teachers who have directly participated and those who have not, especially teachers likely to have had these same students in their classes after the students' partnership activities.

7. For each of these surveys, ask respondents to identify major problems in the partnerships and to give suggestions for improving the partnerships in the future. Such information will help the evaluators identify needed improvements.

8. Examine the attendance records of students in classes, or other science and math related activities, in which volunteers participated. Compare this attendance to the students' previous attendance and to that of other students in regular classes. (This step is likely to be particularly useful in schools with high proportions of disadvantaged youth where absenteeism rates tend to be high.)

9. Examine participation rates in science and math extracurricular activities and elective courses to determine whether students that had been in partnerships appeared to increase their participation afterward, especially as compared to other students.

10. Examine changes in achievement test scores, and grades in science and math subjects to assess whether students that had participated in partnerships appeared to have increased their achievement and learning, relative to what otherwise would have been expected.

11. Examine guidance office records, feedback from graduated students, or similar information, to determine the rate of entry into science or math related programs in college or technical schools for graduates who had participated in partnerships. Assess whether participants appear to have higher than normal rates of participation in science and math career directions.

12. Interview a random sample of parents of students that participated in partnership activities to obtain parents' perceptions of the extent to which the activities led to increased ability and interest in science and math subjects and careers.

The major problem in these evaluation activities is to estimate the difference in outcomes (such as test scores and interest level) that resulted from the participation. This requires, at least implicitly, considering what would have resulted if they had not taken the partnership and instead had been exposed to more usual activities. Making inferences about partnerships from the findings of these steps needs to be done carefully. In some instances, dramatic results may show up, and the evidence will be strong that the partnership is helping (or is not). More often, however, the evidence will be less dramatic, especially in categories of partnerships where the activities involve less intense effort with students or are less directly related to student learning, such as partnerships aimed at developing teacher skills, and some enrichment activities.

Who Should Do These Evaluations?

Many school systems, especially larger ones, have research and evaluation units that are well equipped to undertake the evaluation. To avoid putting partnership coordinators into a compromising situation, they should not be responsible for doing the evaluation themselves. However, because the coordinators will likely be major users of the evaluation findings, they should be involved in the evaluation design and assist in laying out logistics of implementation.

Another possibility, that might be particularly useful for smaller school systems, is to use the evaluation as a class science or math project. Because evaluation methodology has arisen from science and math disciplines, science and math teachers might find it intriguing to lead the evaluation.

Final Comments on Evaluation

While school administrators are likely to be more inclined to rely on their own day-to-day observations and use their judgments as to partnership success, such impressionistic evaluations may not provide a sufficiently comprehensive perspective, especially on the effects of the partnership. For example, students may enjoy the change from their usual classroom routines offered by meetings with volunteers, but does this translate into real improvements in student achievement and increased interest in science and math?

Thus, despite the weaknesses of these evaluation procedures, we recommend that school systems and their business partners periodically undertake systematic evaluations to help them make their judgments regarding partnerships. The potential uses for evaluation in providing information to guide improvements and to provide accountability to sponsors and the public make it highly worthwhile.

EXHIBIT 11

STUDENT FEEDBACK SAMPLE QUESTIONNAIRE

Note: Each partnership should adapt this questionnaire to its specific partnership activities. For example, questions might be added asking students to rate and comment on specific aspects of the partnership, such as its schedule, project or homework requirements, the quality of any lab equipment used, etc.

We need your help in improving the (Name of Partnership program).

Please answer the following questions based on your own experience with the program. (Note: Your responses will be confidential and not attributed to you.)

1. How would you rate the volunteer you worked with on each of the following? (Check one response for each item below)

	Excellent	Good	Fair	Poor
a. Interest in subject matter	___	___	___	___
b. Knowledge of the subject matter	___	___	___	___
c Ability to communicate with students	___	___	___	___
d. Ability to make subject interesting	___	___	___	___
e. Fairness	___	___	___	___
f. Interest in the students	___	___	___	___
g. Ability to motivate students	___	___	___	___
h. Reliability (showed up when scheduled and on time)	___	___	___	___

2. What suggestions do you have for the volunteer to improve his or her effectiveness in working with students?

3. To what extent did the partnership do the following:

	A great deal	Somewhat	A Little	Not at All
a. Increased my understanding of math/science	____	____	____	____
b. Got me involved in extracurricular math or science activities (such as math or science clubs or science or math competitions	____	____	____	____
c. Increased my grades or test scores in math or science	____	____	____	____
d. Increased my interest in math and science	____	____	____	____
e. Improved my interest in doing well in school	____	____	____	____
f. Encouraged me to take science or math elective courses in the future	____	____	____	____
g. Made me feel better about my ability to handle science or math courses	____	____	____	____
h. Increased my interest in a science or math related career	____	____	____	____

4. What do you think should be done to improve the (enter partnership name)?

5. How much did these sessions help you in your other math and science classes? (Check one)

____ A lot
____ Some
____ Not much
____ Not at all

6. How much did these sessions help you in other school subjects? (Check one)

____ A lot
____ Some
____ Not much
____ Not at all

7. How much do you think the program helped you become a better student? (Check only one answer)

____ A lot
____ Somewhat
____ A little bit
____ Didn't help me at all

8. Overall, how valuable was the program experience for you? (Check one)

____ Extremely valuable
____ Very valuable
____ Valuable
____ Not very valuable
____ Not valuable at all

9. Do you have any other comments or suggestions about the program?

EXHIBIT 12

BUSINESS VOLUNTEER FEEDBACK SAMPLE QUESTIONNAIRE

Note: This questionnaire is worded for administration by the school system. The volunteer's firm can modify the wording slightly to obtain its own feedback from its partnership participants. Questions can also be added, such as "To what extent do you believe your firm has benefited from your partnership? In what ways?

Thank you for your participation as a volunteer in the (name of partnership activity). To help us improve our program in the future, would you please give us your views on the following elements.

1. How would you rate the adequacy of the following elements of the partnership activity:

	Excellent	Good	Fair	Poor
a. The information and "welcome" you were given by the school leading up to your selection as a business volunteer.	____	____	____	____
b. Orientation and/or training you received prior to your beginning the partnership activity.	____	____	____	____
c. The communication you had with the school coordinator you worked with throughout the partnership activity.	____	____	____	____
d. The communication you had with the teacher you worked with throughout the partnership activity.	____	____	____	____
e. The help you received from school personnel throughout the partnership activity.	____	____	____	____

f. The facilities provided to you by the school for the partnership activity. ____ ____ ____ ____

g. The recognition you have received from the school system for your role. ____ ____ ____ ____

2. If you responded "fair" or "poor" to any of the above elements, would you please tell us why and give your suggestions as to how this element might be improved?

3. To what extent do you feel:

	A Great deal	Somewhat	A Little	Not at All
a. Your time was well spent	____	____	____	____
b. The students you worked with increased their knowledge of science or math	____	____	____	____
c. The students you worked with increased their interest in science or math topics	____	____	____	____
d Your employer benefitted from your participation	____	____	____	____

4. If you rated any of the elements in Question 3 as "not at all," please explain and provide your suggestions for improving this in the future.

5. Would you recommend that others in your organization volunteer?

Yes ____ No ____

Why?

6. Please give us any other comments or suggestions you have on the program.

EXHIBIT 13

TEACHER FEEDBACK SAMPLE QUESTIONNAIRE

Thank you for participating in the (name of partnership activity). We need your help to improve the program in future. Please give us your views on the following elements.

1. How would you rate the adequacy of the following elements of the partnership activity?

	Excellent	Good	Fair	Poor
a. The orientation you received on the partnership activity before it began	___	___	___	___
b. The communication you had with the school coordinator throughout the partnership activity	___	___	___	___
c. The interaction you had with the volunteer(s) throughout the partnership activity	___	___	___	___

2. If you responded "fair" or "poor" to any of the above elements would you please tell us why and give your suggestions as to how this element might be improved.

3. How would you rate the following characteristics of the volunteer(s)?

		Excellent	Good	Fair	Poor	Don't Know
a.	Interest in their subject matter	____	____	____	____	____
b.	Knowledge of their subject matter	____	____	____	____	____
c.	Ability to communicate with the students	____	____	____	____	____
d.	Ability to deliver interesting presentations	____	____	____	____	____
e.	Interest in their students	____	____	____	____	____
f.	Ability to motivate their students	____	____	____	____	____
g.	Achievement of adequate student participation	____	____	____	____	____
h.	Reliability (showed up when scheduled and on time)	____	____	____	____	____

4. To what extent do you feel:

		A great deal	Somewhat	A Little	Not at All
a.	Your time was well spent	____	____	____	____
b.	The students the volunteer(s) worked with gained increased knowledge of science or math	____	____	____	____
c.	The students the volunteer(s) worked with gained increased interest in service or math topics	____	____	____	____

5. If you rated any of the elements in Question 4 as "not at all," please explain and provide your suggestions for improving these in the future.

6. Would you recommend that other science and math teachers work with volunteers?

Yes ____ No ____

6a. If "No," why not?

7. Please give us any other comments or suggestions you have on the program.

EXHIBIT 14

ILLUSTRATIVE QUESTIONNAIRE TO IDENTIFY "BEFORE VS. AFTER" INTEREST

For each of the following, please check the answer that best describes the way you feel.

		Strongly Agree	Agree	Disagree	Strongly Disagree
1.	I use science or math in everyday life.	____	____	____	____
2.	I am willing to study hard to do well in science or math.	____	____	____	____
3.	I don't want to take more science or math courses.	____	____	____	____
4.	I could do better in science and math if I had more help.	____	____	____	____
5.	Other people would think I was important if I had a job using science/math.	____	____	____	____
6.	I would like to have a job which uses science or math.	____	____	____	____
7.	Working on science or math is boring.	____	____	____	____
8.	Things I study in science or math are too difficult.	____	____	____	____
9.	School is boring.	____	____	____	____
10.	I like to learn new things in science or math class.	____	____	____	____
11.	I am good at science or math.	____	____	____	____
12.	I am willing to study hard to do well in school.	____	____	____	____
13.	I like science or math.	____	____	____	____

Adapted from: Richard N. White, "The Evaluation of the Science/Math Education Project," Report to the District of Columbia Public Schools and Federal City Council, August 13, 1987.

CHAPTER 16
SPECIAL CONSIDERATIONS FOR PARTNERSHIPS HELPING DISADVANTAGED STUDENTS

Some partnerships serve substantial numbers of disadvantaged students. "Disadvantaged" students are often those from households suffering from poverty, low educational levels, and/or language barriers. Their parents are often young, undereducated, lack parenting skills, and have little time or ability to help students at home. Large proportions of minorities and single-parent households generally fall within this group.

Partnerships can have particular benefits for disadvantaged students. These include:

- Receiving remedial education for students with weak academic backgrounds.
- Being exposed to significantly broader educational environments.
- Finding role models, helping students understand that success is related in large part to education.
- Experiencing the relevancy of abstract science and math concepts in the workplace.
- Being stimulated and encouraged to do well in school and to consider careers in science and math, forces that might not exist in many of these students' families.
- Developing daily living skills that their parents might not have, such as knowledge of how to write checks and manage checking and savings accounts.

Two success stories illustrate these potential benefits:

- A St. Louis program was designed to teach students basic math and banking skills. The students not only became more enthusiastic about math, gained information about math-related careers, and understood math and banking concepts, but also developed a sense of maturity because they understood concepts that their parents did not.
- The math lab in Springfield had nearly 100% student attendance on math lab days. Over 90% of the children wished to go to the lab more frequently.

But the disadvantaged students are not the only ones who benefit from these partnerships. Partnerships can also provide encouragement, support, and skills development for teachers who may be in

relatively deprived teaching environments, such as schools with large proportions of disadvantaged students, high drop-out rates, and inadequate teaching materials.

However, special problems exist for partnerships serving disadvantaged students. The sections below describe these problems and provide suggestions for alleviating them. (Many of the partnerships examined for this report and listed in the Appendices served disadvantaged and minority students.)

Special Problems and Ways to Alleviate Them.

1. Many disadvantaged students who could benefit from partnerships where participation is voluntary (such as tutoring, mentorships, and outside enrichment programs) may not know about the activities or may be embarrassed or hesitant to volunteer for them.

   Response:

   (a) Actively recruit disadvantaged students for partnership activities. Encourage teachers, guidance counselors, and principals to personally recruit these candidates. Recruiting should also include notices on bulletin boards, letters to students and their parents, and meetings with students.

   (b) Use disadvantaged students with past experience in partnerships to share their experiences and encourage participation.

   (c) Hold special orientation sessions for disadvantaged students, and possibly their parents.

      - The MESA program in Seattle held an orientation session on a Saturday morning at a local university for prospective student participants and their parents. Talks were given by various role models, former MESA students who had gone on to college, and current participants in the program.

2. Considerable cultural gaps can exist between business volunteers and disadvantaged students. Disadvantaged students may not identify with, or trust, the business person who is attempting to help them. This problem can manifest itself in difficulties in communication, shyness or reluctance of the students to participate. Volunteers may lack understanding of the range of problems that inhibit student learning, and language barriers may exist when students and/or their parents do not speak English well. In some of the minority-oriented partnerships examined for this report, school personnel reported that disadvantaged students were often not good at interaction with adults and felt threatened in one-on-one situations with adult volunteers.

Response:

(a) Seek volunteers from backgrounds similar to those of the students whenever possible. These volunteers can serve as role models. For example, the Springfield-DeBerry School partnership which involved mostly black students was able to recruit a majority of black volunteers.

(b) Have teachers and coordinators provide special orientation for volunteers working with disadvantaged students. Cultural gaps, communication problems and ways to alleviate them should be discussed at this orientation. Teachers or volunteers experienced in working with disadvantaged youths should be present to answer questions and provide guidance.

(c) Have volunteers work with small groups rather than using one-on-one sessions. In some circumstances this will reduce tension for individual students.

(d) Use other students as "peer tutors" to work with the volunteers (such as was done in the Rainier partnership in Seattle).

3. Volunteers may overestimate students' knowledge and assign overly difficult tasks.

Response:

(a) Caution new volunteers about this during their orientation session.

(b) Encourage volunteers and teachers to work together to develop a detailed curriculum at the appropriate skill level.

(c) Provide frequent monitoring of volunteers' work with students and provide prompt corrective feedback when necessary.

Note: At the same time, it is important that volunteers do not misread students' limited verbal ability and limited experience with cultural amenities as lack of intellectual ability. While students should not be given tasks which are too far beyond their current skill level (and hence sources of frustration), they must also be challenged.

4. Students often are handicapped by weak science and math backgrounds and lack of access to science and math resources. Disadvantaged students are less likely to have family members available to help them with homework or special projects, or to have calculators or personal computers at home. These students may not have had a prior strong education in science and math subjects.

Response:

(a) Emphasize the fun, "hands-on" aspects of science to generate enthusiasm and to encourage students to seek help in science and math.

(b) Make arrangements so that these students can borrow equipment for a few days to practice as did the Hartford Aetna partnership, which arranged for students to borrow computers.

(c) Provide access to academic assistance, or make referrals to sources of help. The MESA program sponsored a math hotline staffed by students from the University of Washington's Minority Engineering program. Students could call in with questions and receive help. MESA students were also allowed access to the tutors at the minority engineering students' study center at the University. MESA teachers also provided advice about the tutoring resources available in high schools, or tried to arrange for tutoring, if a student needed additional help.

(d) Encourage parents to be more supportive, perhaps in programs that aim at helping improve parenting and science and math proficiency. The Hartford-Aetna Saturday Academy partnership required parents to participate in the Saturday morning program by taking classes on topics such as parenting, conflict resolution, and health. They also were familiarized with computers. An added problem in Hartford was that many of the students and parents were Hispanic, and some of the parents knew little English. The partnership resolved this problem by hiring Spanish translators.

(e) Send newsletters to parents of participating students (in a foreign language if necessary) on the partnership activities. The newsletters should suggest activities that the parents might do to help--if only by encouraging parents to offer praise for accomplishments.

(f) Involve parents in partnership activities. Parents were invited to attend partnership orientation sessions with their children in the Seattle MESA program, the Indianapolis mentorship, and the Hammond advanced chemistry class. The MESA program also had parent support groups in every school with a MESA program and had regular meetings with them.

5. Business partners may fail to appreciate the range of student problems that can affect learning. Disadvantaged students often have experienced multiple academic failures and/or problems at home.

Response:

(a) Provide good communication between the coordinator and/or teachers and the volunteers on the characteristics and needs of the students. The Indianapolis mentorship program sent volunteers a brief letter describing the academic background, career interests, hobbies, and so forth of the student assigned to them. A more confidential approach, such as a meeting or telephone call, would also be appropriate for discussing student problems.

6. Disadvantaged students may have less "free" time for enrichment, tutoring, and mentorship programs that are held outside regular school hours. For example, the Osceola and Seattle tutoring programs found that many older minority students had to work after school. Furthermore, lack of cars and the need to travel through dangerous neighborhoods may make it difficult for disadvantaged students to attend programs at night.

Response:

(a) Schedule partnership activities at times that will maximize the number of disadvantaged students that can attend.

(b) Provide special transportation to and from the program, as was done in the Indianapolis Mentorship, Hartford-Aetna and Hammond-Inland Steel programs.

(c) Keep to a minimum the amount of homework required for these special science and math activities--and design the homework so that it can be done within the context of a work environment (such as having the student do a time study of their part-time job as a way to improve their use of statistics).

7. Disadvantaged students may lack financial and other resources needed to undertake certain activities which have special requirements, such as personal calculators, special supplies for science fair projects, and transportation for mentorships held at the workplace.

Response:

(a) Arrange for, or subsidize, the students' transportation or other needs (e.g., supplies or a calculator).

8. There may be difficulty in finding minority scientists, engineers, and others proficient in science and math to serve as business volunteers. Many organizations have low percentages of minorities with expertise in science, math, or engineering.

Response:

(a) Make special efforts to recruit minorities to serve as role models. Ask minorities in professional or academic positions, or associations of minorities, to help recruit for the program, or to make suggestions about recruiting. Keep in mind that people with math/science backgrounds can be found in many businesses or industries, not just those focused on science/math. Banks and utilities, for example, can be found almost everywhere. Most industries have at least some personnel with science or math backgrounds. Hospitals and clinics can also be a good source for minority professionals.

(b) Have minority volunteers work with small groups of students rather than one student--if the activity will not suffer significantly.

9. Disadvantaged students need opportunities for "success" experiences to enhance learning. Disadvantaged students have often experienced multiple failures in school, and may find traditional approaches to teaching threatening for this reason. They are likely to be more relaxed, and therefore more open to learning, if partnership activities are associated with success, rather than failure.

Response:

(a) Include a lot of hands-on opportunities and/or projects designed to generate successful outcomes.

(b) Emphasize the "fun" and/or useful aspects of science and math.

(c) Encourage volunteers and teachers to emphasize student achievements and to avoid comparisons or activities that create "winners" and "losers."

(d) Avoid making partnership activities similar to regular classes whenever possible. For example, avoid associating tests or grades directly with partnership activities, unless class credit is given for the partnership, or the partnership activity is an integral part of course content.

10. Disadvantaged students may be harder to motivate to become interested in science and math. Special efforts to motivate them may be needed.

Response:

(a) For activities outside regular school hours, encourage group peer pressure to strengthen attendance, such as use of group incentives--e.g. a special reward if group attendance or achievement meets targeted levels.

(b) Combine activities held outside of regular school hours with a social component. Perhaps have food (e.g. pizza) or activities (e.g., volleyball games) after the sessions (as was done by the Franklin High School tutoring partnership).

(c) Provide monetary awards to individual students as incentives for achievement or attendance (as was done by both the Franklin High School and Seattle-MESA partnerships). The MESA program provided a $50 award at the end of each semester to students that achieved a B+ or higher average in their science and math classes.

11. Disadvantaged students need more extensive partnership interventions in order to compensate for their disadvantaged backgrounds. A partnership involving a small number of sessions is unlikely to have much of a lasting impact on any student.

Response:

(a) Arrange as many partnership sessions as possible to maximize the likelihood of having an impact on disadvantaged students.

(b) Continue the partnership activities for disadvantaged students over a number of years. The MESA program in Seattle, for example, provided a variety of voluntary classes and other events from the 10th through the 12th grades.

(c) Provide a variety of activities to assist disadvantaged students. The MESA program included special classes, lectures/demonstrations, a homework hotline, recognition and social events, parent support, peer study groups, and access to supportive adults who oversaw student progress and provided guidance about courses to take, college admissions, and science and math careers.

12. The school, and particularly the business partners, may have unrealistic expectations for program achievements. Dramatic improvement in grades and standardized test scores and victories in math and science contests will be unlikely for many partnership efforts. This is especially true when the level of partnership intervention is modest and the students served have severe learning handicaps, such as science or math "phobias," weak backgrounds, and non-supportive home or school environments. However, there can still be significant benefits, such as: increased interest in science and math, reduced isolation and alienation, presence of positive and supportive role models,

heightened academic ambitions, and better school attendance on days when partnership activities take place.

Response:

(a) Involve business partners, volunteers, teachers, and other school officials in establishing realistic goals for each partnership activity. Include as goals such items as interest in science and math topics, self-esteem, and ability to handle basic science and math problems. But, do not settle for overly-easy goals.

(b) Undertake regular monitoring and evaluation efforts to help determine the extent to which the partnership activities achieve their goals. Use past achievements to assist in setting future targets.

CHAPTER 17
SUMMARY

Applicability of School-Business Partnerships in Science and Math to Local Situations

Science and math partnerships appear to be widely applicable. This study reviewed 24 different partnerships in 18 communities, and found a diverse group of activities falling into the 6 categories discussed in Chapters 9-14. These partnerships have been applied in a wide range of settings, including urban, suburban, small city and rural school districts, as well as in schools with large proportions of disadvantaged or minority students. However, each type has some special applicability considerations which are summarized below, with situations highlighted in which each is particularly useful.

Classroom lectures and demonstrations - This type of partnership can be used at all grade levels. These presentations are not targeted to either advanced or disadvantaged students, unless the students are already tracked in specific classes. This format is particularly useful when volunteer time is limited, since the number of classroom visits can be adjusted to conform to volunteer availability. Several volunteers can be used in any given partnership activity, each providing a specified number of lectures or demonstrations. Use of multiple volunteers can also minimize volunteers' time-constraint problems.

Business providing teachers for credit classes - These partnerships are particularly useful for schools serving rural or low-income areas that have difficulty attracting and affording full-time science or math teachers. Although teachers provided through such arrangements could teach classes at any grade level, they are generally better suited for somewhat older students who can derive greater benefit from the advanced skills such teachers can bring to the classroom. Students wanting advanced courses, especially electives, are more likely to derive greater benefit from such arrangements because they have less need for basic teaching skills or experience (which regular teachers can provide) and are already motivated.

Out-of-class, voluntary partnerships - This type of partnership can serve the needs of either advanced or disadvantaged students. This format can also be readily adjusted to accommodate volunteer availability and interests.

Tutoring partnerships - Tutoring is typically oriented toward serving the needs of students having academic problems. These are frequently disadvantaged students. Since the need for tutoring generally continues for an entire semester or school year, this type of partnership requires a relatively large time commitment from volunteers. Most tutoring partnerships examined involved the volunteer for at least one hour per week through most of the semester or school year. Tutoring can be used at any grade level but with business volunteers, use at higher grade levels seems more appropriate--to take advantage of the volunteers' advanced science and math knowledge and the volunteer's potential as a role model.

Mentorships - Mentorships are most applicable to older students. Those that take place in the workplace should be limited to mature students in middle or high school. Mentorships often require the student to work on science and math projects, frequently without direct supervision. Mentorships are most often targeted to more advanced students but can be designed for any students. They also can be designed to involve varying degrees of volunteer participation. Mentorships providing school credit require the greatest amount of volunteer commitment, generally lasting over the course of an entire semester or school year.

Teacher development and training - Partnerships focused on teachers are particularly helpful in low-income, rural, or small school districts that have a scarcity of science or math teachers, or where those teaching science or math are not primarily trained in those fields. These partnerships can be particularly beneficial to disadvantaged students, who are often concentrated in such areas. These partnerships can also lead to renewed enthusiasm and interest on the part of older teachers and so are likely to be especially desirable in situations where such renewal seems needed. Volunteer involvement in these partnerships may be limited to a small number of presentations at workshops. However, the more extensive teacher training efforts generally take the form of summer or after-school internships, which generally involve the business partner's employees as co-workers, rather than volunteers.

Expectations and Benefits of Partnerships

School, business, and student participants tended to be quite satisfied in the partnerships we examined. They generally felt the partnerships were worthwhile and should be continued. However, partnerships were usually unable to provide documented evidence of success or of specific benefits. Few partnerships had collected or analyzed data on student performance, attendance, or career paths in science and math in relation to partnership activities.

Though lacking hard evidence, teachers, volunteers and students generally reported that students were more interested in, and enthusiastic about, science and math as a result of partnerships. Some reported that academic performance in science and math had improved because of the partnerships. Responses to questionnaires distributed to teachers, students, and volunteers as part of this study support these general expressions of satisfaction with partnerships. However, data related to partnership effects on academic performance were generally unavailable for analysis, and we were not able to find hard evidence of partnership academic success (or lack of it).

Schools and businesses entering partnerships are cautioned not to have overly-high expectations, as noted in Chapters 1 and 16. Partnerships are often very limited in their scope. Opportunities may be available for only a few grade levels or classes, and may involve only a small number of sessions with volunteers. While student enthusiasm for science and math may increase because of such exposure, this may be of limited duration in many cases and is unlikely to translate into substantial improvement in academic performance.

We encourage business partners to commit at least the equivalent of one class hour per week over a full semester of each volunteer's time. This is not a great deal of time, but it should at least enable the volunteer the opportunity to make a more lasting impact in terms of academic achievement, career interest, etc.

The benefits derived from even limited partnership involvement can be important, however. Generating positive feelings about science and math can leave students more favorably disposed to these subjects in the future. Providing help for students with academic problems can help prevent these students from experiencing even greater problems in later grades, as well as alleviating immediate difficulties. Providing exposure to the uses of science and math in various workplace settings can help convince students that they should pay attention to these subjects while in school.

Above all, students seem eager for activities that add variety, break up monotony, and that show that people care about them. This is likely to be especially important to disadvantaged youth.

Partnership Problems

Many problems commonly encountered by partnerships are related, such as unreliability of volunteers and poor communication. Most partnership problems seem to stem from insufficient coordination and management. While it is difficult to single out some elements as more important for success than others, it is clear that coordination, communication and reliability are key elements. Monitoring and evaluation are also important for alerting participants to the presence of problems so that corrective action can be taken. Problems commonly encountered are summarized in Exhibit 15.

Partnership longevity has been a problem in some instances. Several partnerships reviewed in this study had experienced serious declines in activity, largely due to changed business conditions. Takeovers by other firms, financial problems, and downturns in a particular industry or company were the primary reasons for diminished partnership activity. Partnerships can also shrink or disappear because the CEO of a particular firm develops an enthusiasm for a different kind of community service activity. In addition, partnerships may also falter because of insufficient attentiveness. Having a smoothly-functioning, effective partnership, and maintaining enthusiasm and long-term involvement, requires considerable attention and work on the part of the coordinators.

The partnerships we have described, while potentially highly beneficial, are likely to have limited impacts on education; they do not purport to be directed at comprehensive educational reform. However, to achieve greater impact, schools and businesses that can should take on larger scale efforts, involving more students, more classes, and more intensive assistance. For businesses wanting to be involved in broad-scale educational reform, a different type of effort is required. Alliances and industry-education councils represent such efforts.

Partnership Costs

Partnerships usually do not involve much out-of-pocket cost. (See Chapter 2 for a discussion of required resources.) Costs, of course, will increase with partnership size. Extensive partnership efforts, such as those involving entire school districts, can involve substantial costs, but costs still are likely to be small compared to most other school activities. Costs to the school or school district are generally limited to salaries associated with staffing a partnership office or coordinator, including clerical support. There may also be costs associated with transportation or incidentals, such as supplies and equipment. Teacher time required to support the volunteer effort is likely to be small, though the teacher will initially need to expend sufficient time to plan and to work with the volunteer so that the volunteer has adequate guidance.

Costs to the business partner generally are limited to employee time spent on partnership activities. Some businesses require employees to make up that time, especially if volunteers are from managerial or professional levels. Others may write it off as a contribution to community service. Some businesses make out-of-pocket donations of various kinds. These can include transportation arrangements, refreshments, supplies, awards, etc. Some have subsidized partnerships more directly, for example, by paying coordinator salaries, or salaries of teachers and their own employees while they worked on partnership development.

Factors in Partnership Success

Factors related to partnership success and problems encountered in partnerships have been discussed throughout this guide. Key factors in partnership success are summarized in Exhibit 16.

Below we provide some basic overall suggestion that appear to be particularly important for most, if not all partnerships.

1. Allow time for the partnership to develop; don't expect miracles overnight; don't require it to produce major benefits in one semester or even one year.

2. Pay attention to details such as: developing smooth operating procedures, clearly delineating responsibilities and assignments, setting schedules, and establishing back-up arrangements and procedures.

3. Assign responsibility for the overall partnership effort to someone, such as school and business coordinators. Do this formally to institutionalize the partnership. Give those people time and support to implement the partnership.

4. To avoid monotony and partnership deterioration, periodically inject new content and new approaches into the partnership.

5. Encourage volunteers to use "hands-on," participatory work that requires the students themselves to do some work, such as in experiments and the like. Scientists and engineers, in particular, should be able to provide such activity for students.

6. Make sure that volunteers and teachers communicate with each other regularly--to help the volunteer overcome problems, to provide expeditious feedback about problems such as talking over the heads of students, and to encourage volunteer reliability so they get to the school on the days they are scheduled and on time.

Adherence to all these suggestions, and those presented throughout the guidebook, will not guarantee a successful partnership. However, they should certainly give it a much better chance for success.

EXHIBIT 15: COMMON PARTNERSHIP PROBLEMS

- Insufficient coordination and management of volunteers
- Unreliable volunteers
- Lack of communication between volunteers and teachers and/or students
- Poor matching of volunteers to students and teachers
- Unrealistic expectations
- Insufficient levels of activity for having an impact
- Insufficient monitoring of activities
- Businesses having organizational or financial problems and withdrawing from the partnership effort
- Failure to draw teacher associations, guidance counselors, school board, and parent groups into the decision-making process of the partnership

EXHIBIT 16: PARTNERSHIP SUCCESS FACTORS

- Active school and business coordinators with enough time to coordinate
- Good coordination by school and business coordinators, both with each other and with the volunteers and teachers
- Reliable, dedicated volunteers
- Clear communication links
- Training and orientation for volunteers, teachers, and students
- Careful matching of volunteers with students and teachers
- Clear definition of goals and expectations
- Recognition of participants
- Monitoring of programs in progress
- Timely feedback to partnership participants on any problems and on ways to correct them
- Program continuity and time for program development

APPENDIX A

PARTNERSHIP CONTACTS

APPENDIX A
PARTNERSHIP CONTACTS

	City or County	School or School District	Business Name	Contact
1.	Berks County, PA	Multiple school districts in Berks County	Multiple firms	Barbara Homsher Berks County Intermediate Unit 2900 St. Lawrence Avenue Reading, PA 19606 (215) 779-7111
2.	Cincinnati, OH	Rockdale Elementary School	Children's Hospital-Research Division	Shirley White Rockdale Elementary School 305 Rockdale Avenue Cincinnati, OH 45229 (513) 281-3722
3.	District of Columbia	District of Columbia Public Schools	Federal City Council	C. Vanessa Spinner, Director Volunteer Services and Training Branch District of Columbia Public Schools 415 12th St., N.W., Rm. 1001 Washington, D.C. 20004 (202) 724-4483
4.	Elkhart, IN	Elkhart Community Schools	Multiple firms	Joseph Rueff Elkhart Community Schools 2720 California Road Elkhart, IN 46514 (219) 262-5556

5.	Hammond, IN	Hammond School Systems	Inland Steel	Brent Williamson Gavit High School 1670 175th Street Hammond, IN 46324 (219) 399-3244
6.	Hartford, CT	Hartford Board of Education	Aetna Institute for Corporate Education	Bill Mason Aetna Institute for Corporate Education External Programs Unit 151 Farmington Avenue Hartford, CT 06056 (203) 727-4264
7.	Howard County, MD	Howard County Public School System	Multiple firms	Gerald Einem Coordinator of Mentor Programs Howard County Public School System 10910 Route 108 Ellicott City, MD 21044 (301) 992-0500, ext. 250
8.	Indianapolis, IN	Shortridge Junior High School Arsenal Technical High School	Multiple firms	Jean Campbell Director, Math & Science Mentor Programs Education Center 120 E. Walnut St., Rm. 402 Indianapolis, IN 46204 (317) 226-4716
9.	Long Island, NY	Bethpage, East Islip South Huntington, Riverhead, Shoreham-Wading River School Districts	Grumman Corporation	Roseanne Smith Manager, Advertising/ School Programs Grumman Corporation Bethpage, NY 11714 (516) 575-6075

10. Los Angeles, CA	Cowan Avenue Elementary School	Chevron Corporation	Richard Frey, Principal Cowan Avenue Elementary School 7615 Cowan Avenue Los Angeles, CA 90045 (213) 645-1973 Wayne Carlson Director of Partnerships Los Angeles Unified School District 450 N. Grand Ave., Room H-237 Los Angeles, CA 90012
11. Los Angeles, CA	Tenth Street Elementary School	Atlantic Richfield Corporation (ARCO)	Karen Neal 10th Street Elementary School 1000 Gratten Street Los Angeles, CA 90015 (213) 380-8990 Wayne Carlson (see above)
12. Pinellas County, FL	Osceola High School	General Electric & Paradyne	Helen Pilini Osceola High School 9751 98th Street, N. Seminole, FL 34647 (813) 393-8734
13. St. Louis, MO	Carr Lane Elementary School Long Middle School	Centerre Bank Boatmen's Bank	Wayne Walker, Director School Partnership Program Office St. Louis Public Schools 1110 Victor Street St. Louis, MO 63104 (314) 771-1422
14. St. Louis, MO	Southwest High School	Monsanto	(see above)

Appendix A (continued)

15.	St. Louis, MO	St. Louis Academy of Mathematics & Sciences	McDonnell-Douglas	(see above)
16.	St. Louis, MO	St. Louis Academy of Mathematics & Sciences	General American Life Insurance Co. (GALIC)	(see above)
17.	St. Louis Park, MN	St. Louis Park High School	Honeywell	Bridget Gothberg, Director Community Education 6425 W. 33rd Street St. Louis Park, MN 55426 (612) 925-4300
18.	Seattle, WA (Technology in Education/TIE)	Multiple school districts in Puget Sound area	Multiple firms	Sally Luttrelle-Montes Pacific Science Center 200 Second Avenue, N. Seattle, WA 98109 (206) 443-2001
19.	Seattle, WA (Math, Engineering, Science Achievement/MESA)	Seattle School District	Multiple firms	Patricia MacGowan, Director Washington MESA University of Washington 353 Loew Hall FH-18 Seattle, WA 98195 (206) 543-0562

20.	Seattle, WA	Franklin High School	Security Pacific Bank Washington (formerly Rainier Bank)	Jean Jordan Social Policy Officer Security Pacific Bank Washington P.O. Box 3966 Seattle, WA 98124 (206) 621-4498 Cynthia Shelton Executive Director Private Initiatives in Public Education, Inc. (PIPE) 1200 One Union Station Seattle, WA 98101 (206) 461-7244
21.	Springfield, MA	William DeBerry Elementary School	Digital Equipment Corporation (DEC)	Christine Hurst William DeBerry Elementary School 670 Union Street Springfield, MA 01103 (413) 787-7582
22.	Tulsa, OK (Science Enrichment Program)	Tulsa Public Schools	AMOCO	Nancy McDonald, Director Office of Business/Community Resources Tulsa Public Schools 3027 S. New Haven P.O. Box 470208 Tulsa, OK 74147 (918) 745-6476
23.	Tulsa, OK (Physics Enrichment Program)	Tulsa Public Schools	AMOCO	(see above)

Appendix A (continued)

24.	West Point, VA	West Point Public Schools	Chesapeake Corporation	Jane Sheeran Superintendent West Point Public Schools 1600 Main Street West Point, VA 23181 (804) 843-4368

APPENDIX B

BRIEF PROGRAM DESCRIPTIONS

APPENDIX B: BRIEF PROGRAM DESCRIPTIONS

The following summaries describe the partnerships as we examined them in 1987 and 1988.

Berks County, Pennsylvania: Berks County Educator Internship Summer Program

The Berks County, Pennsylvania Educator Internship Program placed science and math instructors from junior and senior high schools, vocational/technical schools, and colleges from the eighteen school districts in the county in six-week summer internships with local businesses in science and mathematics-related industries. Teachers received a stipend for participating. The program was administered by the Berks County Intermediate Unit (BCIU), a regional agency that provided state-mandated services to county school districts. BCIU recruited teachers and firms for the program. Since 1985, 49 teachers have been placed in internships with 21 firms in the county.

The program was intended to provide an opportunity for long-time teachers to become acquainted with recent technological changes in science and mathematics-related industries, to serve as career development for teachers, and to enable them to better acquaint their students with the skills necessary for science and mathematics related careers in the local community. Teachers were required to develop lesson plans for their classes based on information obtained through their internship experience.

Cincinnati, Ohio: Rockdale Elementary School-Children's Hospital Medical Center

The major focus of this partnership, which was established in 1983, was its mentor program. Hospital volunteers met once or twice a week for four months with one to three fifth and sixth grade students on specific scientific areas of interest. Students were matched with mentors on the basis of their responses to a specially developed interest survey. Mentor sessions involved discussions about the students' specific interests in the topic, research skills, information accessibility, and local resources. The mentor

guided students through completion of a science project. Students also "shadowed" their mentors, spending half a day following them around at the hospital work-site and observing their activities.

In addition to the mentor program, volunteers helped develop a science curriculum for the school. There was also a speakers bureau, consisting of hospital volunteers who were available to speak to classes on a variety of subjects; tours of the hospital; and donations of scientific equipment and supplies.

In turn, the school provided services to the hospital. These included: an annual benefit for a hospital research fund; the use of school facilities by hospital employees; the "loaning" of students to the hospital for staff training procedures, such as mock evacuations; the tutoring of children of hospital employees; and a holiday school choir performance for hospital employees.

<u>District of Columbia: D.C. Public Schools-Federal City Council Science/Math Education Volunteer Program.</u>

In 1984 the Federal City Council, a civic organization of community leaders, undertook an extensive effort to recruit local math and science professionals for classroom demonstrations and lectures, tutorial/coaching activities, substitute teaching, and science fair judging. Volunteers were registered by the Volunteer Services and Training Branch (VSTB) of the District of Columbia Public Schools. VSTB referred the volunteers to the individual schools, which recruited teachers to work with the volunteers and made matches to meet teachers' needs and volunteers' interests.

VSTB developed a special summer program to train teachers in the use of volunteers. Teachers also studied and developed prototypes of lesson plans using volunteers. Participating teachers at the summer program received two in-service credits, and were paid $10/hour. VSTB conducted teacher awareness programs at schools and at the Instructional Resource Center to help stimulate demand for and use of volunteers.

Elkhart, Indiana: Science Mentor Program

This partnership, which started in 1986, involved business volunteers (primarily from Miles Laboratories and Shaum Electric) working as mentors with small groups of 7th and 8th grade students to provide advice and guidance on the development of their science fair projects. Working with mentors on these projects was intended to promote development of research/problem solving skills, self-discipline, and independent study techniques associated with high achievement.

Most of the students participating were enrolled in a science fair elective class for which they obtained credit, or an advanced science course where a science fair project was required. Students identified the topic they wanted to pursue and were matched with a mentor who could help with that topic. Students met with their mentors about four times to receive advice and guidance on their projects. Students prepared "To Do" lists at each session to keep them on schedule between meetings.

Hammond, Indiana: Hammond School System-Inland Steel

In this partnership, which began in Fall 1986, the teaching schedule of a high school science teacher was rearranged so that he could teach four classes before noon on weekdays and work as a chemist for Inland Steel in the afternoon. In return, a fifth class was taught at the Inland Steel facility on Saturday mornings.

This advanced elective chemistry class was available to high school seniors from all Hammond high schools on a competitive basis. It was taught at the level of a freshman college chemistry class. Key features of the class were working with the advanced equipment available at the facility, and using the extended class session for more advanced experiments than could be conducted during the shorter class periods of a regular school day. In addition to classroom instruction, students worked on individual projects in the spring over a six-week period. Other Inland employees also provided occasional demonstrations/discussions of their work and tours of the facility.

Hartford, Connecticut: Hartford Board of Education-Aetna Institute for Corporate Education

The Saturday Academy was an early enrichment program for inner-city seventh graders and their parents that was co-sponsored and co-designed by the Aetna Institute for Corporate Education and the Hartford Board of Education. Its objective was to prevent school failure and dropping-out of inner-city middle school students, many of whom reach an at-risk status in the seventh grade. The program started in 1984.

Students were nominated by teachers in the middle schools in Hartford to attend the program, which was held on nine consecutive Saturday mornings. Two such sessions, each attended by about 75 students and their parents, were conducte ach year. Students were taught computer, math, science, and oral communications skills. Parents were required to attend four out of nine sessions, taking courses on such topics as computers, effective parenting, dealing with grief, family dispute resolution, and health and first aid.

Students were taught by school teachers who were paid extra by Aetna for participating in the Saturday academy. Courses for parents were taught by Aetna volunteers.

Howard County, Maryland: Mentor Program

Students from the eight Howard County high schools had the opportunity to work for a school year on a one-on-one basis with a mentor at the mentor's facility. Students w rked on a research project they designed and received credit for the effort. Students were required to have a B or better average in the field of the proposed activity, have an above-average or outstanding evaluation form their teacher, and have their own means of transportation.

Students were required to submit proposals specifying the nature of their project in the spring. The mentor program coordinator was responsible for finding an expert in a business, university, or government facility to serve as a mentor for each student selected for the program. For one credit, the student had to spend at least five hours per week at the mentor's facility, and 10 hours per week to earn two credits. The mentor program coordinator monitored the program, meeting every two weeks with the student and receiving periodic progress reports from the mentor. Students were required to present their projects at the school system's mentor program fair. The program coordinator, who was a certified science teacher, assigned grades to the students.

Indianapolis, Indiana: Indianapolis Public Schools Science Mentor Partnership

This partnership, which began in 1981, provided career-focused mentorships for middle and high school students in the science magnet programs of two schools. Students were exposed to applications of science/math concepts in the workplace as well as particular kinds of careers. The mentorship coordinator interviewed students about their backgrounds and career interests before matching them with volunteers from a variety of businesses and government or nonprofit organizations.

Students participated in mentorships in small groups. They were generally assigned to work with either the same mentor during each visit, or a small number of mentors who spent 2-3 visits each with them. They generally shadowed their mentors, as well as having opportunities for hands-on experience with their mentor's work. Some mentorship assignments also involved project work. Each visit to the workplace took about half a day. There were about seven visits per year for each student. The school system provided transportation for students participating in the program.

Long Island, New York: Five Nassau and Suffolk County School Districts-Grumman Corporation

The Grumman Corporation initiated partnerships with five school districts located near major company facilities on Long Island beginning in the 1986-87 academic year. The primary focus of the partnership effort was directed at improving and updating the knowledge base and skills of teachers in the participating schools. This was done in a variety of ways, particularly by each year inviting high school teachers to attend a series of professional lectures given by notables in various fields and sponsored by Grumman. Teachers were also invited to a biennial Technology Forum at which college and university professors discussed state-of-the-art findings. Grumman also provided library access, and would attempt to locate technical material not readily available to school teachers and make it available on an interlibrary loan basis.

Grumman volunteers also provided lectures, at schools' requests, on various science/math-related topics (such as fusion, artificial intelligence, airplanes). In addition, Grumman provided field trips for students.

Los Angeles, California: Cowan Avenue Elementary School-Chevron "Wonderful Wednesday" Partnership

Every other Wednesday, volunteers presented lectures with demonstrations to 4th and 5th grade students on science topics. The goal of the program was to generate enthusiasm for math and science, especially as a future career interest. Students were also involved in projects during the course of the session. The business volunteers felt that they needed to reach students early and to show them that science is fun. The program took place in the school's math/science/computer room. The different fourth and fifth grade classes rotated through the room in turns each week. Typically the volunteer presented four sessions (45 minutes each) which took up an entire morning. A total of 11 sessions plus a field trip to a Chevron refinery were held in 1988-89, with 10 volunteers involved.

The program was begun in 1984. Chevron also helped create the math/science/computer room, converting old storage space and donating money and volunteer labor to set it up.

Los Angeles, California: 10th Street Elementary School-ARCO

This partnership began in February 1978, and evolved from ARCO's involvement with USC's Joint Educational Project on partnerships with inner-city schools. This partnership involved a variety of volunteer activities, primarily lecture/demonstrations and tutoring, based on teacher needs. The former included working with small groups of students in a school garden to teach/reinforce concepts from biology and nutrition, and in a photography lab to teach/reinforce chemistry and math.

Tutoring was provided on an individual or small-group basis in the back of the classroom one hour/week during regular class sessions. There was also a tutoring program for about 40 advanced students to prepare them to participate in a city-wide math competition. This program focused on training in problem-solving skills for one hour/week for 16 weeks. The six finalists for the competition received an additional 20 weeks of tutoring with two sessions per week, one at the school and one at ARCO offices.

In addition to providing volunteers (47 in the 1987-88 school year), ARCO paid the salary of a full-time partnership coordinator. The coordinator's primary responsibility was the partnership with the 10th Street School, but she also coordinated partnerships ARCO had with other schools.

Pinellas County, Florida: Osceola High School-General Electric Corporation and Paradyne Company

This remedially focused tutoring program was initiated in 1986. Individual volunteers from the companies generally met weekly with small groups of students (3-5) for 50 minute session during the school day. The primary intent was for students to receive tutoring assistance over the entire semester, but sometimes students received only short term assistance to help them with a particular aspect of a science or math class.

Tutoring schedules were arranged to fit the schedules of the tutor and the students. Students were generally released from the class for which they received tutoring, or could be released from another class such as physical education. Tutoring was held in a room in vicinity of the teacher's classroom to facilitate volunteer-teacher communication before or after the tutoring session.

St. Louis, Missouri: Math Skills in Banking Program with Long Middle School-Boatmen's Bank and Carr Lane Elementary School-Centerre Bank

This program taught and reinforced basic math skills and economic concepts through demonstrating the application of mathematics to real life situations such as balancing a checkbook or applying for a loan. The program also conveyed concepts and practical materials on which students would later be tested in the Basic Essential Skills Test (BEST), a standardized test that all St. Louis public school students were required to take in the 8th grade.

The program included two tours, one of the bank and one of the Federal Reserve Bank in St. Louis, and about five classroom presentations by the business volunteer. These involved 60-90 minute discussions and student participation in activities related to: checkbook management, checking and savings accounts, credit and lending, etc. In one session students were given sample checkbooks with a $1000 credit balance. Students then wrote checks and subtracted their amounts from the initial $1000. Students not only practiced fundamental skills of adding and subtracting, but also learned how to write checks, balance accounts, reconcile monthly statements, and the essential elements for a valid check. One partner developed a special board game to practice money management skills. The teacher provided warm up exercises to prepare students for the volunteer presentations, as well as follow up exercises to reinforce them.

Although the partnership consisted of only 7 double sessions, about 15% of the math sessions in a semester, materials presented in it covered or elaborated on 30-40% of the math curriculum. One bank started its program in 1982, an the other started its program in 1984.

St. Louis, Missouri: Southwest High School-Monsanto

This partnership involved volunteers coming into the classroom to provide lectures and demonstrations directed to "average" students. A key feature of these classes was to take "textbook" examples from math, chemistry, physics and biology courses and replicate their use in the industrial workplace for the students. Anywhere from five to seven sessions or class days for each subject would be devoted to these special classes each year. The volunteer or team of volunteers would come to the school for a day and give the same lecture or demonstration to all classes taking that course. For example, a volunteer doing a tenth grade biology demonstration would teach it to five different tenth grade biology classes.

The program started in 1980 and was severely cut back in 1985 because of organizational changes at Monsanto and a significant reduction in staff leading to a major reduction in volunteers. The program was inactive in 1988.

St. Louis, Missouri: St. Louis Academy of Mathematics and Sciences-McDonnell-Douglas

Volunteers provided 1-7 sessions on specific topics that, while not covered by the existing curriculum of this magnet high school, were relevant to it. Sessions were generally on technical topics with which teachers were not comfortably conversant, such as: aircraft structure analysis; aerospace science; engineering graphics; probability and statistics; and stress testing with polarization. Special equipment and procedures were involved in some of these sessions. Volunteers also made presentations on practical applications of algebra and famous black scientists. Special sessions were held at the McDonnell-Douglas facilities and included tours.

St. Louis, Missouri: St. Louis Academy of Mathematics and Sciences-General American Life Insurance Company (GALIC)

GALIC provided a year-long lecture/demonstration program on actuarial science and practices with one class of advanced mathematics students. The program was established in 1981. The program normally consisted of 10 double class sessions (about 1 1/2 hours per session), presented about monthly by one volunteer from GALIC.

Classroom sessions primarily consisted of lectures demonstrating the application of advanced mathematical concepts in the actuarial field (but often with applications in other fields). Students were given assignments and projects such as insurance product design and development and financial forecasting. Students also toured the GALIC headquarters, visited a local college that had an actuarial program, took actuarial aptitude tests, and conducted mock job interviews.

St. Louis Park, Minnesota: St. Louis Park High School-Honeywell Military Avionics Division

This partnership, established with a formal contract in 1982, included a variety of educational activities, including teacher training, curriculum development, mentorships, and a Science Resources Laboratory for voluntary student participation.

The Science Resources Laboratory was a room equipped with donated instruments and supplies from Honeywell. Two business volunteers staffed the lab for one hour/week each to work with students, individually or in small groups, on special science projects (e.g., building a robot and a weather station). This provided students with an opportunity for independent study/project work, either in conjunction with normal course work or as an extracurricular activity. The lab was staffed with teachers the rest of the time it was open.

This partnership also included a voluntary lecture series for high school students called Scientist of the Month. Volunteers from Honeywell and other area companies made monthly, one-hour presentations

with visual aids and demonstrations on a variety of scientific topics (e.g., chemistry, biology, lasers, information systems, etc). The same presentation was usually given twice in one day and was open to all students on a voluntary basis.

Honeywell also had a Summer Teacher Academy for high school teachers. Teachers attended the academy for ten full days. They toured facilities of the business partner, listened to presentations, and completed a project in a specific area applicable to the classes they taught. They were assigned to work with at least one Honeywell engineer on this project. Teachers were required to develop new curriculum based on their experience and to share ideas with other teachers.

This partnership was designed to provide benefits for the business partner as well as the schools. St. Louis Park school staff have provided in service training sessions for Honeywell employees on professional growth topics, such as career development and listening skills. Company and school staff have jointly sponsored some in-service sessions such as computer training and parenting skills for employees of both organizations. Honeywell staff were allowed to use of school district facilities, such as gymnasiums, pools, auditoriums, and athletic fields. School staff also used Honeywell facilities, such as their conference rooms, for special events.

Seattle, Washington: Technology in Education (TIE) Upgrade Program

This partnership involved TIE (a nonprofit organization), the Pacific Science Center and about 20-30 business and governmental organizations in the Seattle area. It provided training opportunities for middle- and high-school teachers in the Puget Sound area and was started in 1984 as part of its Upgrade program. This program provided three, day-long workshops each year to expose teachers to advances and careers in science and technology-related fields. The intent was to keep teachers current as well as to rejuvenate and motivate them.

The format for the Upgrade program involved a morning lecture with keynote speakers for all attendees, followed by afternoon seminars at various business sites. The teachers chose the one they would attend from the eight to ten offered. Each workplace seminar involved a number of business volunteers as speakers/lecturers.

Teacher participation was voluntary. There was a fee of $125 per teacher for the three sessions. The school districts paid the fee for the teachers and also paid for substitutes to cover their classes. Businesses made financial contributions to the TIE program as well as providing the speakers/lecturers for the afternoon seminars. Volunteers from some of the businesses also belonged to TIE's advisory committee.

Seattle, Washington: Math, Engineering, Science Achievement (MESA) Program

The Seattle MESA program, established during the 1982-83 school year, focused on getting minorities into math-, engineering-, and science-related careers by providing support services (academic, motivational, career information, and advisory components/activities) to encourage and help minority students get into college and pursue studies in these fields. Schools and students joined the MESA program on a voluntary basis. Each MESA school had a MESA advisor (a regular teacher who received a stipend for these activities) and a parent support group. Students were required to participate in some MESA activities, but others were available on a voluntary basis.

MESA provided an advanced science class required of all MESA students in place of a regular 10th grade science elective. This was taught by a regular high school teacher, with lectures/demonstrations by business volunteers on more advanced/applied aspects of the course. Tours of business facilities were also provided. There were also two summer science courses held at the University of Washington campus available for MESA students on a voluntary basis. Saturday classes to help students prepare for SATs were also available on a voluntary basis. MESA also encouraged development of study groups, provided a homework hot-line and assistance in finding tutors, and held a variety of social/recognition events.

MESA is a non-profit organization that received support and funds from a variety of sources - state, federal, school district, university, and business.

Seattle, Washington: Franklin High School-Rainier Bank (now Security Pacific Bank)

A group of bank employees provided weekly tutoring sessions at the high school for about two and a half hours. The program focused on students who had academic problems or who were working below potential. Some high achieving students served as "peer tutors" to help the bank volunteers.

A core group of students attended the sessions for most of the school year. They signed a "contract" pledging to attend at least 80% of the tutoring sessions, to raise their own performance in their weakest areas, and to raise group performance by specified grade point amounts. In addition, students having short term problems or having difficulty maintaining sufficient grades for organized sports participation could attend the sessions on a short-term, as-needed basis. This partnership provided a variety of incentives, including social events at the tutoring sessions (such as pizza parties or volleyball games) and at the bank (such as invitations to the bank Christmas party) as well as monetary awards for achievement.

One of the original goals of the tutoring program, which began in 1985, was to provide role models for minority students. The bank used its personnel computer system to identify minority employees who were recruited to serve as volunteers.

Springfield, Massachusetts: Wm. DeBerry Elementary School-Digital Equipment Corporation (DEC)

The major function of this partnership, established in 1985, was to tutor children in the "Living Math Lab." The lab was intended to make math come alive through realistic "hands-on" activities. All fourth grade and some third grade students attended the lab once a week, where they received instruction from specially trained DEC volunteers. The math areas worked on in the lab included: fractions, money, time, weight, measurement, and metrics. Examples of math lab activities include: using play money to learn to

make change; working with catalogs and local restaurant menus; holding a mock auction; using clocks and stop watches to tell time and learn the hours in the day.

Volunteers used a set of job or task cards, developed the first summer of the partnership by DEC volunteers and school staff, to direct activities in the math lab. Activities were completed on a level-by-level basis, following directions on the cards. The job cards, a set of index cards, were designed to be easy to follow, and were considered to be a very important tool. These cards included identification of skills, activities involved, and ways to extend each activity.

Another element of the partnership was an annual math fair. DEC volunteers and their students had a booth in the gym with displays of activities dealing with the various math areas, such as measures, time and weight that they have completed in the lab. The volunteers worked with their students to tie math into fun activities and the exhibits were intended to be entertaining and "hands-on". They included games such as "Guess the Weight" or "Guess the Number of Jellybeans in the Jar," or making a record of everyone's height by age. The students demonstrated their special activity and talked about their project to attendees.

Tulsa, Oklahoma: Tulsa Public Schools-AMOCO Science Enrichment Project

The Science Enrichment Project provided fourth and fifth grade students with hands-on experience in physics and life science principles in classroom experiments performed every other week over a period of 24 weeks. These curriculum-related experiments lasted 45-75 minutes. A total of 24 different experiments were developed for this project by two AMOCO scientists and a representative of the Tulsa Veterinary Society. They also designed special equipment which was fabricated initially in the AMOCO shop but was later contracted out. Materials for the experiments and a bound volume of related handouts for students were also provided as part of the program.

The experiments stressed hands-on learning in small groups, with no more than 4 students working at each experiment setup. The students were helped in performing these experiments by volunteers from

businesses, professional societies, and civic organizations as well as by parent volunteers. All volunteers were trained to perform and explain the principles demonstrated by the experiments by AMOCO scientists. Training sessions were held every two weeks and involved video tapes and hands-on activities for the adults.

The project started in the 1985-86 academic year serving four elementary schools. In 1987-88, the project served 2600 children at 19 schools and involved 440 volunteers.

Tulsa, Oklahoma: Tulsa Area High Schools-AMOCO Physics Enrichment Program

This program, started in 1984, consisted of a series of seven to nine Saturday morning classes for talented and highly motivated juniors and seniors. The three hour sessions were held in the Fall and again in the Spring at the AMOCO Research Center (ARC). They stressed hands on experiments - often with state of the art equipment - and special lectures on fundamental aspects of physics and geophysics. The classes were generally comparable in complexity to those for first year college students. Students were given optional outside reading assignments but were not given required work or tests.

Fifty juniors and seniors were accepted for each series. The program was conducted by approximately 20 ARC volunteers. Students did not receive credit for the program, but those who attended at least two thirds of the sessions received a one year subscription to a science magazine of their choice.

West Point, Virginia: West Point Public Schools-Chesapeake Corporation

This partnership consisted of the yearly joint hiring by the company and the school system of an entry level engineer to teach half-time at the West Point public high school and work half-time at the Chesapeake Corporation. The cost of the engineer/teacher was totally absorbed by the Corporation. This teacher provided instruction in advanced courses (probability and statistics, calculus, physics, advanced computer concepts, etc.) for which this school system typically did not have a qualified teacher. The school

system provided special training for the engineer/teacher, and the state Board of Education granted a waiver allowing this non-certified instructional personnel to give grades for these credit classes.

In exchange, the school board provided the corporate partner access to school facilities- in particular, recreational facilities and a telecommunications studio--and let the partner use school buses in conjunction with its annual meeting. The partnership was first implemented in the 1983-84 academic year.

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