DOCUMENT RESUME

ED 281 717 SE 047 911

AUTHOR Gold, Gerard G.
TITLE Employer-Sponsored Teacher Internships in Science and Math: A Part of Education Reform Strategy.
INSTITUTION National Inst. for Work and Learning, Washington, D.C.
REPORT NO ISBN-0-86510-051-9
PUB DATE 86
NOTE 49p.
AVAILABLE FROM National Institute for Work and Learning, 1200 18th Street, NW, Suite 316, Washington, DC 20036.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Employment Patterns; *Inservice Teacher Education; *Internship Programs; Mathematics Instruction; *Mathematics Teachers; Multiple Employment; *Program Descriptions; School Business Relationship; Science Instruction; *Science Teachers; Secondary Education; Teacher Employment; *Teacher Interns

ABSTRACT

In 1981, an estimated 25% of the nation's secondary school teachers had summer jobs outside education. This report on the current status and future directions of employer-sponsored teacher internship programs has an underlying theme: that such programs can make a serious contribution to the career and professional development needs of teachers and to the quality of instruction. Chapter 1 considers how employer-sponsored teacher internships are connected to educational reform. The second chapter discusses the purposes of teacher internships. Eleven pioneer teacher internship programs are briefly described in chapter 3. Many of these programs focus on improving mathematics and science instruction; many also place a strong emphasis on communication skills. All rely heavily on the leadership and motivation of employers to improve scientific and mathematical understanding and competence. In chapter 4, replicability, sustainability, and expansion of these programs are considered. Finally, chapter 5 discusses new directions and next steps for teacher internships. Contacts and addresses for the 11 programs are listed in the appendix. (MNS)

EMPLOYER-SPONSORED TEACHER INTERNSHIPS IN SCIENCE AND MATH: A PART OF EDUCATION REFORM STRATEGY

BY

GERARD G. GOLD

NATIONAL INSTITUTE FOR WORK AND LEARNING
WASHINGTON, D.C.

National Institute for Work and Learning
1200 18th Street, N.W., Suite 316
Washington, D.C. 20036

ISBN 0-86510-051-9

TABLE OF CONTENTS

EMPLOYER-SPONSORED TEACHER INTERNSHIPS IN SCIENCE AND MATH:
A PART OF EDUCATION REFORM STRATEGY

ACKNOWLEDGMENTS

The excitement of innovation is contagious. Meeting the people who are initiating teacher internship programs with business and public sector organizations around the United States is to experience the openness, resourcefulness, and creativity that characterize Americans at their best.

Thus thanks are in high order to everyone interviewed for this report and especially to the program pioneers who freely provided information and insights about their programs and about the collaborative process. The names and addresses of the program directors are included at the close of this report. Readers seeking more information about the programs described here may want to make direct contact with these fine folk.

We at NIWL are also grateful to the GTE Foundation and the U.S. Department of Defense for their sponsorship of the Institute's research and technical assistance activities related to science and math internships for teachers.

On the home front, the dedication of the staff of the National Institute for Work and Learning was again self-evident in the support provided for the preparation of this report. Veronica Jenkins, Shirley Fox, and Richard Ungerer could always be counted on whether the need was large or small.

EMPLOYER-SPONSORED TEACHER INTERNSHIPS IN SCIENCE AND MATH

EXECUTIVE SUMMARY

In 1981, the most recent year for which survey data are available, an estimated 25 percent of the nation's 959,000 secondary public school teachers, or about 240,000 teachers, had summer jobs outside education. This report sees employer-sponsored teacher internships as a vitally important way to put summer months to productive uses benefitting teachers, employers, students, and all those working to improve American education.

In Cleveland, Ohio, for example, in the summer of 1985 some 55 school and college teachers improved their science and math teaching skills and their awareness of business and technical occupations through hands-on experiences coordinated by Cleveland's Teacher Internship Program. Typical of the teachers was Doris Decatur, a mathematics teacher at Nathan Hale Junior High School, who earned a substantial summer stipend while learning how to perform computerized financial and tax system functions. Ms. Decatur was an intern with TRW, the aerospace and automotive conglomerate. Robert Slivka, a biology teacher at Gallagher Junior High School, worked with electron microscopes and x-rays for his materials research project at Standard Oil Company.

In Philadelphia, the Silicon Valley, Columbus, Pittsburgh, Washington, D.C., and a growing number of other communities across the nation, employer-sponsored summer teacher internship programs such as that in Cleveland are beginning to prove their worth to employers, teachers, school systems and their communities. Improving science and mathematics education has been a starting point for most of these programs.

This report on the current status and future directions of employer-sponsored teacher internship programs has an underlying theme. That theme is

this: employer-sponsored teacher internship programs can make a serious contribution to the career and professional development needs of teachers and to the quality of instruction in science, mathematics, career education and other important areas of instruction.

In more detail, the theme of this paper can be stated as follows:

- The development of teaching as a profession in a period of rapid technological and social change requires more time for teacher retraining, self-renewal of career interests and personal motivations, and more systematic relationships between organizational change and the individual teacher's professional development activities.

- Current school system schedules, financing, and organizational policies and structures make professional development activities for teachers appendages to routine responsibilities rather than a primary function of school systems.

- Summer months are now poorly used for professional development of teachers in part because of historical school year patterns, but also because of inadequate institution-building strategies constrained by the same factors of schedule, financing, organizational policies, and structures.

- Educational policymakers in states and local communities currently have unprecedented access, if they know how to use their opportunities, to top level corporate and public sector employers.

- This access, based on relatively new and widespread perceptions of converging self-interests between education and employment organizations, can be used to turn summer months now relatively unused for teacher professional development into a time of exciting learning for teachers, participating employers, and local school district leaders.

- Using these summer months more creatively constitutes a strategic approach to educational reform that supports other strategic reform initiatives already underway.

- The concepts and examples of effective teacher internship and fellowship programs sponsored by employers appear to offer an excellent vehicle for achieving the strategic objectives of school reform as well as many of the more specific and self-interested objectives of the teachers, school districts, and employers involved. Reform efforts will go further faster and with greater likelihood of success if reinforced by the self-interests of the key participants.

Teacher internships -- typically during summer months -- with private and public sector employers are one means being developed to achieve a variety of objectives:

- Providing students (through their teachers) with accurate and timely information about career opportunities and the decisions students must make in selecting courses and extracurricular activities needed to achieve career goals. Encouraging students to strengthen their mathematics, science, and communications skills is a special objective of many teacher internship programs.

- Improving teacher competencies and motivation through direct contact with current research and business-related ideas and practices. Contact with the people who make those ideas and practices "come alive" in their daily work is essential motivating factor for internship programs.

- Improving school curricula in mathematics, science, and written communications, for example by stimulating teachers to identify and correct problems in current instructional methods and content both within their classrooms and in system-wide school curricula.

- Supplementing basic teacher salaries with stipends and salaries for summer work experiences that combine professional development with meaningful contributions to the employer or other sponsoring organization. Combined summer and school year incomes enable skilled teachers to continue in their profession rather than seek greater financial rewards in year-round employment elsewhere.

- Enabling employers to fulfill commitments to cooperate with local school districts in efforts to improve teacher competencies and overall educational quality.

- Providing employers with qualified, reliable summer interns who can accomplish specific projects requiring instructional or guidance skills or who can assist employer staff in the fulfillment of normal work tasks. One person's task become's a teacher's learning opportunity.

Teacher internships address all of the objectives above.

In this report, eleven pioneer teacher internships programs from across the nation are briefly described. Most of these programs focus their efforts on improvements in science and mathematics instruction in public schools. Many also place a strong emphasis on communication skills and make a special effort to also involve teachers of English and social studies. All rely heavily and

often entirely on the leadership of employers, both public and corporate, and on the deep motivation of those employers to improve scientific and mathematical understanding and competencies throughout our society. Descriptive information is then used as the basis for an analysis of the directions in which these new ideas and programs could move if supported by effective leadership.

Leadership is needed in four specific areas of importance:

- o Development of a network of corporate "champions" of teacher internship programs as a major component of education-business partnerships
- o Creation of more school district leadership and action to put the collaborative opportunities available in internship programs to work.
- o Collaboration among state-level business, education, and government leadership groups to integrate teacher internship programs into broader educational reform activities.
- o Creation of new career paths for teachers, using summer science, math, and other internship opportunities to open up new learning and career development options.

What could be done with teacher internship programs, especially among the almost 260,000 secondary school teachers of mathematics and science? The establishment of effective teacher internship programs of 50-to-100 positions annually in 100 metropolitan areas nationwide would appear to be within reach. Inevitable issues of replicability, sustainability, and expansion will require careful attention. But if institutionalized on a modest and manageable scale with strong quality controls, the nationwide impact of teacher summer fellowships/internships in sciences and mathematics could be monumental over a 10 year period. A nationwide network of programs reaching 5,000 to 10,000 teachers annually might touch the lives of 40,000 to 50,000 teachers or more in a decade. This would be a major national accomplishment.

I. CONNECTING EMPLOYER-SPONSORED TEACHER INTERNSHIPS TO EDUCATIONAL REFORMS

In 1981, the most recent year for which survey data are available, an estimated 25 percent of the nation's 959,000 secondary public school teachers, or about 240,000 teachers, had summer jobs outside education. Of these 959,000 secondary school teachers in 1981, about 27 percent taught primarily mathematics (15.8 percent) or science (11.7 percent) subjects.*

Improving science and mathematics education in the public schools has been a matter of great concern to national groups assessing the quality of public secondary education. Helping to improve science and mathematics education has also become a starting point for a growing number of employers nationwide who are involving themselves in summer internship programs serving secondary school teachers.

Why do school teachers work at other jobs during the summer months? What kinds of jobs do they seek and obtain? Could that time and energy be better used for the refreshening of souls, the learning of new and more effective teaching skills and techniques, or the building of more meaningful connections between the teaching profession, other professional groups, local school districts and local employers? Could the earning of supplemental income be linked more usefully and excitingly to professional development objectives?

This report on the current status and future directions of employer-sponsored teacher internship programs has an underlying theme. That theme is

---

* Suzanne Gardner, Status of the American Public School Teacher: 1980-81 Washington, D.C.: National Education Association Research, 1982.

Sources: W. Vance Grant and Leo J. Eiden, Digest of Education Statistics 1982. Washington, D.C.: National Center for Education Statistics, 1982.

this: employer-sponsored teacher internship programs can make a significant co: ribution to the career and professional development needs of secondary school teachers and to the quality of teaching in science, mathematics, career education and other important areas of instruction.

Pursued thoughtfully and systematically in concert with other reform efforts, teacher internship programs can have especially powerful effects on the quality of science and mathematics instruction and on the quality of career information provided to students interested in careers in science, mathematics, and other fields of research and applied research.

In more detail, the theme of this paper can be stated as follows:

- The development of teaching as a profession in a period of rapid technological and social change requires more time for teacher retraining, self-renewal of career interests and personal motivations, and more systematic relationships between organizational change and the individual teacher's professional development activities.
- Current school system schedules, financing, and organizational policies and structures make professional development activities for teachers appendages to routine responsibilities rather than a primary function of school systems.
- Summer months are now poorly used for professional development of teachers in part because of historical school year patterns, but also because of inadequate institution-building strategies constrained by the same factors of schedule, financing, organizational policies, and structures.
- Educational policymakers in states and local communities currently have unprecedented access, if they know how to use their opportunities, to top level corporate and public sector employers.
- This access, based on relatively new and widespread perceptions of converging self-interests between education and employment organizations, can be used to turn summer months now relatively unused for teacher professional development into a time of exciting learning for teachers, participating employers, and local school district leaders.
- Using these summer months more creatively constitutes a strategic approach to educational reform that supports other strategic reform initiatives already underway.
- The concepts and examples of effective teacher internship and fellowship programs sponsored by employers appear to offer an

excellent vehicle for achieving the strategic objectives of school reform as well as many of the more specific and self-interested objectives of the teachers, school districts, and employers involved. Reform efforts will go further faster and with greater likelihood of success if reinforced by the self-interests of the key participants.

In the pages that follow, eleven pioneer teacher internship programs from across the nation are briefly described. Most of these programs focus their efforts on improvements in science and mathematics instruction in public schools. Many also place a strong emphasis on communication skills and also make a special effort to involve teachers of English and social studies. All rely heavily and often entirely on the leadership of employers, both public and corporate, and on the deep motivation of those employers to improve scientific and mathematical understanding and competencies throughout our society. This descriptive information is then used as the basis for an analysis of the directions in which these new teacher internship ideas and programs could move if supported by broader leadership in communities across the nation.

II. TEACHER INTERNSHIPS: THE PURPOSES

Internships in business and industry for school teachers are becoming recognized as an effective way to keep good teachers teaching and to improve student understanding of career opportunities and of the learning needed to reach those opportunities.

Teacher internships -- typically during summer months -- with private and public sector employers are one means being developed to achieve a variety of objectives:

- Providing students (through their teachers) with accurate and timely information about career opportunities and the decisions students must make in selecting courses and extracurricular activities needed to achieve career goals. Encouraging students to strengthen their mathematics, science, and communications skills is a special objective of many teacher internship programs.
- Improving teacher competencies and motivation through direct contact with current research and business-related ideas and practices and with the people who make those ideas and practices "come alive" in their daily work.
- Improving school curricula in mathematics, science, and written communications, for example by stimulating teachers to identify and correct problems in current instructional methods and content both within their classrooms and in system-wide school curricula.
- Supplementing basic teacher salaries with stipends and salaries for summer work experiences that combine professional development with meaningful contributions to the employer or other sponsoring organization. Combined summer and school year incomes enable skilled teachers to continue in their profession rather than seek greater financial rewards in full time employment elsewhere.
- Enabling employers to fulfill commitments to cooperate with local school districts in efforts to improve teacher competencies and overall educational quality.
- Providing employers with qualified, reliable summer workers to accomplish specific projects requiring instructional or guidance skills or to assist employer staff in the fulfillment of normal work tasks.

Teacher internships address all of the above objectives. To emphasize the professional development and continuing education aspects of these programs and to distinguish them from learning experiences aimed at students and novices, some programs identify themselves as "teacher fellowships" rather than as "internships."

Internships for students have long been recognized as an important method of initiation into the practices of an occupation or profession. The use of internships for further professional development of already experienced staff -- whether in teaching or any other profession -- is far less well established. Of the teacher internship programs that do exist around the nation, all are small in size and most have been initiated only within the last two or three years. Therefore, the concepts and practices of teacher internships should be understood as experimental and pioneering ideas and activities.

The most significant stimuli for these projects and programs have been employer concerns about (1) the quality of science and mathematics instruction in secondary schools and (2) the quality of career guidance information being provided to students. Leading educators have sought to address these issues for many years. But in the past the school-employer connections needed to respond effectively and on a wide scale have been lacking.

Beginning with the "Career Education" movement of the 1970s and continuing to the educational excellence reform movement of the 1980s, educators and employers are learning how to work together on a broad agenda of needs and concerns. This willingness to work collaboratively has enabled teacher internship programs to find sponsors in both schools and research and business institutions. The involvement of higher levels of leadership on both sides and the willingness of these leaders to commit their organizations and resources to the development of joint programs have been crucial to program initiation and success.

III. TEACHER INTERNSHIPS: WHAT'S OUT THERE?

Professional development internships for teachers can be found scattered across the nation. A few exemplary programs have already inspired replication. Some of these replications have themselves been exemplary, further demonstrating the importance of networking as a strategy for developing the exciting potential of internship opportunities. In this way, without widespread national recognition or legislation and even without major financial support for dissemination activities, internship models are gaining credibility and acceptance among educators, business groups, and local and state governments. Given the growing general concern for the quality of teachers and their training and the already significant concern for the quality of instruction in science and mathematics, teacher internship programs appear as a creative and effective response and as one component of an overall reform strategy. It would not be surprising to see a "mushrooming" of teacher internship programs throughout the nation over the next several years. But with expansion could come serious problems of quality control.

During 1985 at least eleven teacher internship programs of significant size and quality operated around the nation. The programs are summarized in Figure 1 at the end of this chapter in the chronological order of their establishment. More detailed, but still brief, summaries follow below:

- San Francisco Bay Area: Industry Initiatives for Science and Mathematics Education (IISME) is a project of a consortium of high technology firms in the San Francisco Bay Area. Coordination and assessment assistance is provided by the Lawrence Hall of Science at the University of California at Berkeley. A small program in 1984 preceded the decision to organize IISME as an on-going industry-sponsored program.

  During the summer of 1985, IISME provided internships to 41 "teacher fellows" at 13 companies. Teacher fellows are paid $600 per week for mathematics and science internships of eight or six weeks duration.

With leadership from Lockheed and Hewlett-Packard Corporations, IISME may be the most ambitious of the private sector teacher internship programs: (1) rapid expansion to 200 teacher fellow positions at 50 firms in seven Bay Area counties is planned for the summer of 1986; (2) program developers hope to use the summer experiences and teacher-initiated planning as leverage for collaborative curricula changes with area school districts; and (3) the program's corporate organizers have raised funds to support a year-round staff for IISME and its collaboration with the Lawrence Hall of Science. Local expansion of IISME will reach out to service industries including banks, other financial institutions, and retail sponsors. The eventual goal is to see IISME replicated in other areas of the country.

The IISME approach also includes follow-up activities for teacher fellows during the school year following the summer internship: two meetings of fellows and their mentors to assess program impacts in the classroom, and other opportunities for fellows to attend lecture series at the Lawrence Hall of Science.

o Cleveland, Ohio Area: Cleveland's Teacher Internship Program (CTIP). What may be the oldest teacher internship program in the nation is located in Cleveland, Ohio. Organized in 1979 with its first interns in the field in the summer of 1980, CTIP emphasizes internships for experienced teachers of science, mathematics, and other subjects.

The Institute for Environmental Education (IEE), a local non-profit organization, initiated and operates the internship program. Direct financial support has come largely from corporate sponsors and area foundations. In 1986 CTIP will be entirely self-supporting through corporate sponsorships.

In 1985, CTIP placed 60 interns, including six college faculty, in a wide variety of corporate assignments at 26 sites. The bulk of these positions were computer applications, technical writing, and science research, with others in marketing, statistical analysis and other business applications.

Basic features of the CTIP experience are:

-- Companies agree to sponsor 8-11 week internship/learning experiences.

-- Teachers apply and compete for internship assignments with employer-sponsors. All contacts are coordinated by CTIP.

-- Teachers enroll at their own expense in courses at Cleveland State University, earning 1 to 7 credit hours (depending on the number of school curriculum projects developed).

-- Interns attend Wednesday afternoon seminars during 5-6 weeks of the summer internship.

-- All interns design and produce new classroom curriculum projects and share them with the other interns.

-- Companies pay stipends and costs to CTIP, which in turn allocates stipends to teacher interns.

-- Stipends earned by school teachers range from $275 per week for a first year intern to $575 per week for a seventh year intern. Stipends for college-level teachers range from $600 per week for a first year intern to $900 per week for a third year intern. CTIP distributes the total summer stipend over a 12 month period.

The program achieved a financial break-even point in 1986 with the placement of 50 teachers. About half of each year's interns continue in the program the following summer. As interns accumulate graduate academic credits, they may qualify for permanent salary increases in their respective school systems, thereby securing additional financial benefits from the internship program. CTIP has also initiated an internship program for 50-60 college faculty during the academic year.

o Washington, D.C. Area: Teacher Component of Summer Science and Engineering Apprenticeship Program (SSEAP). In 1984, a teacher component was added to the Department of Defense-sponsored summer apprenticeship program for high school students. Fourteen high school science teachers from school districts in the metropolitan Washington, D.C., area held summer internships with SSEAP in 1985.

Each teacher intern receives an educational support stipend of $350 per week for the eight week summer program which is designed and operated by the University of the District of Columbia (UDC). The teacher internship is described as the laboratory half of a two-part graduate course sequence. Teacher interns must first complete a three-credit UDC course on "New Technology in the Science Classroom." This course, conducted on Saturdays during the school year, combines classroom readings, class discussions, presentations by outstanding researchers, and field trips to laboratory sites. Following satisfactory completion of the course, the summer internship is worth another three graduate credits from UDC. Tuition for the school year course is also paid by the DoD grant to UDC. Not all teachers completing the course enroll in the summer "laboratory" experience.

o Columbus, Ohio Area: The Teachers-in-the-Workplace (TIW) Program. TIW operates in Columbus, Ohio, and its hinterland of Franklin County. It was initiated in 1982 through a grant from the Columbus Foundation as the result of a proposal submitted by the Career Education staff of the Upper Arlington school district. The first operating internship program was in the summer of 1983.

The program involves a cooperative effort among seven local school districts and collaboration between business/industry and education. The Employment and Education Commission (EEC), a private non-profit corporation, assisted in developing, administering and promoting the program among local businesses. In January, 1986, this function was passed to the participating school districts.

During the summer of 1985, 11 teachers participated in paid four-week internships sponsored by nine Columbus-area employers.

For the 1985 summer program:

-- During the previous school year the EEC staff recruited private sector sponsors and helped them develop effective internship experiences. Starting in 1986 this function will be provided by career education coordinators in cooperating school districts.

-- EEC staff also worked with the non-profit Center for Economic Education at Ohio State University to plan and coordinate a two-week seminar: a one-week economics and business orientation immediately preceding the internship and a one-week classroom-planning seminar following the internship experience.

-- Teachers applied for positions through their own school districts. Career education staff in each district interviewed and selected teacher applicants.

-- EEC and career education staff from participating districts helped match selected teachers with employer positions.

-- Employers donated $1,100 for each teacher intern sponsored, $1,000 going as a stipend to each teacher. The modest remaining funds were distributed among the fiscal agent (Franklin County Schools), EEC, and the Center for Economic Education.

-- Local school districts may help teachers transfer new skills and insights into classroom activities.

In the two program summers prior to 1985, the teacher stipend costs had been paid half by the sponsoring employer and half by the Columbus Foundation. The 1985 program was self-supporting. The Employment and Education Commission disbanded in December, 1985.

o Philadelphia: The Philadelphia Teachers in Industry Program (PTIP) placed seven teachers in 8-10 week research and field study "fellowship" positions with six corporate "hosts" during 1985. PTIP was initiated in February 1985 by the members of PRISM, the Philadelphia Renaissance in Science and Mathematics. PRISM is itself an unincorporated action arm of a business and education leadership group, the Committee to Support Philadelphia Public Schools.

Modelled on the Cleveland Teacher Internship Program, PTIP offers a 12-month professional fellowship consisting of:

-- an 8-10 week summer placement or a 14-week Fall or Spring placement in industry-sponsored research.

-- academic study to assist teacher fellows to adapt their new knowledge for classroom instruction. The combined summer and school year study earn teachers three graduate credits from Temple University.

-- four mini-conferences during the school year on topics dealing with "cutting edge" technological developments.

-- year-round dissemination of ideas and information through teleconferencing, electronic bulletin boards, and newsletters.

-- a stipend of $2700 to $3600 during the 12 month fellowship. Stipends are paid by PTIP in monthly installments.

-- Technical assistance from university faculty "consultants" available to both teacher fellows and business mentors.

Corporate sponsors donate funds to PTIP, which administers the program and pays stipends to teacher fellows. PTIP expects a corporate donation of $4500 for each teacher sponsored. Expansion of the program is planned for up to 40 fellowships in 1986-87 and 80 in 1987-88. PTIP staff develop placements with local employers and coordinate year round cooperative action between schools, universities, and employers.

o Denver Area: Summer Fellowships for Science and Math Teachers. The success in 1984 of an informal teacher internship project at a Denver area Hewlett-Packard facility led in 1985 to the initiation on a prototype basis of Summer Fellowships for Science and Math Teachers under the sponsorship of the Colorado Alliance for Science (CAS). The 1985 program placed five teachers in fellowship positions at local facilities of Kodak and Hewlett Packard Corporations. The Alliance, a non-profit coalition of employers and education leaders and their organizations, is based at the University of Colorado in Boulder. Leadership from the Alliance's Steering Committee helped establish the program's financial and programmatic base. A one year grant from the Colorado Commission for Higher Education supports Alliance for Science program administration, seminar instruction, and assessment during 1985-86.

-- Teachers receive $4,000 each for their eight week assignments.

-- Employers contribute the $4,000 per teacher to the Alliance, which distributes stipends.

-- Placements are in an industrial laboratory or manufacturing facility.

-- Teacher fellows will receive three graduate academic credits from the University of Colorado starting with the 1986 summer program.

-- Each employer designs a research project for the teacher fellow to complete within the eight week period.

-- University staff design and conduct three two-day seminars during the eight week period. Seminars are designed to orient teachers to their internship experience and to help them apply their new learning to classroom practices.

- Nationwide: The U.S. Army Summer Associateship Program for High School Science and Mathematics Faculty, jointly sponsored by the U.S. Army Research Office (ARO) and 28 participating Army research laboratories or centers nationwide, was first conducted during the summer of 1984. The program provided 10-week associateships for 86 outstanding high school teachers. In 1985, the second year, the program placed about 100 teachers at 27 Army research laboratories or centers. The Battelle Scientific Services Program Office in Research Triangle Park, North Carolina, serves as contract manager.

  Battelle's responsibilities are to make high school teachers aware of the program, collect and distribute applications to participating Army laboratories, award associateships to selected candidates, oversee the conduct of the program, and report its accomplishments. Teachers submit applications for the summer positions by mid-February. Each teacher associate is paid $450 per week. Selected applicants must live within commuting distance of a cooperating site. The Army Research Office has funded more than half the awards, with the remainder funded by participating Army research organizations. In 1984 teacher associates came from 72 high schools in 15 states and the District of Columbia.

- Flint, Michigan, Area: The UAW-GM Quality Education Program provides paid internship-style work experiences for teachers from public school districts throughout Genesee County, the heartland of the automobile industry and especially of the United Auto Workers Union (UAW) Region 1C and the General Motors Corporation (GM). Begun in the summer of 1983, in 1985 the program placed 29 science, mathematics, industrial education, English, and communications teachers in 13 different UAW-GM plants.

  -- Summer internships ("teacher consultantships") are eight weeks long.

  -- Teachers receive a stipend of $125 per day (for a total stipend of about $5,000).

  -- All teachers serve in consultant roles and are assigned tasks related to UAW-GM employee training.

  -- Teachers receive graduate level credits from Michigan State University through a course designed to critique the work experience and help teachers transfer information into school curricula.

  -- Teachers develop written course modules usable in regular UAW-GM training in topics ranging from basic skills to computer awareness, task analysis, and process control.

  The UAW-GM Program estimates that teacher projects produced an estimated $277,000 in cost-avoidance savings in 1985. The program is jointly funded and administered by the UAW-GM Region 1C Human Resource Center in Flint and the National UAW-GM Human Resource Center in Troy, MI.

Washington, D.C Area: The Summer Work-Education Externships Program in the Washington, D.C., metropolitan area is operated by the not-for-profit Institute for Educational Leadership (IEL). IEL, a policy analysis and leadership training organization with projects nationwide works directly with area school districts and business leaders of the Greater Washington Board of Trade to provide 4-week work exploration experiences for teachers, guidance counselors, and other school staff.

Participating "externs" receive tax-exempt stipends ranging from $200 to $800 for the four weeks. The program was tested in the summer of 1983 with District of Columbia counselors and expanded to include suburban school districts in 1984. The program enrolled 26 externs at 25 employer sites in 1984 and 30 participants at 27 sites in 1985.

A wide variety of employers participate in the program whose major purposes are (1) to provide educators with experiences and information they need to prepare students better for the transition from school to work, and (2) to build partnerships and develop networks to bring the business community into the schools. Retail and financial businesses account for a substantial number of placements. The number of technology companies participating in the program is growing each summer.

Participants' externship experiences range from regular job entry training and typical initial work placements to special assignments appropriate to a participant's skills and experience. In all placements, externs learn about various aspects of their sponsoring employer. IEL provides information and professional development seminars over a five-month period, June through October, to assist in transferring new insights and knowledge into the participants' classrooms during the school year.

Pittsburgh, Pennsylvania area: Professional Enrichment Program (PEP). Math and science teachers from middle and secondary schools participate in a summer teacher internship program operated by a local non-profit organization, Conservation Consultants, in cooperation with the Pittsburgh Council on Higher Education. The core of the PEP program consists of:

-- A six-to-ten week summer internship for teachers with Pittsburgh area corporations or research institutions. In some cases the teacher has been teamed with a qualified student.

-- Teachers receive a stipend of $300 per month: one month's stipend for each week in the internship. Student interns are paid transportation and meal expenses.

-- Teachers enroll in a ten-session "Science and Math Enrichment Seminar" taught at Duquesne University. The seminar meets every other week, September through March. Tuition for the three credit graduate course has been paid thus far by the Buhl Foundation. The teacher internship itself qualifies for another three credits for a total of six credits.

FIGURE 1: ELEVEN EMPLOYER-SPONSORED TEACHER INTERNSHIP PROGRAMS

LOCATION AND PROGRAM NAME	FIRST YEAR OPERATIONAL	NUMBER OF TEACHERS SERVED 1985	NUMBER OF INTERN-SHIP SITES 1985	LENGTH OF INTERN-SHIP WEEKS	AMOUNT OF PAY/ STIPEND	GRADUATE CREDITS	SOURCES OF FUNDING	SCHOOL-YEAR PRE-INTERN OR FOLLOW-UP ACTIVITY	TYPE OF EXPERIENCE
Cleveland, OH: Cleveland's Teacher Internship Program (CTIP)	1980	55	26	8-11	$275-$575 per week for school teachers; $600-900 per week for college teachers	1-7 (Cleveland State U.)	Employers; local foundations (only employers in 1986)	graduate courses (summer internship, seminars, and class-room pro-jects)	science, computer, technical writing and research projects; school year curriculum planning
Columbus, OH: Teachers in the Workplace (TIW)	1983	11	9	4	$1000	3 (Ohio State U)	Employers; (also local foundation in prior years)	In-service activities and class-room pro-jects	Work explora-tion with manufac-turing and service industries: bank, retail, law, news-paper; defense plant
Genesee County, MI: UAW-GM Quality Education Program	1983	29	16	8	$5,000 ($125 per day)	3 (Michigan State U.)	UAW-GM Human Resource Centers: Region 1C and national office	None	Assist in employee training; prepare training modules; school year planning

LOCATION AND PROGRAM NAME	FIRST YEAR OPERATIONAL	NUMBER OF TEACHERS SERVED 1985	NUMBER OF INTERN-SHIP SITES 1985	WEEKS LENGTH OF INTERN SHIP	AMOUNT OF PAY/ STIPEND	GRADUATE CREDITS	SOURCES OF FUNDING	SCHOOL-YEAR PRE-INTERN OR FOLLOW-UP ACTIVITY	TYPE OF EXPERIENCE
Pittsburgh, PA: Professional Enrichment Program (PEP)	1983	13 (plus 21 in seminar only)	12	6-10	$300 per week (paid $300 per month)	3-6 (Duquesne U.)	Employers; local foundations and corporate grants	University graduate seminar; in-school projects	Employer-specified research projects
Washington, D.C. area: Summer Work Experience Externship	1983	30	27	4	$200-$800 per internship	None	Employers; local school districts; foundations	Seminars; curriculum development	Work exploration in primarily service businesses: banks, retail, hospitals
Washington, D.C. area: DoD Teacher Summer Science and Engineering Apprentice Program	1984	14 (plus 11 in seminar only)	7	8	$2800 ($350 per week)	3-6 (U. of Dist. of Columbia)	U.S. Dept. of Defense	University graduate seminar	Science research or staff assistance role in government research laboratories
Nationwide: U.S. Army Summer Associateship Program	1984	100	27	8-10	$450 per week ($4500 maximum)	None	U.S. Army Research Office	None	Science and engineering research projects

LOCATION AND PROGRAM NAME	FIRST YEAR OPERATIONAL	NUMBER OF TEACHERS SERVED 1985	NUMBER OF INTERN-SHIP SITES 1985	WEEKS LENGTH OF INTERN SHIP	AMOUNT OF PAY/ STIPEND	GRADUATE CREDITS	SOURCES OF FUNDING	SCHOOL-YEAR PRE-INTERN OR FOLLOW-UP ACTIVITY	TYPE OF EXPERIENCE
Berkeley/Bay Area, CA: Industry Initiatives for Science and Mathematics Education (IISME)	1985	41	14	6-8	$600 per week	None	Employers	Two follow-up meetings	Math/Science Research project fellowships
Boulder/Denver, CO: Summer Fellowships for Science and Math Teachers	1985 (prototype year; full operation 1986)	5	2	8	$4,000	3 (U. of Colo. beginning in 1986)	Employers; Colorado Comm. for Higher Ed.	None	Math/Science research project fellowships
Philadelphia, PA: Philadelphia Teachers in Industry Program (PTIP)	1985	7	6	8-10	$2700-to-$3600 (paid over 12 months)	3 (Temple Univ.)	Employers; Foundations; Corporate donations	Industry seminars; post-internship meetings; mini-conferences; newsletter; computer-conferencing; graduate courses	Research and field study fellowships with math/science emphasis
New York State: Teacher Summer Business and Employment Program (not an internship program; but has major internship potential)	1985	310 state-wide	216 in ten regions	N/A	Varies by employer	None	Employers pay wages; state reimburses up to $1,000	None	Not an internship per se. General employment for teachers of science, math, computer science, and occupational

-- Conservation Consultants recruits both teachers and corporate internship positions, and matches teachers to projects. Employers interview and select interns.

-- As a result of the internship and subsequent seminar, teachers are expected to develop science and/or math curricular projects applying their new insights to improve classroom learning.

-- Participating corporations and other employers (including area universities) contribute $500 per week to Conservation Consultants to cover stipend and program operating costs. Sponsors of student interns contribute an additional $50 per week.

-- Additional costs are met through contributions by other corporate and philanthropic foundations.

Initiated in 1983, PEP has supported about 14 teacher interns each summer. About 35 teachers have participated in the tuition-free curriculum enrichment seminar. In 1985 thirteen teachers held internships at twelve employer sites.

o New York State: Teacher Summer Business Training and Employment Program. Structured as an employment program rather than as an internship program, New York State's Teacher Summer Business Training and Employment Program has significant potential for internship activities. In 1985 it sponsored summer jobs for 310 teachers statewide in a wide variety of occupations.

The program is based on 1984 legislation authorizing reimbursements to employers statewide for 30 percent of teacher wages and benefits of up to $1,000 per teacher. Intended to assist over 4,000 mathematics, science, and occupational education teachers annually, the Program will be revised during 1985-86.

The New York State Department of Education administers the statewide program through ten regional "Commissioner's designees." The State Business Council and other state and local level business groups assist in popularizing the program among employers. In 1985 just over 200 employers participated.

No academic credit program is provided currently through the statewide program. Programs which offer academic graduate credit are being established on a regional basis. The structure of this teacher employment program could be adapted easily to become a true internship program.

From a local viewpoint the ten regional Commissioner's designees provide information and assistance to teachers, employers and school systems.

IV. REPLICABILITY, SUSTAINABILITY, AND EXPANSION

In the few years of their existence at scattered locations around the nation, science/math fellowship and summer internship programs for teachers appear to be accomplishing the goals set for them. Anecdotal assessments indicate:

- Participating mathematics, science and other teachers are receiving significant monetary supplements through summer internships. These supplements range from stipends of about $3,000 to stipends or wage income of up to $6,000. In addition, tuition costs may be included and graduate credits earned may contribute toward permanent salary increases from school districts.
- Paid work-study experiences are also educating teachers to new developments in their fields of instruction. Special emphasis in most internship programs is given to science and math.
- Teachers are using their new contacts and insights to improve their teaching and enrich the instructional content of their classes.
- Students are gaining more insight into career opportunities in technical fields and have more direct access to adults working in those occupations.

The reported satisfaction levels among teachers and employers are high, as is the enthusiasm of the coordinators of teacher/internship fellowship programs. Lacking longitudinal data from assessments of local programs, however, no firm conclusions can be made about the validity of these perceptions.

Initial perceptions are persuasive nonetheless. Programs are closely monitored by both employers and local funding sources. These people have strong and pragmatic interests in improving the quality of science and mathematics instruction in secondary education.

High levels of initial satisfaction probably reflect the careful planning and administration which seems to be associated with these pioneer programs.

Less obvious are answers to questions of program replicability, expansion, sustainability, and leadership.

Replicability

On the surface, replication of teacher internship and fellowship programs at new sites would appear to be easy and natural. Several cities have already learned from the examples of others.

Where the conditions of success already exist, successful replication does indeed appear feasible. Success probably depends on a few key factors:

- Business leaders committed to successful working relationships with local public schools, universities, and teachers.
- A few employers willing to devote modest professional staff resources to the organizing and on-going coordination of business involvement in the internship program.
- Adequate financial backing to assure top quality staff to administer programs and conduct seminars and related learning activities which distinguish internship/fellowship programs from simple summer jobs.
- University cooperation to qualify the internship program for academic credit and, preferably, to build on-going professional development activities closely and carefully linked to the summer program.
- Teachers and school systems ready to cooperate.
- Sophisticated and dedicated program administrators skillful in the ways of education-employer collaboration and partnerships.

Replicability requires all these factors as well as the strong initial leadership needed to galvanize positive attitudes and organize time and resources so that the central concepts of teacher internship programs are seen as important partnerships between schools and employers.

Expansion Locally and Nationally

Many factors determine the optimum size of a teacher internship program in a given community. Among them are:

- Number and type of large employers
- Corporate policies toward education partnerships

- o Authority delegated to local plant or division managers
- o Adequacy of financial incentives offered to teachers
- o Adequacy of school system support
- o Appropriateness of the implementation strategy
- o Leadership skills of people who design the campaign to establish the program.

Once a program is well designed and well implemented, the enthusiastic sponsors may tend to think that "the sky's the limit." That is, they may tend to believe that success will breed success, that other employers will see the ease, simplicity, and rewards of participation. Internship "slots" and funding will follow. Teachers will queue for the offered experiences.

Major expansion of existing internship programs may prove to be more difficult than program initiators anticipate. The oldest, most experienced internship program for science and mathematics teachers is in the Cleveland, Ohio, area. There, amid many corporate research, manufacturing, engineering, and headquarters organizations, the Teacher Internship Program has maintained a participation rate of 40-50 interns each summer. Reaching that plateau has been hard work.

Other program organizers have found that corporate consolidations, mergers, and economic shifts affect the willingness of even very large corporations to participate on even a small scale. The willingness of satisfied employers to sell the program to their peers may be limited despite their own positive experiences and attitudes. The effort and time required to sell the program to a second ring of employers may be out of proportion to the number and quality of internship positions gained. Finding qualified staff to operate an expanded program may be an obstacle.

All these considerations point to the fact that internship programs cost money for careful and sophisticated implementation. These overhead costs beyond the direct costs of participant stipends and/or salaries must be paid either by the cooperating employers, by foundations, or by other sources.

Are employers willing to carry these extra costs in addition to the internal supervisory costs of organizing teacher internship projects?

One answer, of course, is that some are and some are not willing to make these commitments. The reward-cost ratio is calculated differently in each case. This suggests that even effective internship programs may find a limit to the number and quality of cooperative employers in a given area. Educating additional employers and school districts to the benefits of participation may be a task more complex than anticipated.

Limitations on the employer side will be put to the test in 1985-86 in the San Francisco Bay area. Under almost ideal conditions of top level leadership, strong program implementation capability, and positive pilot program experience, attempts are being made to expand the IISME teacher fellowship program from 41 positions in 1985 to 200 positions in 1986. In contrast, the New York State legislature assumed in 1984 that most employers would need financial incentives to hire science and math teachers for summer jobs, even for jobs where no internship or learning requirement was involved. Far from asking for employer contributions, the State chose to reimburse part of the wages paid to eligible teachers by summer employers. The state also paid the costs of program administration.

Even successful expansion of IISME, based as it is in California's highly sophisticated, science-driven economy, may be a poor guide to the expansion opportunities in most American urban areas. Much less might be expected in rural areas or communities lacking a large number of major high technology

employers. On the other hand, the establishment of effective teacher internship/fellowship programs of 50-to-100 positions annually in 100 metropolitan areas nationwide would appear to be within reach. The example of the UAW-GM Quality Education Program in Genessee County, Michigan, shows what can be accomplished when even a single employer asserts interest and thoughtful leadership.

Institutionalized on a modest and manageable scale with strong quality controls, the nationwide impact of teacher summer fellowships/internships in science and mathematics could be monumental over a 10 year period. A nationwide network of programs reaching 5,000 to 10,000 teachers annually might touch the lives of 40,000 to 50,000 teachers or more in a decade. This would be a major national accomplishment.

Sustainability

Both individuals and organizations need results of which they can be proud. Program sustainability must be rooted in task performance and utility. Without quality performance, useful tasks, and pride in accomplishments, a school-employer program of any type will wash away in the first sprinkle of criticism or budget cuts.

In every successful, on-going program, it is the examples that count:

- A teacher whose work in an engineering firm made her a valued member of a project team.
- A teacher whose positive experience led her to write a new physics textbook, assisted informally by company scientists on their own time.
- A teacher who designed and prepared a new training manual in clear English for company engineers.
- A teacher who helped a company identify the best ways to work with area schools: organizing volunteers for classroom speakers, developing procedures for site visits to the firm, and preparing guidelines for topics most useful to students.

With enough good experience to demonstrate that internships can work, managers and school administrators will support each other when the occasional disappointment arises. Successful experience builds confidence and trust.

But experience may not be easy to come by where little or none previously existed. Coordinators of teacher internship programs quickly discover that engineering and research companies are difficult customers: they frequently doubt that teachers are worth the trouble and are astounded when a teacher actually demonstrates competence and professionalism. These managers can be persuaded by example, but only after they see the evidence -- good empirical method, perhaps, but tough on the internship salesperson and a challenge to the teacher interns themselves.

Sustainability within a company requires more than successful internships. No internship program is essential to an employer's economic success or to its public relations image. Even successful programs that justify the company's investment and enhance its public image must depend for their continuity on the good will and attention of high level executives.

Internship and fellowship programs for school teachers are blossoming in the mid 1980's only because of a national mood which has turned the attention of business leaders to the needs of elementary and secondary public education. Thus sustaining effective internship programs requires on-going, determined efforts to assure both top level support and task-level quality. Each reinforces the other.

Will internship programs survive the recent flurry of interest in teacher quality and concern for shortages of science and mathematics instructors?

Are these programs merely one aspect of a faddish interest in education-business collaboration, merely an investment in good public relations?

Improvements in science and mathematics education will come only from mature programs that have earned the trust and respect of institutional leaders. Effective long term internship programs should become points of departure for collaborative leadership and programs among a select group of teachers and their research mentors. For these reasons, teacher internship programs must emphasize their connection to a broad philosophy of school improvement and collaboration between education and work institutions.

V. NEW DIRECTIONS/NEXT STEPS FOR TEACHER INTERNSHIPS

- Could teacher internship and fellowship programs with corporations and other employers have a major, positive impact on the teaching of mathematics, science, and other disciplines in the nation's schools?
- Could these programs make a significant impact on the ability of elementary and secondary schools to attract and retain skilled teachers?
- Could teacher internships in science and mathematics-related occupations become a core part of employer-school partnerships across the United States?
- Could teacher internship programs also become a standard part of teacher in-service training and an expected experience in a teacher's career development process?
- Could these internships become a major vehicle for disseminating accurate career information to students, thereby sharply improving the quality of student decisions about their future lives?

Strengthening the case for teacher internship programs will require dynamic leadership in four areas:

- A network of corporate "champions" is needed to advocate and organize the internship approach to school-business partnerships in science and math education.
- School district boards of education and superintendents should take the initiative to persuade employers of the need for and significance of internship programs.
- State-level organizations representing employers, educators, and professional scientists and engineers should collaborate on advocacy and networking strategies supporting teacher internships.
- New patterns of teacher career development and advancement should incorporate internship opportunities and concepts.

Employers, professional teacher unions, school administration groups, and higher education institutions will need to collaborate in the development of these alternative career models involving internships systematically.

A Network of Corporate "Champions"

In California companies like Hewlett-Packard, Lockheed, and TRW have been active as organizers and advocates of science and math internship programs for teachers. In each case someone fully committed to the collaborative spirit and quality of internship programs has worked hard to involve her/his corporate employer in the design and implementation of a community-based teacher internship program.

Unusual commitment to these programs is required from top level executives and educators, mid-level supervisors and administrators, and the teachers and mentors themselves. Innovations -- especially across institutional boundaries -- are usually seen as troublesome until proven valuable.

The natural place to look is to larger national corporations with facilities and effective managerial talent located in many communities. General Electric Corporation, for example, has had exceptional success over a 25-year period in implementing Educators-In-Industry seminars and other career education programs in GE and non-GE communities nationwide. Starting in Syracuse, New York, and then to Louisville, Kentucky, and Lynn, Massachusetts (all sites of major GE facilities), and supported annually by modest financial grants from the GE Foundation, the Educators-In-Industry program is now active in 36 GE communities.

Moreover, other communities have successfully involved their local business leaders in replicating the program. And the State of Arkansas liked the idea so much that in 1982 it initiated a state wide Arkansas Educators-In-Industry Program. Using the GE model and backing it with a state employee dedicated to the program's dissemination, Arkansas had established the program in 21 cities by mid-1985.

Similarly, GTE Corporation has sponsored since 1983 a Growth Initiatives for Teachers (GIFT) Program that provides grants to teams of science and math teachers for school enrichment projects. Local school systems must match the GTE teacher grant, thus assuring local school system cooperation.

Although not teacher internship programs, the GE and GTE examples demonstrate how energetic, effective, and sustained commitment invested by a single company can gain credibility and visibility for ideas that link the very different worlds of schools and businesses.

Do teacher internship programs lend themselves to advocacy and action by a single company? Or is collaborative networking and advocacy needed by a core group of corporations. Many companies already engaged in local teacher internship programs could provide exceptional leadership - whether singly or collaboratively - for the gradual nationwide dissemination of internship programs.

One possibility is that a single major corporation could identify itself with teacher internship programs and become the chief sponsor and advocate of program dissemination. Other employers would be involved in local internship programs. But national program strategy, responsibilities, and visibility would be largely "owned" by a single corporation.

Alternatively a group of large corporations with facilities scattered around the nation could work together to plan and implement a national "roll-out" strategy for teacher internship programs. Perhaps all of these firms would represent a single sector -- such as computer manufacturers, electronics, or defense -- particularly dependent on the quality of science and math instruction. Perhaps, as is the case in the San Francisco Bay area, the corporate network would be a diverse group interested both in their own business sectors and in the overall quality of regional economic and educational

competitiveness.

In essence, leadership strategies can vary, but corporate commitment is essential for the development of locally responsive, creative programs.

Another example of commitment to building an effective education-employer network is the U.S. Department of Defense (DoD) and its Summer Science and Engineering Apprenticeship Program (SSEAP) for high school students. All three military services - Army, Navy, and Air Force - are involved, each in its own way. Military laboratories and research centers nationwide participate. Overall, about 3,000 student apprentices (interns) have worked with science and engineering mentors since the initial DoD summer program in 1980.

The DoD teacher summer internship program operating through SSEAP in the Washington, D.C. metropolitan area since 1984 and the larger U.S. Army Summer Associates Program sponsored nationwide since 1984 by the U.S. Army Research Office build on DoD's experience in designing and operating successful internship programs for students.

The command structure of military organizations, one might assume, could facilitate networking and speed the implementation of a new program. But far more important than centralization of command authority, however, is the fact that DoD reinforces policy guidance with financial support. Sharing the costs of innovation makes the participation of local research offices both feasible and more enthusiastic. Voluntarism and incentives, not command, are at the heart of internships and other collaborative learning programs.

Creating national attitudes that turn work into learning experiences and use summer internships as a natural part of teacher career development will take time and leadership. Business leadership networks are the key element in this effort. Employers control the work experiences, information, and many of the institutional incentives necessary for successful local internship initiatives.

All these factors tend to favor participation by larger corporations and research organizations. These large organizations tend to be reliable because of:

- Management depth and specialization (usually lacking in small businesses) which can take on program coordination and supervision tasks without detracting from a business' primary responsibilities.
- Dependable financial resources that can be committed to a small internship/partnership program despite temporary changes in economic conditions.
- Adequate numbers of employees and supervisors who will want to work with teacher interns and who can provide backup support when problems arise.

School District Initiatives

Business leaders want to see schools improve instruction in mathematics, the sciences and other areas of the curriculum. Many business leaders can be persuaded to provide students and teachers with opportunities for internships in science and mathematics occupations.

But first they want to be welcome. They want professional educators to acknowledge that participation by business and research professionals is valuable, desirable, and feasible from an educational perspective. Leadership from the education side must support leadership from the employer side.

Local educational leadership can come from several principal sources:

- School boards
- Superintendents, school administrators
- Teachers and teacher unions and professional organizations
- Local university faculty and administrators

School boards can provide overall policy approval and assure that teachers receive recognition within their schools. Board members can become effective advocates of internship programs in their meetings with business groups, journalists, and the general public. They can legitimize summer internships and

mid-year seminars for secondary school teachers by encouraging experimentation in teacher career development strategies.

Superintendents, principals, and other school administrators, like school board members, have extraordinary influence over the general attitudes and resources that support or inhibit teacher internship programs. To a greater degree than board members, however, education administrators can control the flow and quality of information to teachers; and an extraordinary degree they can control the flow of information from participating teachers back into the education system. Thus the ability of teachers to learn about internship/fellowship opportunities in a favorable way and to use what they learn to make changes in classroom and school system procedures is directly and deeply shaped by the quality of leadership exhibited by local education administrators.

Teachers themselves must show individual as well as group leadership. As individuals, teachers are the heart of internship programs. Their motivations and skills must be involved if these programs are to make any sense practically and are to result in improvements in student learning. The positive examples of individual teachers are the bits of evidence that keep employers motivated and persuade other employers and school districts to participate.

Nurturing these individual motivations and interests is also a responsibility of teacher unions and other professional teacher organizations. Through the collective bargaining process and in many informal ways these teacher organizations, like school administrators, shape the types and quality of information available to teachers. These organizations have many ways to influence the extent of teacher participation in internship programs and the application of new knowledge to classroom and school system practices.

As the grantors of graduate academic credit toward masters degrees, local universities often hold one important key to the success of internship programs. The learning content of internship programs should be of a quality worthy of graduate academic credit. Conversely, graduate credit should reflect solid learning experience. The incentive of degree credit should be used to stimulate both teacher participation and serious attention to the learning content of the internship experience. Because school districts frequently award permanent salary increases on the basis of graduate credits earned, administrators and school board members also should pay close attention to this important link between experience, learning, and rewards.

Equally significant in potential if not actual impact to date are the ways college faculty can use internship programs to connect the different purposes and needs of employers, school districts, unions, and postsecondary education institutions. As researchers, consultants, assessors, conceptualizers, teacher trainers, and advocates, college and university faculty and administrators should be in the forefront of efforts to open communications across these institutions and to improve the quality of teachers and teaching. Internships are one of these opportunities.

State Level Collaboration

Providing local exemplary teacher internship programs with national prominence would be far more likely if state policy makers were involved. State level business and professional groups as well as state government leaders all have something to gain and little to lose by the selection of science and mathematics-related internships for teachers as a priority collaborative activity. With their funding sources, conferences, workshops, and newsletters, these state-level groups are ideally situated to plan the expansion of effective programs.

New programs of governmental funding are not necessary although they can be extremely helpful. New York State's program to reimburse employers up to $1,000 paid to each eligible public school teacher hired for summer employment was designed not for internship purposes but rather as a way to supplement teacher incomes through incentives to private employers. Nonetheless, this employment incentive program could also become the financial basis for collaboration on locally-developed teacher internship/fellowship efforts. Corporate, school system, and teacher union leaders could work together to "piggy-back" learning, career development and curriculum reform objectives on top of the more narrow economic and teacher retention objectives that motivated the original State legislation in 1984.

Alternatively, state leaders might prefer to follow the example of Arkansas' support for the General Electric Educators-In-Industry program. Here the appointment of a state program coordinator operating with a modest budget has been useful in popularizing innovative ideas and stimulating local community initiatives. Clearly this advocacy model calls for the selection of a very energetic and persuasive person able to elicit enthusiasm and resources from local business groups, school districts, and universities.

A third approach to state-level leadership would not require any government involvement at all. Here the leadership would clearly be in the hands of non-governmental business and education organizations. Leading private sector employers, state Chambers of Commerce, manufacturers, and other trade associations, state labor council leaders, and state engineering and other professional associations, state-level associations of teachers and school administrators could form a coalition to support the development of local teacher internship programs. The emphasis could be placed on science, math, computers or other academic and occupational disciplines depending on the

interests of the coalition partners. States with established special focus business groups like the Massachusetts High Technology Council might be tempted to build on those specialized sources of leadership.

New Career Paths for Teachers

The fear that exciting and financially lucrative summer jobs will lure away a school district's best teachers to new careers has long been an obstacle to local collaborative programs. Or at least this fear has been articulated as a way of legitimizing inaction on joint programs of various types.

In practice, all effective internship programs use contractual language which forbids the sponsoring employer from offering employment to the teacher intern. But are the fears legitimate in the first place?

The evidence to date is that these fears are misplaced and exaggerated. Teacher turnover is far more likely to occur as a result of teacher "burnout" than as a consequence of enthusiasm for an unexpected alternative career. Negative push is a greater factor than positive pull. That, at least, is the experience thus far of effective teacher internship practitioners.

Several factors lead to this conclusion. First, relatively few teachers have the advanced training needed to let them move readily into new careers with comparable pay. Most have skills comparable - if at all - to technician-level workers. Their undergraduate science, math, or engineering training has equipped very few teachers for viable career options as engineers or scientists.

Second the stipend or salary received through a summer internship supplements a basic teacher salary quite effectively. This is especially true in cases where teachers are encouraged to return to the same employer in subsequent summers. The employer comes to rely on the teacher, to put the teacher's skills to more effective use, and to recognize the justification for increases in summer stipends or pay. Meanwhile the teacher probably has used

the academic credits earned to secure a permanent salary increase within the school system.

Thirdly, a successful internship experience tends to reinforce the self-confidence and motivations of the teacher to remain a professional teacher. The internship experience is refreshing. It provides new information and new perspectives. But it also helps teachers see what they like about teaching: the independence of the classroom, the contact with students, the ability to influence young lives rather than be one person in a bureaucracy. A few weeks each year in another but not greener pasture becomes a useful, temporary change, not a permanent temptation.

For the vast majority of teachers, even science and math teachers working in companies short on scientists and mathematicians, internships serve as career enhancements, not career distractions.

The most effective strategy, therefore, for teachers, school administrators, school boards, employers, teacher colleges and universities, state governments and legislatures and any one else concerned about teacher retention and public school excellence is to use the collaborative possibilities of internship programs for their maximum impact: to build motivations to learn and teach well.

But what about those teachers who do change careers as a direct result of their participation in internship programs?

A magnanimous view of this problem would be to wish these departing teachers well. What would be gained by having unhappy teachers in the classroom? But this response begs the larger policy issue of how to keep qualified teachers teaching.

There is another view. This is to use the full potential of summer teacher internships as part of a set of incentives drawing more qualified young people

into science and math teaching and education careers generally.

In their present forms teacher internship programs are aimed exclusively at the needs of current teachers. For most college students with a latent interest in teaching but a primary interest in engineering, science, or some other career, a detour into teaching seems inevitably a deadend.

Would our schools and our society be any healthier if well-trained young people could see teaching as a first career with the potential to lead to future careers in other professions and in education? Making teacher turnover less of a negative, "burnout" phenomenon and more of a positive career ladder development would have to enhance both personal growth and the quality of instruction in American schools.

The long range direction for teacher internship programs should be as part of a larger strategy that breaks down the barriers between schools and other institutions. Those who make lifelong careers of teaching should do so because they want to, because of the unique rewards found in that profession. Internships can make that choice more economically, psychologically, and professionally acceptable. Those who seek eventual careers in other professions - whether law, engineering, science research, management, medicine, or wherever - frequently would like to "try on" teaching as a first job and as an opportunity for service to their communities. For them, opportunities in summer internships offer connections to second careers. And those who chance into teaching, perhaps on the advice of parents, because of their admiration of a teacher, or for lack of a perceived alternative, also need the stimulation and wider horizons that internship programs offer in part. Whether or not this group of individuals remain in the classroom, they and their students will benefit from any effort to open communications between schools and the world around them.

APPENDIX: CONTACTING SPECIFIC TEACHER INTERNSHIP PROGRAMS

The people listed below provided information about the exemplary programs described in Section III of this report. Changes in program personnel do occur from time to time. Readers seeking current information can begin their own searches with the information/contacts here.

Joseph H. Chadbourne
Director, Cleveland's Teacher
Internship Program
32000 Chagrin Boulevard
Cleveland, OH 44124
(216) 464-1775

Cleveland, Ohio Area

Roni Golden
Columbus Area Chamber of Commerce
37 North High Street
Columbus, OH 43215
(614) 221-1321

and

Ellen Erlanger
Director of Career Education
Upper Arlington Public Schools
1950 North Mallway
Upper Arlington, OH 43221
(614) 486-0621

Columbus, Ohio Area

Maynard Kennedy
Colorado Alliance for Science
Campus Box 249
University of Colorado
Boulder, CO 80309
(303) 492-6392

Denver, Colorado Area

Raymond L. LaClair
Henry L. Keys
Co-Directors
UAW-GM Human Resource Center - Region 1C
4823 Fenton Road
Flint, MI 48507
(313) 257-5325

Genessee County, Michigan

Dr. Frank Dean
Battelle Scientific Services Program
200 Park Drive
P.O. Box 12297
Research Triangle Park, NC 27709
(919) 549-8291

Nationwide

Cynthia T. Laks
Associate
Bureau of Occupational and Continuing
Education Programs Support (after 1/1/87)
New York State Education Dept.
Albany, NY 12234
(518) 474-3973

New York State

Dr. Francis M. Betts, III
Executive Director
Philadelphia Teachers in Industry
Program
P.O. Box 58938
Philadelphia, PA 19102
(215) 545-5616

Philadelphia Area

Jacqueline Tucker
Professional Enrichment Program
Conservation Consultants
417 Thorn Street
Sewickley, PA 15143
(412) 741-3533

Pittsburgh, Pennsylvania Area

Kaye Storm
Program Director, IISME
c/o Lockheed
0/90-01 Space B-253
3251 Hanover Street
Palo Alto, CA 94304-1191
(415) 424-3311

San Francisco Bay Area

Marylin Krupsaw
Program Director, Science and Engineering
Apprenticeship Program
The George Washington University
School of Engineering and Applied Science
515 22nd Street, N.W. Room 50
Washington, D.C. 20052
(202) 676-5581

Washington, D.C. Area

Jacqueline P. Danzberger
Director, Multi-Sector Collaboration Programs
Institute for Educational Leadership
1001 Connecticut Avenue, Suite 310
Washington, D.C. 20036
(202) 822-8405

NATIONAL INSTITUTE FOR WORK AND LEARNING

The National Institute for Work and Learning (NIWL), a private, tax exempt, not-for-profit corporation, seeks to improve the relationships between institutions of work and of learning; to facilitate linkages between education and work for youth and adults; and to bring the supply of and demand for critical skills into better balance.

The means to these ends have taken a variety of forms, including: research, pilot programs, case studies, policy studies, information networking, and technical assistance.

While the means vary, a common thread runs through all NIWL undertakings: the pursuit of collaborative efforts among employers, educators, unions, service organizations, and government to resolve work and learning problems. The development of collaborative processes at local, state, and national levels has been a consistent focus of the Institute since its creation in 1971.

The NIWL agenda is carried out through projects in three related program areas:

1. **Youth Development.** NIWL contributes to: better education-work transitions; greater private sector involvement to increase public school effectiveness; and closer relationships among employers, unions, and education institutions.

2. **Worklife Transitions.** NIWL seeks to aid worklife transitions made necessary by new technology, changing skill needs, plant closings, structural changes in the economy, the movement of women into the labor force, and the prospects of retirement.

3. **Critical Skills.** NIWL focuses on critical skill needs; identifying skill shortages and bottlenecks to their supply; and developing efforts to increase the number of persons with skills critical to industry and the economy.