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ABSTRACT
                This publication reports on a project designed to
increase the awareness and appreciation of educators, and through
them the awareness of middle and high school students, of the
advantages of preparing for careers in technology and science. These
are fields in which Boston high school students generally, and
minority students particularly, have been underrepresented. In this
project--Technology and Science Careers for Minorities (TSCM)--the
Massachusetts Institute of Technology Work in Technology and Science
(MIT/WITS) group served as the catalyst for Boston public schools and
local technological companies. Through workshops, site visits, career
materials, and classroom programs, Boston educators from 16 schools
developed knowledge about careers and their prerequisites. They also
realized that these careers represent excellent possibilities for
minorities and that teachers, counselors, and administrators are in
critical roles for expanding students' perceptions of career options.
The publication summarizes the following aspects of the project:
career awareness; educator's questions; establishing linkages;
educators' workshops; student field trips; classroom speakers;
materials and other services; educators' recommendations; and a
summary of participants' reactions. Appendixes contain lists and
tables of associates with WITS in the TSCM project; forms and
letters; and materials used to link technological organizations to
schools. (KC)

Work in Technology and Science: Linking Education and Employment

Edith Ruina

Technology and Science Careers for Minorities
A progiam of staff development for Boston middle and high school teachers, counselors, and administrators

Contents

THE SCHOOL COMMITTEE OF THE CITY OF BOSTON

BOSTON PUBLIC SCHOOLS
OFFICE OF THE SUPERINTENDENT
ROBERT WOOD

July 8, 1980

Mrs. Ellen Ruina
Massachusetts Institute of Technology
Project on Work in Technology
   and Science
Room 20-____R
Cambridge, MA 02139

Dear ___ ____:

The _____ ____ and Science Careers for Min____ ___ (TSCM) project
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the ___ ___h ___s. _____oughout ___ _im ___ _ __ _____ciation with _
the ___ ___ub ic Sc____ _ I hav __ __an c_____ ___ ____ the low
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are su___ ____ __ificant _iece of ___ Massachus____ economy. We
know ___ __ ___cience, __thematic __ and ___h___ ___ ___ses that
woul_ _____ ___ecpl_ fc ___ood c____er pro____ ___ ___e areas do
not h__ ___ ___ient par____cipat___ of mi___ritie_

It is __ _____enin__ for me t_ ___ow tha_ thr____ _____, the Boston
school_ ___ _ ma__e major ____ide__ __ linki _ cur ___ca____nal programs
with t___ ___nological industr___. The Boston _duc___ors who
partic ____ ___ know the_ th___ ___e possibilit__es ___ our students
in t__ ____ ____ies. The many ___ __ e who repres___t__ their companies
also ___ ___ the Boston sch__ ____ ant to and can ___italize upon
the__ __ ____ss to hel__ exp__ ___ r students' kno___ ___ce and
moti___ ___ __is will enlarg_ ___ pool of talent__ minority people
who ca___ ___ members of the__ work force.

We are ___ __idst of discus___ ___ with the feder__ ___AA office
regardi__ ___ __nuation of _he ___ and other projects. I recognize
how muc_ ___ __ould be acc_mpl__shed wit_ funding for continuation
and I p__ __ _xert my eff_rts __ that __nd.

It is cl___ ___t WITS' good ____ __enerated the enthusiasm and commit-
ment of r___ __ople to shar_ __ ___is endeavor. It is evident, as
well, tha_ ____ and its larg__ ___egial community enhance the capacity
of the Bos__ ____hools to pr____ ___unysters for our technological
society. We ____uld plan to ___ __ on this year's program to provide
awareness __ ____eers and of _____tions of technology to math,
science, a__ ___terdiscipli___y ____icula.

May I take ____ opportunity __ ___nk the WITS staff for its
contribution__

With every good wish,

Robert Wood
Superintendent

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Introducing the Project

This publicati.. . report.. o.. ....ect designed to i.. ..ease the a.. ... .recia- tion of educa.. ..s, and thr.. .. ..arenes.. of middle an.. ..h-schoo.. ... . .dvan- tages of prep.. ..g for care.... .. ..o... and sc.. ence. These.. ..elds in v.. ....-school students gen.. .., and m.. ....articu- larly, have b.. ..ry und.. .. ..his project—Te.. ...og.. and .. .. Minorities (.. SCM)—the .. ..a.. .... ..itute of Technol.. .. Work .. T.. .. .. Science (MIT/WITS.. ..o..p s.rve.. .. .. Boston sch.. ..d ..ba.. ....ie.. Through w.. ..s, s.. ..re. ..ater.. and classro.. .. ..ato.. ..m 16 schools.. .... and their p.. ..equ.. ..s. .. ..aps, they realiz.. ..d that ..ese .. ..ent possibili..e.. for m.. ..r.. .. .. counselors, and ac..in.. .. roles for expandi.. ..t.. .. .. options. The pro.... .. .. ation wi.. .. the B.s.. .. .. ..

The TSC.M proje.. de.. .. .. w.. and com..itmen.. of .e.. .. ...n.. .... ..atio.s. Some are named, .it.. .. .. .. appendices; others w.. .. ..e —the staff of the Emerge.. .. .. other administrat.. .. ..d a host of other me.. .. .. .th us their wisdom and ..ave .. ..tance.

We are i..debted .. the .. ..s.. .. ..e of Technol.gy for f..rnish.. .. .. ..th physical.. .. term.. of s.. .. ..d psychologically b.. ..rov.. .. environment of fa.ulty .. ..th experience and ins.ght.. .. requirements of a tech.. ..og

My overa.. responsibility for the direction of the TSCM pro.. ..ct was complemented by Nadine Rodwin. I.. a most thoughtful and competent way, she m.naged the day-to-day operation of the many an..complex project activities. ..he dedicated.. ..cretarial support of Toni Paganis assured the ..ttenti.n to detail essential to this kind of p.. ..ram.

The follow.. .. pag.. ..will try to explain w.. ..the project wa.. ..derta..en, what competenc.. W..TS ..ad to assu.. ..e task, what the pr.gram consisted .. .. ..articipated, and n..w well the program w.. .., both from the ..o.. of view of ..e organize.. ..the participants.

.dith F.ina
..ambridge, ...husetts
..ly 1980

Focus on Career Awareness

It seems clear that many jobs being created today require technical background: national employment patterns show that the market for engineers, technicians, and computer specialists, for example, is quickly growing, but too few minorities are represented in these fields, despite equal education and employment legislation and regulations.

Throughout their schooling, students acquire little understanding about the technological world. Most educators themselves have had little opportunity to learn about a broad range of careers. Even math and science teachers are unfamiliar with the engineering, science and related technical applications of their subjects and are handicapped, therefore, in explaining to students why they are necessary in many careers; nor are they prepared to use technology as a way to provide hands-on experience that makes science or math more engaging for all students.

Boston teachers and guidance counselors need greater understanding of the labor market to understand how to help their students achieve effective transitions from education to work. A study prepared by the Department of Management Information Services on Boston public schools—An Assessment of Needs to Support the 1978-79 Emergency School Aid-Act—noted that in addition to reinforcing basic skills in mathematics, more curriculum for career and occupational education was needed.

The Boston schools have already tried to incorporate a greater understanding of the world of work into the system by pairing schools with businesses. However, most of the court-ordered pairings are with businesses that do not include many technology and science options—although every company now has computer-related jobs. Up to now, Boston teachers and counselors have had little opportunity to develop relations with the Greater Boston area technology and science companies. This lack of career knowledge undoubtedly limits students' awareness of choices and of the relevance of their school subjects.

A follow-up study of graduates from the Boston public high schools in 1978 illustrates this problem. Eight hundred and fifty-five graduates who had entered full-time employment following graduation responded. These included 489 males and 366 females. Of the eight classes of occupations listed, only 29 males (3.3%) and 7 females (.8%) were employed in the technical category. Thus, there is a clear indication that recent male graduates of Boston high schools are poorly represented in technical employment with women's participation negligible or nonexistent.

Desegregation of the Boston schools has served to emphasize the fact that minority students have had even less encouragement than white students to study math and science. Not being encouraged, and avoiding math or science in school, has cut them off from more advanced education in technology and science, left them inadequately trained for desirable jobs, and with little understanding of labor market needs. Opportunities for teachers to design and implement school-based programs that foster equal student enrollment need to be created particularly in the areas of math and science to reduce real differences in performance.

Science has traditionally had low priority in American education in the pre-college years, and it has been considered almost "off-limits" for the non-academically gifted. Few Boston students enroll in elective science courses. The Boston high schools generally require only one year of math for non-college-bound students, and two years of science. Moreover, many teachers report that with a tradition of "social promotions" to keep students at an appropriate age/grade level, many students complete each school year without having developed sufficient knowledge.

It is within this context that WITS, building upon its past experience, undertook to assist Boston schools expand their capacity to develop the untapped resources of minority and other students. The program of Technical and Science Careers for Minorities is a continuation of WITS' earlier efforts to enhance the schools' capacity to prepare students for life in a technological society.

Our project has been evolving since 1973, originating with an MIT Workshop on Women in Science and Technology. This was one of the first conferences in the country devoted to the complex issues of expanding female participation in technical areas where they are underrepresented—a serious societal problem of underutilization of human resources. Workshop recommendations and discussions of educators and employers over several months eventually resulted in WITS receiving a three-year grant from the Massachusetts Department of Education under Title IVC of the Elementary and Secondary Education Act (ESEA). Local technological companies, educational institutions, and government agencies provided speakers, site visits, and materials to people from over 40 schools. Companies seemed eager to avail themselves of opportunities for interacting with educators through an organized program. Perhaps the most exciting and intensive part of the WITS program was the provision of summer internships for over 50 teachers and counselors, immersing them in the technological world. This was made possible by additional funding from the Massachusetts Division of Occupational Education.

The importance of encouraging female participation has continued to be a priority, and is, of course, an aspect of the TSCM program since approximately half of the minority students happen to be female. When we speak of "women and minorities" it unfortunately obscures the necessity to give special attention to female minority members. Even though more black women than men go to college, a much lower percentage go into the technical fields.

This year, with the TSCM focus on minorities, both men and women, we remain convinced that catalysis will continue to be necessary if reasonable priority is to be given to linking education and work for minorities or other target groups. For despite rhetoric about the importance of such linkages, or of eliminating race and sex segregation in occupations, or of developing career awareness and technological literacy, these are rarely articulated as program priorities in schools or in industries.

If work-education programs are to be they require considerable planning personal contacts, and neither in some industries is there much staff time ability for such endeavors. Perhaps standable, given the primary mission institutions.

Programs linking education and work generally targeted a small percentage with special academic programs. Ra provide career awareness to a broad students, nor are they likely to enco minority young people to pursue m or to enroll in post-secondary techn

WITS programs are primarily for te counselors, and administrators who students with all ranges of ability, carry the message to students in su The goal is not place students in jo them too soon to narrowly specia rather to encourage the academic that will keep their options ope

Research on career development parents and peers are the primary career choice. Too often, the key is taken to mean that therefore t be influential. The WITS premise even more incumbent upon scho role if we truly want minorities a become part of the scientific and force. Because of their own inexp may be unable to assist their chil directions. So, if we want the ex hear other than traditional messa futures, teachers and counselors positions to help students and th perceive the full range of choice

Some of the recurring questions ere asked by Boston educators in the past they sought to help their students prepare or careers are dealt with in the next section

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What Educators Asked

...preliminary discussic ... with the edu...tors ...nd increasingly during the ...ourse ...he program, certain ...ncerns kept su ...ac... ... Some of th... recurrent questions ...s ...eated here.

Are there really jo... engineering...hem... ... ...ave heard so much about...

...though there are variati...ns among the ... engineering, the ...nal employmer... out...ok for the pro...ssi...u... s good for the ...mties. The same ap plies ...o engineering ...nd s...ienc... ...ans, of whom there ...re a little over half a m...ion. In Massac...us... ...he... ...n rate in the demand ...r high technology elect...al engineers, as well as ...g... ...e... in general, is projected to be 4% and 3% res...ctively per year, whi...to ...oyment in Massa-...usetts, is expected to gr...v at 2% per year ...rom ... ... t...1985. "Although ...re students are now enr...lling in engineeri...g ...an ... th... 7C's, a legitimate ... ...ncern is that the increased supply wi...l not come ... se t... matching the demand ...eing generated by high technology firms, stat...s... ...cen...study."[1] This implies ...hat the job prospects for ...ose with the r...ght...c... ...caitc...ns are good in the next ...ew years.

Many other job opportunities also exist in the c...mputer ...du...try. In Massachusetts, this industry is rapidly expanding, anc ...uring field trips and talks at schools, it was pointed out ...ime and time agai... ...at career opportunities were good even for persons starting at entry level jo... including clerical and assembly line jobs, anywhere in the computer manufac...ing companies. In the fields where computer use is expanding, such as data processing, chan...es in technology will have varying effects on computer operating occupations over the next decade. Employment of key-punch operators, for example, will continue to decline, while employment of computer technicians is ex...ected to grow much faster than the average for all occupations through the mid-1980's"[2].

In Massachusetts, employment in the so-cal...d high technology manufacturing industries which include electronic comput...g equipment, electrical machinery and supplies,.and several other smalled categ...ies, is expected to increase from 1976 to 1985 by over 38% (i.e., an increase... 67,000 jobs).[3]

The speakers emphasized repeatedly that th...asic math and science skills are important in many other careers which are n...entirely technical. Among the things which participants learned from the pr...ram was that not only is there a demand for technically and scientifically tra....... people, but also that these basic skills are needed everywhere.

What ...an we tell students who don't have good grades...r who don't want to continue after high school?

In the course of workshops, classroom program... ...nd visits to companies, educators began to perceive possibilities for those y...ng people and reasons for encouraging them to keep up with as much math ...nd science as possible.

Educators learned about the "internal labor ma...et" in companies. Many entry jobs exist in all technological companies for pec...le without special training—for example, production and office jobs. Once peop...e are in these jobs, they have a chance to acquire experience; companies post j...s for their own employees and like to promote from within. Companies also ha...e tuition reimbursement plans.

[1] E... ...oyme... ... ...
me... ...oy Oc... ...by
Inc...try 19... ...M...
chu...ts Div... ...
Em...oymen... ...v...
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[2] R...int from ...e ...S.
De...ment ...abor,
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Severa... ...ople who are now in technical jobs, who had no... ...rong students
in aca... ...c subjects, described discovering their technical ...s and interests
after h... ...hool. On a site vis... ...one young person, a high- ...dropout,
descrit... ...ow he became first a helper and than an apprer ...a mechanical
technic... ...He discovered on ...e job that he could learn al... ...he completed
high.sc...ol and plans to go to ...ollege soon.

Educa... ...about other ...dents who did not have hi... ...des in high scho
who su...ed... at Wentworth ...stitute of Technology and ...rneastern Univer-
sity or in apr... ...ticeship programs. They heard about tech...am training that
requires one ...wo years of post-secondary education and o...the big demand fo...
technic...ns.

Other rout... s in...o these fields are through military service pro...rams, some of
which were ...cribed at one workshop. Some companies exc...ned efforts that
they were... ak...g to show women office workers how they c...ld switch into
technical w...k. Materials given to participants explained technician jobs and prep...
aration in ...re detail.

One couns... ...ow alert to the variety of possibilities summ...d it up at the final
workshop ...."Now when C students tell me they are thinking about engi- ...
neering o... ...chnical job, I tell them about the preparation but urge them
to try ... ...er all, I am not God—I do not have a crystal ball ... People can make
it if they ...nt to."

Wha... ...out role models?

Those w... contributed to workshops for educators and classroom programs
demonst...ed the range and variety of careers in technological and scientific areas.
That wa: important. But even more significant, they demonstrated that there
are oppo 'tunities for people with different kinds of interest and abilities, and that
there are different ways to enter these fields. The minority engineers and techni-
cians proved that minorities have made it, often after overcoming social and eco-
nomic handicaps.

The success stories told by the technicians and engineers sometimes had the
paradoxical effect of making the educators feel that these people "made it"
because of social, economic, or familial advantages that many Boston students do
not have. Despite some of this feeling, several teachers and counselors became
more hopeful about possibilities for their students by year's end.

In line with research findings, there proved to be no simple recipe for whom
students considered good role models. A speaker, whether black or white, who
was too technical turned students off. An older black scientist made students feel
they, too, could make it. A white female engineer and a black technician had kids
on the edge of their seats. What seemed to matter most was the ability to capture
attention and to hold it.

The people who spoke shattered some stereotypes that influence counselors.
Most work roles in technology do not separate people who are "people" oriented
from those who are "things" oriented. Technical people work in teams, and to
move up the career ladders communications skills as well as technical competence
are essential.

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Traditionally, counselors ask students to state their interests or abilities when they are in middle or high school as a basis for future planning. This may eliminate minority or other students who have had no exposure to the world of technology and hence indicate no such preference.

Can a minority person be comfortable working in a technological company?

All company participants in the TSCM program represented companies who want to hire minorities. This does not mean that the people who have been hired by these companies necessarily feel as though they have not encountered problems. A few of them who are enthusiastic about the future for minorities nonetheless pointed out vestiges of discrimination that still may limit promotion or may make personal relationships at work not totally comfortable. But, for the most part, they felt that as more minorities come into organizations the patterns of discrimination will lessen. Legislative affirmative action requirements have accelerated changes in institutional behavior, and changes in individual attitudes and behavior are following.

Why should we refer students to what we think of as boring jobs?

When educators visited companies, the most visible jobs were those in assembly lines, and many of the educators considered these boring. However, one person who had had assembly-line experience in his youth observed how much better the work environments were in the high-technology companies.

In order to confront this attitudinal problem, we planned one workshop that featured people from community agencies who work with minority youth. They said that the definition of a dull and boring job is a matter of opinion, but that the bigger question is whether such an entry-level job is indeed a dead end or whether is has clearly defined career ladder opportunities. Similarly, companies need to demonstrate that they encourage upward mobility for minorities.

How can students get jobs when companies are not located close to public transportation?

Although the middle and high school students are several years away from actual employment, the educators fear that transportation problems for Boston residents will make it impossible for even technically trained people to go to the companies on Routes 128 and 495. Not all companies are inaccessible to public transportation, but in any case we believe that it would be poor planning to limit young people's horizons arbitrarily because of this factor. Experiments have been made from time to time in providing special busses or feeder lines on Route 128 and our hope is that individuals, organizations, and the public transportation system will be willing to confront the transportation problem if it will improve the employment situation both for the companies and for the urban workers. In fact, many companies have experimented with providing company vans or car pools and other schemes to make transportation easier.

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Establishing Linkages

Project Personnel

The TSCM staff was basically the staff of the previous WITS project. It was headed by the Director of WITS, Edwin Ruina, who took overall responsibility, and the Associate Director, Nadine Rodwin. Together they shared the responsibilities of Educational Coordinator. Support services were performed by an administrative assistant, Jennifer Porter, and a secretary, Toni Paganis, who assumed major responsibility for executing the detailed paper work. The WITS staff was responsible to Barbara Nelson, Associate Director, Division for Study and Research in Education, Massachusetts Institute of Technology. In frequent meetings with the WITS project director regarding implementation issues, she brought to bear her broad knowledge of education as well as her specific knowledge of the Boston system based on her responsibility for MIT's pairing with the "magnet" Umana Technical Harbor School.

The responsibility for liaison and activities in the Boston schools was vested in a Staff Trainer/ Supervisor, Richard Deveney, who had previously been Emergency School Aid Math Coordinator for the Boston School Department. He reported to the Boston Public Schools ESAA Project and to the Educational Coordinator of the WITS/TSCM Project.

WITS called upon an advisory group on an ad hoc basis for recruiting resources and for general advice on issues associated with assuring industry commitment and selection of minority members and others for participation in the program. We also engaged expert consultants. At the beginning of the year, Edward Strickland, Acting Chairperson of the Black Studies Department, University of Massachusetts, provided counsel on issues associated with classroom motivation of students. Vivian Johnson, Educational Consultant, played a major role in planning and executing the final workshop design and reporting on participants' recommendations.

We found that a comparatively small paid staff could generate a large amount of time and effort by other organizations and individuals: Our primary recommendation for staff selection is to utilize people with enthusiasm, commitment, good humor, and good organizational ability.

Schools and School Teams

In September 1979, when the WITS/TSCM program was established, the Boston School Department circulated a letter to all middle and high schools inviting them to participate. A committee was formed to select the 16 target schools from the more than 40 which applied. The final group included nine middle schools and seven high schools, two of which were parochial schools. Criteria for selection included a full team of one math teacher, one science teacher, one guidance counselor, and one administration person. The team was to have at least one female and one minority member. Other considerations affecting selection of the target schools were to favor schools that had rarely had special programs, to complement efforts made by another program targeting minority students in the eighth grade, and to achieve an equitable district-wide distribution of target schools. The participating schools and school teams are listed in Appendix A-1.

Teachers, counselors, and administrators were expected to attend workshops organized by WITS, to provide feedback to the project, and to develop through individual and team efforts in-school activities for students based on the workshops. During the course of the year, although some school teams found time to meet, many did not, apparently because of schedule conflicts, because some counselors had no responsibility for students in target classes, or because a low priority was placed on the value of such meetings. Funds were available to purchase technology and science career-related curriculum materials for each school, to be used in the target classes. One field trip per school was provided. Compensation for the teachers and administrators for the TSCM out-of-school workshops was in accordance with the current collective bargaining agreement.

The Staff Trainer/Supervisor had a busy and varied schedule that changed from month to month to accommodate the needs of the program. After participating in the process of school selection, he visited each school to explain the program to the Principal, and to develop a good working relationship, an essential factor in ensuring that the program would run smoothly. He conferred with individual and team members freely and frequently, distributed appropriate material to the teachers, ascertained their reaction to the progress of the program, and carried their recommendations to the WITS staff. The Staff Trainer/ Supervisor explained and distributed pre- and post-tests for the Boston School Department evaluation of ESAA projects. He handled individually with teachers all plans for site visits and for having speakers in their target classrooms. His was an essential role, making the program run smoothly.

The WITS Director conferred periodically with members of the Boston ESAA office, Department of Curriculum and Competency, and the Director of Guidance and reported to the City-Wide Advisory Committee (CWAC).

Recruiting the Experts: Community, University, and Technological Cooperation

Great care was exercized in creating a pool of people we could call upon who shared the goals of TSCM and had something to offer its participants. We needed role models who could present the range of careers in technology and science, and the applications of math and science to those careers. We especially wanted to include minority men and both minority and non-minority women in these roles.

The workshops required people who could deal with issues associated with career development. Psychologists, educators, and representatives of community organizations working on development of human resources talked about motivating youngsters. We located effective speakers through WITS staff connections with many university and community groups seeking to develop human resources. For labor market and career information, we called upon government and university contacts as well as personnel people in companies.

To provide a picture of the uses of technology, we invited an engineer to explain communications satellites, a group of computer experts to talk about the computer, some MIT people to give their perspectives on technology, and we arranged visits to company and university laboratories.

WITS original network of contacts with people in the technological industries was expanded through the cooperation of members of an integrated advisory group (see Appendix A-3) representing the Boston schools, parents, companies, and community agencies. These people, in turn, enlisted executives in their organizations who realized the importance of helping the schools increase the likelihood of minority preparation for technological and scientific careers.

It took a great deal of personal communication, many telephone conversations and visits back and forth, and numerous exchanges of letters to fit a company's available resources to our needs. Most companies sponsor some kind of open house and send out speakers, and once they understood the TSCM goals, the tailored their programs and choice of speakers to provide suitable ones for the Boston educators and their students.

Usually, the actual working out of specific activities of company commitment was delegated by the person at the top, with whom we tried to make our initial contact, to a specific person with whom we then maintained communication. The ongoing contact was likely to be someone in personnel, affirmative action, community relations, education, or college relations.

Although many who were enthusiastic initially were not able to follow through, each of the companies that finally participated selected co-ordinators who developed a fine-tuned sense of what educators and students would enjoy. People who assume responsibility for cooperating with this kind of program have to identify and recruit appropriate people from their companies. These people, in turn, have to receive a clear message that management thinks the project is important and will free personnel to speak at schools or to organize a field trip. The company representatives with whom we worked recognized the long-range benefits of enlarging the pool of qualified minorities who could become engineers, technicians, and computer scientists.

One company executive who was happy to participate said, "It's important for us to make known our work and opportunities, especially to minority and female students. This is due to the requirements that our investigators must have at least 30 college hours of science. Unfortunately, current numbers of minority/female science majors are small." And another participant was frank about his motives for speaking: "I want to encourage and be an example to young people for any non-traditional career. It also gives me speaking experience."

The WITS staff tried to recruit company and professional participants by speaking at professional gatherings and to student and minority groups both at MIT and elsewhere. We talked about the program and distributed forms which interested persons could complete and return. These forms generated a lot of enthusiasm and good will, but in the end, our most successful cooperation came from direct contacts with the companies. Some letters and forms we used in recruiting appear in Appendix C-1 and C-2.

Attendance at workshops by teachers, counselors, and administrators was a vital part of the TSCM program. School participants met with each other and with speakers from industry and government to discuss a multitude of subjects related to young peoples' career choices. Workshops were planned on the basis of WITS' past experience, and were modified during the course of the year as feedback was gathered from TSCM participants through questionnaires, informal communications with the Staff Trainer/Supervisor and workshop discussions. Some of the educators' comments are quoted later in this section.

Workshop 1:
November 1979
Campbell Resource Center
Dorchester
Dr. Alan Clarke, Executive Assistant to the Superintendent of Boston Public Schools, brought a message of support from Boston Superintendent Dr. Robert Wood. Boston School Committee member, John D. O'Bryant, also stated his recognition of the importance of the program. Following these opening remarks, Arthur E. Carter, Manager of Equal Employment Opportunity and Employee and Community Relations Programs, Honeywell, discussed minority underrepresentation in the technological fields and the importance of motivating female and minority students to consider the technological and scientific careers.

Dr. Edward Strickland, Acting Chairperson of the Black Studies Department, University of Massachusetts and TSCM consultant, coordinated the efforts of several facilitators who subsequently led small group discussions relating to each team's selection on one math and one science class as TSCM "target" classrooms. Dr. Strickland also summarized some of the important work on motivation and the potential for developing greater motivation through enhancing student and parent understanding of career options. At the end of the first session, TSCM participants received copies of the recent New York Times' "Review of Careers in the 80's" so that teachers and counselors could find ways to use the appropriate section of this material with their students.

Facilitators
for Small Group
Discussions

John Conlon,
Director of Teacher
Certification,
University of Massachusetts

John Robinson,
Director of Counseling,
University of Massachusetts

Reginald Williams,
Instructor, Black Studies
Department,
University of Massachusetts

Earl Williams,
Graduate Student,
University of Massachusetts

Mary Hope,
Dean of Student Affairs,
Massachusetts Institute
of Technology

Workshop 2
December 1979
Wentworth Institute of Technology
Boston
Patricia Garrison, Director of Personnel Services at MIT, moderated the opening presentation by a lively panel of minority "role models" who spoke about their personal and educational backgrounds as well as their current positions in local technological industries. A small-group discussion followed in which participants considered the underrepresentation of Boston public school graduates in technology and science-related careers. Teachers and counselors subsequently discussed how they might effectively develop student interest in math and science through cooperative teaching and counseling efforts.

Norma Clarke's talk later in the day about Mitre's program with Madison Park High School complemented the role model panel; she commented that students seeking employment in the high-technology industries will need to develop basic math and science-related skills, because "You just can't beep-bop your way around a circuit board."

In the afternoon, Dr. Edward Kirkpatrick, President, Wentworth Institute, drew a matrix which graphically illustrated scientific, engineering, and technical jobs. He emphasized that Wentworth encourages applications from all interested students including those with low test scores and/or grades.

Panel of Minority
Engineers and
Technicians
Discussing Their
Career Development

Benjamin Brathwaite,
Technician,
Wang Laboratories

Robert Davis,
Assostant to the
Vice-President,
Bell Laboratories

Willis E. Gray,
Division Manager,
Polaroid

Irvin M. Lyles,
Manager, Manufacturing
Documentation,
Prime Computer

Robert Pinckney,
Engineer,
Draper Laboratories

Horace B. Rogers, Jr.,
Technician,
Factory Mutual
Engineering

Willard R. Thompson,
Group Manager,
Digital Equipment
Corporation

Facilitators
for Small Group
Discussions

Clara Hicks,
Senior Curriculum Advisor
for Elementary and Middle
Education,
Boston Public Schools

John Tsang,
Senior Curriculum Advisor,
Boston Public Schools

Earl Williams,
Graduate Student,
University of Massachusetts

Workshop 3
January 1980
Northeastern University
Boston

The first speaker was F. Williams Sarles, Senior Staff, Lincoln Laboratory, MIT. In his talk, "What Does an Engineer Really Do?", Mr. Sarles described his work on experimental communications satellites. A technologocal oversight—no overhead projector —made it possible for him to demonstrate how ingenious engineers can be!

Mary Kay Tetreault, Area Supervisor, Equal Education Opportunity Bureau, Greater Boston Regional Center, followed Mr. Sarles with her talk "How to Use Career Materials and Get the Most Out of Speakers." Later, math teachers, science teachers, and counselors each grouped for discussion of their respective roles in stimulating student interest in math and science.

After lunch, participants reconvened in school teams to review company brochures and choose an industry site to be visited in February. David Blackman, Director of Minority Affairs, College of Engineering, Northeastern University, then discussed the Junior Engineering Technical Society (JETS) program and introduced another panel of role models who discussed educational options at Northeastern University.

**Panel of Students
and Educators:
Education for
Engineering Careers**

Ruth Karp,
Associate Dean,
Office of Student Affairs,
Northeastern University

Betty Solzberg,
Professor of Mathematics,
Northeastern University

Enrique Melendez,
Student,
Northeastern University

Lana Schike,
Student,
Northeastern University

Workshop 4
February 1980
Site Visits to Analog Devices, Hewlett Packard, Millipore and Polaroid

During the educators' February vacation, four high-technology companies hosted site visits for approximately twelve participants at each site. Accompanied by TSCM personnel, these educators visited:
Analog Devices (a manufacturer of precision data acquisition products used in measurement and control instrumentation);
Hewlett-Packard (a designer and manufacturer of precision electronic equipment for measurement, analysis and computation),
Millipore (a business involved in the analysis and purification of fluids), and
Polaroid (manufacturer of Polaroid cameras).

Each company organized its site visit in its own way. The common element of all the visits was that they were carefully prepared and that the visitors had ample interpersonal contact with employees. In all companies, persons with different occupations and at different job levels talked with the Boston teachers and counselors.
At Polaroid, the tour was preceded by small group discussions with company representatives. Then various speakers joined the group for lunch, and everyone took pictures with the Polaroid SX-70 camera provided by the company. At Hewlett-Packard the format was somewhat different: the tour was a larger part of the program and preceded the luncheon conversations with the tour guides and other company officials. Analog similarly conducted a tour of its facility and described the manufacturing and purpose of its products. They showed the engineering offices and the "clean" rooms required for precision parts assembly. Then a panel of workers representing a spectrum of technician and engineering jobs talked about their career development. Some of them had entered through military or CETA training programs, since their family economic and social situation could not have supported their professional development. At Millipore, people using audio-visual aids described Millipore products, the development of prototypes, the transition to mass production and the application of Millipore products to health care. Except at Millipore, which is mainly a headquarters facility, manufacturing assembly operations were visited. Teachers and counselors walked through some of

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the assembly lines with a guide who explained the work, and many of them asked questions of employees concerning their educational background, job satisfaction and long-term career goals.

Educators responded to the site visits in a variety of ways; while some found the to : of an assembly operations intrinsically interesting, others resented being exposed to assemblers and technicians rather than to engineers. In general, host industries tended to assume that desks occupied by engineers working out calculations would be perceived by educators as less interesting than viewing the actual physical assembly of a computer or camera or a circuit board.

In a post-site visit evaluation, 37 of the 49 educators who attended the site visits indicated that their attitude about work in technological fields was either more positive after the site visits or that they continued to see advantages as previously. One person indicated feeling more negative, and the remainder continued seeing problems in these areas.

Workshop 5
March 1980
MIT Student Center
Cambridge

The fifth workshop began with small group discussions facilitated by members of Boston's Instructional Support Team. Discussion focused upon realistic strategies for reaching target students with career information in math and science, as well as for developing student interest in math and science. Facilitators summarized participants' comments for a report which was subsequently distributed to TSCM teachers, counselors, and administrators. A panel presentation on the Impact of Computers was followed by a question and answer period.

Facilitators for Small Group Discussions	Panel on Computer Related Careers
Brenda Jones, Boston Public School Instructional Support Team	Verniece Hensey, Information Research Analyst, Mitre Corporation
Donald Boyd, Boston Public School Instructional Support Term	Jim Wisdom, Teacher of Computer Science, Cambridge Rindge and Latin.
Janet Owens, Boston Public School Instructional Support Team	Irma Wyman, Director, Central Staff Operations, Honeywell Information Systems
Frederick Checovich, Boston Public School Instructional Support Team	Tom Yocom, Manager, Systems & Administrative Educational Services, Digital Equipment
Grace Campia, Boston Public School Instructional Support Team	
Walter Wood, Boston Public School Instructional Support Team	

Workshop 6
April 1980
MIT Student Center
Cambridge

The session began with a panel presentation on the topic "Technical and Scientific Careers in the Public Sector," moderated by Helen B. Munzer, Director of Job Market Research, Massachusetts Division of Employment Security. Following the presentation, participants broke into small groups for discussion. Panelists provided a wide array of materials describing careers in science and technology in their organizations, and participants were encouraged to take these materials back to their classrooms. The panelists answered many questions, several of the agencies expressed their desire to continue the relationship with a school, and the possibilities of student work-study programs were discussed.

Workshop 7
May 1980
MIT Student Center
Cambridge

This session focused on the topic, "Work and Youth Employment." Panelists discussed the Vice-President's Commission on Youth Employment, and the proposed $175 million program designed to improve the teaching of basic skills to link schooling with work. The educators also heard about the Urban League of Massachusetts and its local and national programs in career development and youth employment. In addidion, a regional officer from the Massachusetts Department of Education described her work with parents, and efforts to develop collaborative programs which promote equality of education and prepare students for the world of work.

Panel on Scientific/Technical Careers in the Public Sector

Al Fenton,
Education Coordinator,
Army Boston District
Recruiting Command

Susan Brown,
Biologist,
U.S. Army Corps of
Engineers

Calvin Currington,
Civil Engineer,
U.S. Army Corps of
Engineers

Gordon A. Bruggeman,
Supervisory Metallurgist,
Army Materials and
Mechanics Research Center

James L. Gilchrist,
Personnel Specialist,
Army Materials and
Mechanics Research Center

Barbara Kirkwood,
Textile Technologist,
Army Natick Research
Center

Irving Weitzler,
Director,
Aero-Mechanical
Engineering Laboratory,
Army Natick Research
Center

Earl Burton,
Director of Investigation,
Food and Drug
Administration

Patricia Spitzig,
Drug Specialist,
Food and Drug
Administration

Lewis Aleurs,
Personnel Specialist,
Hanscom Air Force Base

Bob Ellerin,
Senior Staffing Specialist,
Hanscom Air Force Base

Diane Gunn,
Associate Engineer,
MassPort

Tim Kinton,
Building Maintenance
Facilities Manager,
MassPort

Joseph Ellis,
Associate Sanitary
Engineer,
Massachusetts Department
of Environmental
Quality Engineering

Panel on Issues Involved in Youth Education and Employment

James Patterson,
Executive Director,
Massachusetts Pre-
Engineering Program for
Minority Students
(Mass Pep)

Derek Coelho,
Manager,
In-School Program,
Youth Entitlement
Service (Y.E.S.)

Dolores Swan,
Assistant Director
Regional Office,
Massachusetts Depart-
ment of Education,
Springfield

Adriana Stadecker,
Employment Planner for
Youth Grants,
Center for Employment
and Income Studies,
Heller School,
Brandeis University

Modesto Maldonado,
Guidance Counselor,
Greater Lawrence
Regional Technical School

Deborah Barr,
Occupational Educational
Coordinator,
Tri-Lateral Council for
Quality Education

Donald King,
Coordinator,
Pre-Work Orientation
(Y.E.S.)

Emory Jackson,
President,
Urban League of Eastern
Massachusetts

Workshop 8:
June 1980
MIT Student Center
Cambridge

Session 1
The June workshop was a full two-day session; activities on the first day included the following:
1 Each school team worked together to complete a final program evaluation on a questionnaire.
2 A newly released film sponsored by the Massachusetts High Technology Council entitled "Technologically Speaking" was screened by filmmaker Carl Sykes, Career Communications, Vocational Guidance Programs for Schools and Industry.
3 Four teams met to discuss and recommend strategies for continuing career awareness activities in each TSCM school.

After lunch, all TSCM participants gathered for general discussion by the group facilitators about group recommendations. Participants then departed for site visits at six MIT locations, including the Arteriosclerosis Center, Computer Graphics Laboratory (Architecture), Energy Lab (Combustion), Environmental Medical Services, Nuclear Research Reactor, and the Word Processing Center (School of Engineering).

Session 2
At the final TSCM session, three professors from MIT addressed themselves to the question of how "mainline" curriculum can incorporate technology. Presentations were given to math and science teachers by Ernest Cravalho, Professor of Mechanical Engineering; Ray Pariser, Associate Director for Education, Sea Grant Program; and Louis Bucciarelli, Associate Professor, School of Engineering. These talks were intended to stimulate ideas and discussion about how applications of technology could be included in math, science, or inter-disciplinary curricula. Counselors and administrators, meeting together, heard presentations related to the guidance of students toward careers in science and technology by Phyllis Wesley, Assistant Director of Admissions, University of Massachusetts, Harbor Campus, Boston; Dorothy States, Manager of Equal Employment Opportunity, Honeywell; and Vivian Gilfoy, Project Director, "Second Look," Education Development Center (EDC). Following these presentations, teachers, counselors, and administrators formulated recommendations regarding curriculum and staff development relating to applications of technology. TSCM participants subsequently reconvened to hear facilitator reports on these recommendations at a session moderated by Leon Trilling, Professor of Aeronautics and Astronautics, MIT. These recommendations are summarized in the section "Getting It All Together."

Moderators of TSCM Group Discussions and Panelists Presenting and Commenting on Recommendations

Sally Diaz,
Director,
Central Massachusetts
Regional Education Center

Norma Clarke,
Manager,
Personnel Relations,
Mitre Company

Lillie Davis,
Guidance Counselor,
Malden High School

Derek Coelho,
Manger,
In-School Program,
Youth Entitlement Service
(Y.E.S.)

Phillip Harrington,
Educational Director,
Action for Boston
Community Development
(ABCD)

John Turner,
Associate Dean of
Graduate School, MIT

Marianne Abrams,
Executive Director,
Tri-Lateral Council for
Quality Education

Comments of Participants

after the first three workshops ha been held were helpful in pinpointing what aspects of the program were valued and what suggestions the participants had for future workshops. Among the "most liked" aspects were:

"The interplay with professionals in technical careers—prospect of getting these professionals into the classroom."

"Contacts with business representatives of various companies who are ultimately going to hire our kids—more small-group time with these businessmen would be appreciated."

"Personal experiences of minority role models."

"New information."

"Meeting with people in technical fields and universities, particularly students of engineering, whose remarks are closer to our needs as teachers of younger students."

"My consciousness about careers in technology has definitely been raised—speakers have helped."

Working with teachers from other schools in the city and discovering that we all have similar problems, especially in subject matter."

There was an overwhelming feeling that the workshop at Wentworth Institute was excellent. "The best, most articulate, intelligent panel I have ever met."

Mentioned among the "least liked" aspects were:

"Not enough time to talk to fellow counselors about common problems."

"Parts of the program designed to show me how to present career materials and how to motivate my students. I don't need this type of expertise."

And from another:

"We know how to teach—Let us have time to organize our ideas using your materials and resources."

"The sessions for the most part are from a white middle-class standpoint. A minority should have run the workshop."

"Inadequate summarizing and follow-through."

"Highly technical speakers."

Suggestions for the future included:

"Using the resources (expertise) of the group members and/or other career education coordinators in the Boston school system." (Names were given.)

"Skip the lunch period."

"Allow more time for lunch."

"Have free lunch."

"Longer gaps between speakers and for discussion purposes. Most speakers go right out the door."

"Start on time and stick to schedule. Hope that there will be follow-up next year."

"More emphasis on top-rate schools rather than mediocre places."

"Physical set-up is important (heat, comfort, sound, etc.)."

"Now that this program is starting to reach the classroom level, thought needs to be given to follow-up and expansion of the program. I am a former participant in a workshop program designed to bring career education into the Boston schools. This was an excellent program but it floundered when there was no follow-up, no second state. I fear the same thing will happen here."

Student Field Trips and Classroom Speakers

Opportunity for personal interaction with people in technological careers through field trips and classroom programs was a key part of the TSCM program. Students, as well as their teachers and administrators, saw or heard first-hand what goes on in a scientific or technical organization and got a better idea of some careers for which the students may seek to prepare themselves. The variety of males and females, minority and other, whom educators and students met were fine role models and the students' response to them was very favorable. The organizations that hosted student field trips and those that sent speakers to classrooms are listed below. A chart of all the organizations participating in the TSCM program appears in Appendix A-2.

A field trip to a company is not an outing to a science museum. It is intended to be a learning experience where youngsters see the world at work. Yet it can be fun, and the students, in most cases, were enthusiastic. Although pushing buttons, operating machinery or handling materials is not always possible, many organizations, whenever and wherever possible, tried to provide hands-on experience for the students. In some cases, they even gave them some reject parts to take home. And one company distributed "T" shirts. But, most important of all to the students was the direct contact with employees at the company, the opportunity to ask questions about careers, the chance to see and hear about new and exciting techniques, equipment, concepts. Not all field trips, however, were to manufacturing establishments. Technical educational institutions, government research, facilities, and public utilities were also part of the program. Field trips at the MIT nuclear reactor and solar house included talks by professionals on energy and the basic chemistry and physics involved. At the New England Telephone Company, large-scale computers were seen. At the Transportation Center of the U.S. Department of Transportation, the group looked at the tire-testing laboratory and also heard about the invisible types of research going on; e.g., the assessment of various transportation systems. At the Wentworth Institute field trip, WITS took advantage of the Open House to have a specially guided tour through laboratories and other facilities most appropriate for a seventh or eighth grade math class.

Speakers were urged to bring materials—a product, a tool used in their work, or any equipment to make the presentation lively and interesting. From the responses by teachers, school staff, and students, these "hands-on" experiences were most appreciated. One firm, Prime Computer, brought a portable terminal that could be connected to a telephone outlet and the middle-school students were able to see it in operation. Representatives from Polaroid Corporation not only demonstrated cameras, but donated one to the class. A technician from Data Instruments took apart and explained one of his company's products.

Occasionally, companies sent a team of two and even three people. For the school, this proved a great advantage since it provided a larger exposure and more "role models." Since about 41% of the speakers were women and 50% were minorities, in many cases, students had chances to identify with different people. But, in all cases, just hearing about the day-to-day work of a technician, an engineer, a computer operator, etc., clearly widens the students' comprehension of the world beyond the school room. Some speakers were college students and several teachers indicated in their comments that youngsters more easily identified with them than with older persons.

The persons addressing classes came from a variety of educational, professional, racial and ethnic backgrounds. They included women engineers, an American Indian, an MIT professor, and many others. Following are some of the terms they used to describe their roles and titles: chemist, civil engineer, design engineer, development supervisor, drafting supervisor, electric designer, employment manager, engineer, engineering student, engineering technician, field service manager, geographer, group supervisor, inspection supervisor, instrumentation specialist, iodation technician, manufacturing documentation manager, manager of graphic arts, metallurgical engineer, nuclear engineering student, personnel specialist, quality assurance engineer, radiation protection officer, research service manager, supervisor, systems analyst, technical staff member.

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Student Field Trips
(Several organizations hosted more than one trip.)

Analog Devices
(Manufacturer of precision data acquisition products used in measurement and control instrumentation.)

Army Materials and Mechanics Research Center

Data General
(A computer manufacturer.)

Digital Equipment
(A computer manufacturer.)

Input-Output Computer Services
(A high-technology computer software and systems engineering company.)

Massachusetts Institute of Technology:
Graphic Arts, Nuclear Reactor, Solar House, General Guided Institute Tours

Massport: Logan Airport

Mitre Corporation
(A corporation that refines techniques of large-scale system engineering design and analysis.)

New England Telephone

Prime Computer
(A company that designs, manufactures, sells and services small and medium-size general purpose digital computer systems.)

Raytheon
(A company whose principal business is in the design, engineering, manufacturing and servicing of advanced electronic devices.)

Stone and Webster Engineering Corp.
(A consultant firm providing engineering, design and construction services.)

U.S. Department of Transportation: Transportation System Center

Wentworth Institute of Technology

Classroom Speakers

Army Corps of Engineers

Bell Laboratories

Clinical Assays
(A company involved in medical/biological research and production)

Data Instruments

Digital Equipment
(A computer manufacturer)

Draper Laboratories
(An independent, non-profit corporation dedicated to scientific research, development and education in the public interest. Its main business has been the development of inertial guidance and navigation systems for land, sea, undersea, air and space vehicles.)

Honeywell
(A company that designs, manufactures and makes a complete range of computer hardware and software systems, peripheral equipment and terminals.)

John Hancock Mutual Life Insurance Company

Massachusetts Institute of Technology: Environmental Medical Services, Students/Staff

Millipore
(A business involved in the analysis and purification of fluids.)

Mitre Corporation
(A corporation that refines techniques of large-scale system engineering, design and analysis.)

New England Nuclear
(A manufacturer of radio-active chemicals)

Polaroid Corporation
(The manufacturer of Polaroid cameras)

Prime Computer
(A company that designs, manufactures, sells and services small and medium-size general purpose digital computer systems.)

Society of Women Engineers

Stone and Webster Engineering Corporation
(A consultant firm providing engineering, design and construction services.)

The sp..akers reported that the eagerness of the teache.. and students was very gratifying. One speaker said, "This was a delightfuly group of kids—they were alert, interested, etc. In contrast, a year ago, I spoke to a group of 10th graders at a suburban school who squirmed and talked all through my talk. I may be moving out of the area, but if I'm here, I'll do it again. Mr. "X" was a delightful teacher, and I think he'd be glad to have another speaker." And another commented, "My talk at _____ High was enjoyable as well as reward-ing. The students were clearly attentive and inter-ested in what I had to say. It was brought to my attention by the teacher that the students did well at school. My feeling was that it is preferable to speak to a small number of interested students than a large number of apathetic students. If I can be of any assistance in the future, please do not hesitate to call." Some personnel people indic...d that being asked to speak by your com.. ...v supervisor is for them a form of "job enr... .ment."

Stu...ent response to field trips was also very favorable. For example, one student said, "I think that it is fun to find out about technology because many new things are coming into the world and many people do not know about them. People don't know much about companies (and computers), but if they visit a place like Analog Devices, they will find out the facts." A teacher who accompanied the group commented, "The students appeared to be amazed at the various kinds of engineers. They asked very good questions about years of study, salary and what engineers do during a typical workday."

Based on our experience, it is hard to overempha-size the amount of detail that went into preparing for successful field trips for students: establishing dates; clearing conflicts, securing permission slips for kids to attend trips, making arrangements for bus transportation to the companies, and for luncheon arrangements as needed. Equally detailed arrangements were pursued in the case of speakers: confirming letters were sent to schools, speakers, and companies, as illustrated in Appendix C.

Teachers were urge... ...hone the speakers ahead of time to discuss t... ...mation, inform them about their classes, ...necessary infor-mation to prepare t... ...ts. Flexibility was required in fitting t... ...or c...ires of the target classes with the cap... ...of the companies. We found, for example... ...mpanies were less willing to sponsor visits ... middle schools than for the teachers and counselors or for high-school classes. Specific dates for student field trips were, of course, individually negotiated, with special requirements of size, age level, and special interest. In planning visits and telephone conversations, the agenda for the field trip was arranged between TSCM and the hosts. Company literature was given to teachers for class discussion.

Despite all efforts, a few things went wrong at the last minute—a wayward bus, a conflict with a roller skating party, a speaker who mismarked his calendar, a teacher who never got the word, a speaker who had to be out-of-town, or who was transferred to a different job. Occasionally, also, despite the fact that teachers were supposed to phone the speakers, the youngsters were not sufficiently prepared for the event. And, on a few occasions, speakers whose qualifications sounded impeccable were not suitable: some spoke at too high a level and the class was bored; perhaps a speaker was inexperienced with young audiences or was scared. Still, in the end, WITS provided 46 classroom speakers and field trips for 31 classes, as well as the eight workshops which included participation by 75 speakers, panelists, and facil-itators. As one satisfied speaker from a company said, "We whetted the appetites of some students in the technical and science area who otherwise would not have this information." The mutual satisfaction of speakers and students lays a good foundation for future collaboration.

The speakers reported that the eagerness of the teachers and students was very gratifying. One speaker said, "This was a delightfuly group of kids—they were alert, interested, etc. In contrast, a year ago, I spoke to a group of 10th graders at a suburban school who squirmed and talked all through my talk. I may be moving out of the area, but if I'm here, I'll do it again. Mr. "X" was a delightful teacher, and I think he'd be glad to have another speaker." And another commented, "My talk at ____ High was enjoyable as well as reward/ing. The students were clearly attentive and interested in what I had to say. It was brought to my attention by the teacher that the students did well at school. My feeling was that it is preferable to speak to a small number of interested students than a large number of apathetic students. If I can be of any assistance in the future, please do not hesitate to call." Some personnel people indicated that being asked to speak by your company supervisor is for them a form of "job enrichment."

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United States Office of Personnel Management
Washington, D. C. 20415:
Computer Specialists, Opportunities in the Federal
Government, Announcement 420, February 1977
For Starters, Federal Government Jobs that require six
months of experience; a high school diploma; up to 2 years
of college, vocational training or specialized work
experience, BRE-78, January 1979

United States Office of Personnel Management
John W. McCormack Post Office and Courthouse
Boston, Massachusetts 02109:
New England Region Federal Job Prospects Bulletin,
No. 80-2, Issued: 3/1/80, Effective Until: 4/30/80

Other Services

Teachers and counselors emphasized the impor-
tance of parental influence on their children's
career choice, and it was generally agreed that
schools should help the parents realize the oppor-
tunities for their children in engineering and
technical fields. How to accomplish this was not so
clear: Boston schools find that few parents partici-
pate in school-sponsored events. One workshop
featured a speaker on parent involvement, and
concern about parental support was expressed in
many discussions throughout the year. In response
to a TSCM questionnaire, students said what they
most wanted from their parents is "Encourage-
ment." Counselors and teachers suggested inviting
parents on field trips and identifying some in
technical fields to speak.

In an attempt to work directly with students and
their parents, TSCM arranged for industry person-
nel officers to be available on a Saturday morning
to counsel parents and their youngsters about
technical jobs. To offer some special attractions,
the meeting was held at MIT in conjunction with
the Massachusetts Science Fair and the MIT Open
House. A copy of the announcement of this event
and the accompanying letter to teachers appears in
Appendix B-10. For whatever reason, neither
parents nor children chose to meet with the
counseling company personnel that day.

Several times during the year some schools or
teachers organized career days or other events and
asked WITS to identify speakers or other resources.
Whenever possible, we helped on an ad hoc basis;
but given time commitments for planned TSCM
activities, we were not able to do as much as we
would have liked.

Getting It All Together: Educators' Recommendations

In the final June two-day workshop a considerable amount of time was set aside for the educators to meet in discussion-sized groups to formulate their evaluation of the program and make recommendations for the future. Their response was thoughtful, varied, and valuable: only a few highlights can be summarized here:

Administrative Support

"Without administrative support, I doubt I'll be able to do much in terms of careers. The heads of departments need to be involved. My being part of a team has enabled me to be continually aware—to talk about careers. I will continue to mention careers but feel there is need to keep the team going."

It was agreed by all the educators that administrative support was essential. Beyond mere endorsement of the program, an administrative mandate is often necessary to designate priorities and to permit allocation of staff and resources. Hope was expressed that there would be continued funding to build on the present momentum, encourage participants to continue school programs, and avoid losing gains made in the schools which participated this year. There was a feeling that the position of Career Coordinator should be revived in the schools: some schools have career centers which are little used because they are not staffed through lack of funds; counselor case loads need to be reduced and the significance of their roles clarified. Administrative support is also necessary to help participants continue career awareness activities to follow up on students who have had exposure to the program this year.

Staff Development

"All faculty members ideally should be involved so that they have more comprehensive understanding of the projected job market. . . .Too often, teachers operate from within their own spectrum without an appreciation of overall development of the student."

"Teachers feel isolated; there is not enough communication with other teachers or linkages with industry and higher education."

There were repeated requests for inservice workshops linking math and science with technology. Participants requested that the workshops be interdisciplinary, including math, science and industrial arts teachers and that summer internships be made available in industry for educators.

In order to address the problem of low achievement in math and science, participants recommended that there be a unified curriculum in the schools regulating scope and sequence in each math and science subject, including clear definitions of achievement expectations, and requiring a minimum of five periods per week in any math or science class.

Counselors need opportunities and strategies for motivating minority and female students to learn about the labor market and technical careers, and for developing relations between students and engineers and technicians.

Curriculum Development

In math, we need a curriculum which relates basic skill work in whole numbers, fractions, and decimals to jobs. Specifically, we need to look at careers and the specific kinds of math they use. We need filmstrips and media which explain the fields of engineering and computer science. In science, we also need to have audio-visual materials which relate the science learned in class to specific science careers."

The participants expressed the need to increase the amount of hands-on material available to students, including computers and other materials used in industry, so that classes would be more "real-world" oriented. They felt that given the rapid changes in technology their materials should be constantly updated and field-tested, that more and better quality materials should be available for the middle schools, and that there should be a directory of resource people from business and industry, including the services provided (whether equipment, brochures, speakers or site visits), and an annotated bibliography of career materials related to math and science.

It was suggested that counselors could be especially helpful in developing career bulletin boards, math and science fairs and clubs, making contacts with parents to encourage their participation, and increasing work/study opportunities for students. Counselors could help develop "big sister or brother" programs with local post-secondary students.

Collaborative Educational Planning

"It's everyone's responsibility to stimulate and encourage the students."

"It is essential to try to eliminate students' apprehension concerning math and science."

"The role of the teacher should be motivational as well as informational."

There was general consensus that positive attitudes about career options were best developed within a supportive structure of strong linkages within schools, across schools, with parents, and in community programs. Programs like WITS can pay special attention to developing and maintaining linkages. Some teachers felt that math and science teachers should be encouraged to work in teams to teach about technology. Several people suggested that math and science could be demystified if high school students explained their math and science programs, including their problems and triumphs, to younger children, and college students described and explained their programs to high-school students. It was emphasized that teachers should recognize and encourage even minor successes because competence develops confidence.

The participants felt that improvements were needed to make a stronger program of relations with industries: that the number of role models with urban roots who understand the concerns of students in Boston should be increased, and school participants should be more closely involved in the selection of speakers and site visits, which was not possible this year. Adequate in-school planning time should be available in the future for this kind of input.

Many people cited examples of the good the program had accomplished: one immediate achievement was noted by the educator who said:

"Since our participation in the WITS Program we have had three students enroll in an engineering program at Northeastern University. Several others are planning to take advanced math and science classes in the fall."

There was a general agreement that "career awareness should be a thread that teachers weave in once they learn about careers" and that "there is a great need for these services, and programs such as TSCM should continue."

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Summing Up: Did We Get There from Here?

The primary question that must be asked as the term of a project comes to a close is—to what extent did the project achieve its objectives? It is our feeling that we achieved real progress in helping the selected Boston educators to arrive at a better understanding of how they might help their students to participate gainfully in this technological society. Few programs in the country have provided so many people in a single system with so much interaction with employers who sought to help in the educational system, not simply to go through whatever motions were necessary for recruiting a work force. The interaction was beneficial to both sides, but the educators, in particular, felt that to be of real value, some mechanism would have to be provided for continuing contacts.

We certainly do not delude ourselves that a small-scale operation like the WITS/TSCM project, staffed by a handful of dedicated people, run on a small budget, and funded for one year, can make a lasting difference in the overall awareness by minority students of the options for employment in science and technology. Given the huge social inequalities in housing and income, the educational pressure for minimum competence, an uncertain economy and its impact upon schools, how much can be expected? Certainly the TSCM program could address only a piece of a much larger societal situation. We did not escape these larger issues—in some ways TSCM was a microcosm of social conflicts that surfaced in myriad ways throughout the program and could have destroyed it but did not. Some of these conflicts are worth mentioning because we think they might be faced by any other mixed group in a common effort.

There were inevitable differences in work assumptions and style between the universities and the Boston schools. To educators in the Boston schools, academic institutions can look like playgrounds for people philosophizing about education and social problems without having to come out of their ivory-towers. To academics who take a great degree of institutional freedom as a matter of course, the regulations of a large urban school system requiring detailed accountability for time and procedures, connote an unacceptable lack of trust of employees. For example, it came as a shock to some university faculty to hear that Boston educators had to sign time sheets upon arrival and departure from workshops and expected to leave exactly on schedule.

Educators and employers are also sometimes skeptical about each other. Educators sometimes think that employers would be satisfied with any level of education, however narrow, as long as it could supply them with an adequate work force. They also feel that employers push tax reduction at the same time as they expect schools with financial and personnel problems to do a better job. Employers, on the other hand, feel that schools aren't part of their "real world" and are unwilling or unable to communicate the work ethic or to develop competence. But, as one administrator said at the end of the school year, "WITS shattered a myth—that companies are not willing to come to the aid of schools and that schools won't use their resources. Now I know that is not true."

Another difference in perception surfaced within the MIT/WITS family when one of our educational consultants expressed a concern she shared with some other minority people: "At issue in the implementation of any program for a targeted group is the question whether or not the affected group is involved in project management. In this program they were not."

Although the leadership of WITS, which existed prior to undertaking the TSCM program, is white, it was recognized that minorities should have significant project roles, and minority people, both male and female, were recruited as speakers and consultants throughout the year. We deliberately asked whites as well as minorities to contribute to all activities not only because we think it unfair to

exclude those whites who share interest in developing the resources of all people, but also because employers are inclined to overburden minority employees with community and educational activities. It is also important in a democratic society for young people to see that minorities and whites share concern about opportunities for youth and that they can work together. We believe that the WITS staff should build upon relationships with minority-managed organizations who shared in the TSCM program to aid them in expanding access to resources for their own efforts on behalf of Boston minority youth. Such an implicit commitment was made at the close of the year, and we expect to meet with representatives of minority programs which similarly seek to assist minority students in the Boston schools.

This accounting has permitted us to reflect on a difficult but rewarding effort. If we have learned anything from our experience, it is that there are no quick and easy solutions to a problem as complex as widening students' perceptions of what work they may want to do and what they must learn to do it. One cannot create career awareness for any group in the schools simply by furnishing teachers and counselors with a list of resources: the person who was a splendid role model when living in Sudbury may now have moved to Silicon Valley. Contacts must be made and followed up individually, repeatedly, and with good humor.

Fortunately, this is a game that any number can play. In this brochure, we have deliberately included "the troubles we've seen" but also, we hope, the joy and dedication of many people who participated with us in linking education and work in practical ways. We hope this report will be useful to TSCM participants as they struggle with implementation, to those who funded TSCM and others who fund similar programs, and to people in companies, colleges, and community agencies who might play similar catalytic roles in developing human resources in our technological society.

Appendices Contents

*This form was also sent out with C-1
**A similar set of forms and memos was used for field trip confirmations.
***Similar Thank You letters and questionnaires were sent to field trip organizers and workshop participants.

Appendix A-1

LIST OF TSCM PARTICIPANTS

Explanation of abbreviations:
T.A. = Team Administrator
(One of the team members was
selected as the Team Administrator.)
G.C. = Guidance Counselor
Math = Math Teacher
Science = Science Teacher

BOSTON LATIN SCHOOL

Principal : Michael Contompasis
T.A.: Stacy Johnson
G.C.: Kevin Bowers
Math: Edith Walker
Science: Robert Akeson

CATHEDRAL HIGH SCHOOL

Principal: Sister Nancy Roache
T.A.: Elizabeth Feser
G.C.: Leo Hogan
Math: Richard Thoen
        Brother Stephen Wang

CLEVELAND MIDDLE SCHOOL

Principal: F. Robert Lyons
T.A.: F. Robert Lyons
G.C.: William Burke
        Iris Husbands
Math: Joseph Pokaski
Science: Kenneth Kaplan

DORCHESTER HIGH SCHOOL

Principal: Edward C. Lambert
T.A.: Anthony Dileso
G.C.: Jacqueline Murray
Math: John Holmes
Science: Yvonne Phillips

HYDE PARK HIGH SCHOOL

Principal: Michael A. Donato
T.A.: Ruth O'Day
G.C.: John Craven
Math: Gerard Quinn
Science: Adelle Jones

IRVING MIDDLE SCHOOL

Principal: Richard J. Maloney
T.A.: Richard J. Maloney
G.C.: Phyllis Coughlin
        William McDougall
Math: Mel Campbell
Science: John Sheridan

KING MIDDLE SCHOOL

Principal: Will Ella Brown
T.A.: Robert Dever
G.C.: Paul Connell
Math: Ocie Sydnor
Science: Robert Brown

LEWIS MIDDLE SCHOOL

Principal: George A. Johnson
T.A.: Joseph Sullivan
G.C.: Marilyn Stevens
Math: David Thweatt
Science: William Robinson

MADISON PARK HIGH SCHOOL

Principal: Thomas P. Hennessey
T.A.: Melvin Simms
G.C.: Thomas Gilarde
        Roberta O'Leary
Math: Patricia Tremblay
Science: Winnifred Conroy

MCCORMACK MIDDLE SCHOOL

Principal: John D. Callahan
T.A.: Leonard Epstein
G.C.: Estelle Hector & Joseph Ford
Math: Patricia Artis
Science: R. Christine Jordan

MICHELANGELO MIDDLE SCHOOL

Principal: John P. Breen
T.A.: John Mullen
G.C.: Salvatore Cacciola
Math: Leo Lew
Science: William Marshall

MISSION CHURCH HIGH SCHOOL

Principal: Sr. Jacqueline Colabe
T.A.: Sr. Eileen Shea
G.C.: Margaret Tampone
Math: Sr. Eileen Reilly
Science: Joseph Fillmore

ROOSEVELT MIDDLE SCHOOL

Principal: Clifford Janey
T.A.: Clifford Janey
G.C.: Paul Clancy
Math: Richard Stutman
Science: Northa Lee Lewis

TAFT MIDDLE SCHOOL

Principal: Michael Fung
T.A.: Michael Fung
G.C.: Luco LaCambria
Math: Ruthann Seck
Science: Janet Ellis

THOMPSON MIDDLE SCHOOL

Principal: Gerald Hill
T.A.: Gerald Hill
G.C.: Ivy Beckles & Janet Owens
Math: John Bunker
Science: David Donato

UMANA TECHNICAL HARBOR SCHOOL

Principal: Gustave Anglin
T.A.: Paul DeLorie
G.C.: Cora Ott
Math: Paula Barton
Science: E. Jeanette Burns

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INDUSTRY AND OTHER
ORGANIZATIONS PARTICIPATING IN THE TSCM PROGRAM 1979-80

Organizations	Field Trips For Students	Site Visits For Educators	Speakers For Schools	Speaker/Moderator Participants at Teacher Workshops
Action for Boston Community Development (ABCD)				X
Analog Devices	X	X		
Army Boston District Command				X
Army Corps of Engineers			X	X
Army Materials & Mechanics Research Center	X			X
Army Natick Research Center				X
Bell Laboratories			X	
Brandeis University				X
Clinical Assays			X	
Data General Corp.	X			
Data Instruments			X	
Digital Equipment Corp.	X		X	
Draper Laboratory, Inc.			X	
Governor's State Youth Council				X
Factory Mutual Engineering				X
G.T.E. Sylvania				X
Greater Lawrence Regional Technical School				X
Hanscom Air Force Base				X
Hewlett Packard		X		
Honeywell			X	X
Input-Output Computer	X			
John Hancock Mutual Life Insurance Co.			X	
Malden High School				X
Massachusetts Department of Education				X
Mass. Dept. of Environmental Quality Engineering				X
Mass. Division of Employment Security				X
Massachusetts Institute of Technology:				
Graphic Arts	X			
Nuclear Reactor Laboratory	X	X		X
Personnel Office	+			
Solar House	X			
Students/Staff			X	X
Computer Graphics		X		
Arteriosclerosis Center		X		
Energy Lab		X		
Environmental Medical Services		X		
Word Processing Center		X		
MassPep				X
Massport				X
Millipore		X	X	
Mitre Corp.	X		X	X
New England Nuclear Corp.			X	
New England Telephone Co.	X		X	
Northeastern University*				X
Polaroid		X	X	
Prime Computer	X		X	X
Raytheon	X			
Society for Women Engineers			X	
Stone & Webster	X		X	
Tri-Lateral Council for Quality Education				X
Urban League of Eastern Mass.				X
U. S. Food & Drug Administration				X
U. S. Transportation Systems Research Center	X			
University of Massachusetts				X
Wang Laboratories				X
Wentworth Institute*	X			
Y.E.S. Program				X

*osted a Teachers' Workshop

Appendix A-3

TSCM Advisory Group on Organizational Participation

Name	Organization
Marianne Abrams	Tri-Lateral Council for Quality Education
David C. Blackman	Northeastern University
Robert Borden	State Advisory Council on Vocational-Technical Education
Regina Clifton	Boston public school parent
Sally Cortese	Digital Equipment Corp.; President, Boston; Section Society of Women Engineers
Michael Feld	Massachusetts Institute of Technology;
William S. Gale	Gillette Compäny
Joyce Grant	Boston Public Schools—Office of Planning and Policy
Frank Hazel	Mitre Corporation
Verniece Hensey	Mitre Corporation
Clara Hicks	Boston Public Schools—Curriculum Advisor
Hattie B. McKinnls	City Wide Advisory Committee—B.P.S. ESAA
Michael Odom	Digital Equipment Corporation
E.R. Pariser	Massachusetts Institute of Technology
Sally Patton	Department of Manpower Development
Byron Ricketts	Raytheon Company

Appendix A-4

Statistical Summary of Workshop Panelists/Facilitators

	Male Number	Male Percent	Female Number	Female Percent	Total Number	Total Percent
Black and other minorities	30	61%	12	46%	42	56%
White	19	39%	14	54%	33	44%
Total	49	100%	26	100%	75	100%

Statistical Summary of Speakers at Schools

	Male Number	Male Percent	Female Number	Female Percent	Total Number	Total Percent
Black and other minorities	15	55%	8	42%	23	50%
White	12	45%	11	58%	23	50%
Total	27	100%	19	100%	46	100%

Appendix A-5

Students in Target Classes, Race and Number

	Race and Number of Target Students			
	Black	White	Other	Total
Boston Latin School	30	4	3	37
Cathedral High School	16	7	10	33
Cleveland Middle School	30	22	6	58
Dorchester High School	29	6	2	37
Hyde Park High-School	30	7	0	37
Irving Middle School	23	17	2	42
King Middle School	29	18	5	52
Lewis Middle School	23	18	2	43
Madison Park High School	18	22	10	50
McCormack Middle School	17	20	21	58
Michelangelo Middle School	14	12	34	60
Mission Church High School	11	29	1	41
Roosevelt Middle School	22	13	17	52
Taft Middle School	32	8	14	54
Thompson Middle School	48	16	1	65
Umana Technical Harbor School	18	18	10	46
Totals	390	237	138	765

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Appendix B-1

BPS Boston Public Schools
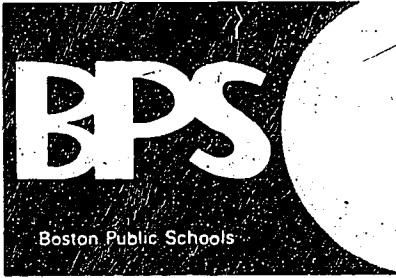
\APPENDIX B-1

PERSONNEL CIRCULAR

No. 12, 1979-1980
October 11, 1979

WORKSHOPS FOR MIDDLE AND HIGH SCHOOL MATH AND SCIENCE

TEACHERS, GUIDANCE COUNSELORS AND ADMINISTRATORS

To Community Superintendents, Headmasters, Principals and other Administrative Heads:

Headmasters, Principals and other Administrative Heads are requested to keep on file a DATED CHECK LIST signed by all academic personnel under their jurisdiction as evidence that each has read this circular.

GENERAL INFORMATION: Project TSCM:

The Emergency School Aid Act (ESAA) of the Boston Public Schools and Massachusetts Institute of Technology/Work in Technology and Science (WITS) has received funding for the Technology and Science Careers for Minorities (TSCM) component for the 1979-80 school year.

PURPOSE: To provide training for teachers, counselors and administrators to aid them in developing strategies for expanding minority student awareness of technology and science careers through the design of instructional activities which inform them of the practical applications of math and science.

PARTICIPANTS: A total of 15 Boston middle and high schools will be selected to participate in the Project. All middle schools in Districts 1, 2, 3, 4, 5, 6, 7, 9 and all high schools are eligible to participate. Each school will be represented by 1 math teacher, 1 science teacher, 1 guidance counselor and 1 administrator. Five of the fifteen schools will be able to have two guidance counselors on the team.

WORKSHOPS: The workshop schedule is as follows: (Some of these will be job site visits)

Teachers and Counselors		Administrators	
November 14	4-7 p.m.	November 14	4-7 p.m.
December 15	9-3 p.m.	Feb. 19, 20,21	9-3 p.m. (choose one)
January 19	9-3 p.m.	March 19	4-7 p.m.
Feb. 19, 20, 21	9-3 p.m. (choose one)	April 9	4-7 p.m.
March 19	4-7 p.m.	May 14	4-7 p.m.
April 9	4-7 p.m.	June 23, 24*	9-3 p.m. (2 days)
May 14	4-7 p.m.		
June 23, 24*	9-3 p.m. (2 days)		

Compensation will be in accordance with the current collective bargaining agreements. First workshop, November 14, 1979, will be held at the Campbell Resource Center.

*Date assumes that June 20 is last day of school.

(over) 33

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ACTIVITIES: The workshops will provide opportunities for personal interaction
               with people working in technology and science. The orientation to
               careers and implementation ideas will aid schools in orienting
               students to the work world. Material presented will suggest career
               options for students with varying interests, abilities and educational
               interests.

               1. Workshops: Areas covered will include labor market orientation,
                   resource materials, professional organizations, publications,
                   programs serving minorities, labor unions, site visits (training
                   programs, etc.), speakers from industry, role models, applications
                   of math and science, career awareness in science and technology,
                   instructional strategies, resource identification.

               2. In-School: School team members will develop activities for students
                   based upon workshops. One job-site field trip per school may be
                   provided, and funds will be available to purchase technology and
                   science career related curriculum materials for each school.
                   Participating teachers will also receive a roster of people from
                   related industries who will be available to deliver presentations
                   and demonstrations to their students. Also, Hubert Humphrey Resource
                   Center cluster planners will be able to provide technical assistance.

REQUIREMENTS: Approval of Headmaster or Principal for delivery of TSCM curriculum
               to your students.

PERFORMANCE RESPONSIBILITIES:

Teacher participants in the TSCM Project will be expected to:

1. Attend workshops.
2. Administer pre-post tests to their students (at least one class) in or re-
    lated to awareness of technology and science careers. Test will take less
    than 30 minutes.
3. Incorporate into their lessons the materials and ideas obtained at training
    workshops.
4. Plan to involve persons in technology and science careers, including minorities,
    as guest speakers to discuss career options with students (with Headmaster
    and teacher approval).

Counselor participants in the TSCM Project will be expected to:

1. Attend workshops.
2. Communicate regularly with team members to identify students for counseling
    with respect to technology and science careers and, for high schools, related
    elective courses, and cooperate with teachers in planning career related
    activities.

Administrator participants in the TSCM Project will be expected to:

1. Attend workshops.
2. Gain knowledge of the TSCM program, and, as much as possible, facilitate the
    project reaching its goals/objectives.

PREFERRED QUALIFICATIONS:

1. Interest in providing technology and science career information to your students.
2. Flexibility in your teaching style to incorporate gained ideas, information, curriculum.
3. Willingness to allow a guest speaker(s) to address your class.
4. Special concern about how to encourage minority students to prepare for careers in science and technology.

APPLICATION PROCEDURE:

Math and science teachers, guidance counselors and administrators (when not Headmaster/ Principal) should apply to their Headmaster/Principal in writing by October 31, 1979. Headmaster/Principal will then select participants from his/her school and complete the attached application form. Each interested school will submit an application with 1 math teacher, 1 science teacher, at least 1 guidance counselor (maximum of 2 - ranked in order) and 1 administrator as a team for the Project. Schools with less than a full team will be considered for participation after schools with complete teams. Headmasters and Principals are asked to make every effort to insure balanced race and sex representation on each team.

SELECTION OF SCHOOLS:

Final selection of participating schools will be made by the TSCM staff in conjunction with the Department of Curriculum and Competency, Boston Public Schools.

Headmasters and Principals of interested schools should forward the attached application form to Richard Deveney, Coordinator, TSCM Component, ESAA Office, 26 Court Street, Boston, MA 02108 by November 5, 1979. All applications will be acknowledged in writing.

The recruitment, selection and assignment policies and procedures of the Boston Public Schools are covered by federal and state non-discrimination laws, by federal court orders and by affirmative action policy of the Boston School Committee. Questions regarding recruitment should be addressed to the Office of Personnel Recruitment, 726-6592. Questions regarding assignment should be addressed to the Office of Equal Opportunity, 726-6364.

FOR FURTHER INFORMATION, PLEASE CONTACT RICHARD DEVENEY, ESAA COORDINATOR, 26 COURT ST., BOSTON, MA 02108, Telephone 726-6525.

CLARENCE COOPER
Director of Personnel Management

Attachment

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Response to PERSONNEL CIRCULAR NO. 12, 1979-1980
October 11, 1979

Richard Deveney, Coordinator
ESAA Office
26 Court Street
Boston, MA 02108

APPLICATION FOR PARTICIPATION IN
TECHNOLOGY AND SCIENCE, CAREERS FOR MINORITIES

_____   _____
        (School)   (Date).

The following math and science teachers, guidance counselor(s) and administrator
have been selected to apply to participate in the TSCM Project. Teachers, counselors
and administrators agree to implement the performance responsibilities as indicated
in this circular.

Signature   Race Sex Courses now teaching & grade level where applicable

Math Teacher

Science Teacher

Guidance Counselor
(1st Selection)

                                    : This counselor may not be allowed to participate.
Guidance Counselor   Schools will be notified.
(2nd Selection)

Administrator   Rank   (If teaching, courses only)

        I agree to allow the math and science teachers to incorporate some technology
and science career awareness curriculum into their courses.

                                    _____
                                        Headmaster/Principal
                                            (Signature)

TEACHERS

Your input is essential for planning the TSCM program and to make the workshops as interesting and useful as possible. So we can help you, please help us by giving us realistic and complete answers. Feel free to continue your answers and to add comments on the extra sheet. Some of the data will be utilized also for project evaluation. Your personal identifying information is necessary for payroll purposes. We realize that everyone's time is limited, and to minimize the paper work; we have consolidated all the information in one form. <u>Please return this form in the attached envelope by November 21</u>. WE DO APPRECIATE YOUR COOPERATION!

Name_____ School_____

Home Address_____ School Address_____

Home Phone_____ School Phone_____

Social Security Number_____ Race_____ Sex_____

Times available for occasional meetings with Richard Deveney:

	Specify Times of Day
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	

What courses do you teach? (Please specify titles, grade levels and number of classes.)

_____

Approximately how many students do you teach per school day?

	White	Black	Other Minority
Male			
Female			

DURING THE COURSE OF THE 1978-79 SCHOOL YEAR:

1. In how many class sessions, if any, did you include career awareness activities, curriculum or materials?

    None_____   1-4_____   5 or more_____

    Approximately how much time did you spend during the year conducting these activities?

    Less than 3 hours_____   3-10 hours_____   Over 10 hours_____

    If you have conducted such activities, please give examples._____

    _____

    _____

2. Did you take your classes on one or more field trip(s)? No__ Yes__ .If yes, how many?_____

    Purpose and location of field trip(s)._____

    _____

    _____

    What would you like to see done in the future to facilitate a field trip for a math or a science class?_____

    _____

    _____

3. Have you had speakers address your classes? No___ Yes___. If yes, how many times?_____.
Please explain briefly how you arranged for the speakers, the subject matter, the speaker's
title and affiliation, and what you thought of the impact on students._____

_____

_____

_____

_____

4. What career materials, if any, have you used in your math or science classes?   None___
If you have used career materials, please give a few of the best name(s) and source(s).

_____

_____

5. Related to careers, which of the following have you obtained from a school counselor?

   Nothing_____   Career Materials_____   Other Information (Pls. specify)_____

   _____

6. How frequently have you discussed career related issues with:

	Number of Times			
	Never	1-4	5+	Pls. comment on the nature of the discussion.
...an individual student				
...a school administrator				
...your department head				
...a guidance counselor				
...a career educator				
...a school librarian				
...another teacher				
...a parent				

7. Have you used a Career Information Center? No___ Yes___. If you have used it, please
explain in detail how often, for what students, etc._____

_____

GENERAL INFORMATION:
8. Is your school paired with a business firm or university? No___ Yes___. If yes, what
firm?_____. What university?_____. Has this
pairing been of use to you or your students? No___ Yes___. If yes, please explain how.

_____

_____

_____

9. What community resources (e.g., Boston Volunteers, Jobs for Youth, etc.) are available
to your school to assist you in planning career related activities? If you have used
them, please explain how._____

_____

_____

_____

10. Have you heard of the Massachusetts Occupational Information System (MOIS)? No___ Yes___
    Have you used it? No___ Yes___. Please comment._____

    _____

    _____

11. Please describe briefly your participation in the following during the last three years:
                        Please specify subject matter, sponsoring institution, etc.

    in-service programs_____

    courses_____

    professional meetings_____

12. Please describe briefly ways (e.g., work experience, T.V., reading, relatives, friends,
    college courses, YMCA or YWCA, etc.) that have informed you about:

    ...careers in technology and science_____

    _____

    ...minority issues_____

    _____

13. What limits your capacity to implement activities related to careers in your classroom?

14. What would you like to learn about careers in technology and science this year?

15. What do you think can/should be done to encourage middle and/or high school students to
    pursue math, science and technical courses?

16. Please suggest ways to involve parents in meeting the objectives of this year's program.

Thank you for your cooperation!!!

TEACHERS' QUESTIONNAIRE SUMMARY (22)

What limits your capacities to implement activities related to careers in your classroom?

8-time
6-career materials on science/technology
5-own lack of knowledge
3-student motivation
1-math & science phobia
1-class size
1-no AV equipment

1-disorder & confusion
1-students not thinking at all about careers
   (9th grade)
1-students have career ed twice a week-
   don't like it in class
1-space

Quote: "avoid assemblies."

What would you like to learn about careers in technology and science?

9-skills needed
6-job descriptions
5-job outlook
4-motivation process
2-financial aid available
2-guest speaker available
2-information sources
1-information on use of algebra, calculus, trigonometry to explain to middle school students

1-how to use them to motivate students
1-nothing in particular
1-eliminate phobia
1-evaluate test results
1-financial benefits
1-how employees are evaluated
1-on-the-job training

What do you think can be done to encourage students to pursue math, science & tech. careers?

3-hands-on experiences
3-role models
2-build interest
2-inform them
2-make math fun
1-part-time job
1-present practical nature of math/science

1-guest speakers
1-field trips
1-do all possible
1-illustrate requirements to get jobs
1-discuss future technological changes
1-good communication (family-students)
1-no theoretical math&science until high school

Quote: "Realistically only students that have measured success in math and science can
be expected to pursue a rigorous course of study in such subjects."

Please suggest ways to involve parents in meeting the objectives of this year's program.

5-parents as guest speakers (survey them & find if any are in tech. fields)
4-chaperones - field trips
4-pay
2-make parents go on field trips
2-inform them
2-REPC
2-invite to school to hear speakers

2-Brochure on jobs
1-newsletter
1-parent group
1-churches
1-career day
1-school activities

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wits

MIT	Room 20C-228	Cambridge	Telephone
Project on	Massachusetts	Massachusetts	617-253-7378
Work in	Institute of	02139	
Technology	Technology		
and Science			

Dear Math and Science Teachers:

We would like to use this questionnaire as an opportunity to explain this year's program to the students in your "target class". We would like to convey several ideas to your students: we would like them to know that the project is an effort to help them to think about their own futures, and that the choices they make in school do have real impact on their lives as they make career choices. We hope that the speakers from industry and the field trips will convey to students what technical and scientific careers are all about, and why skills in science and math become increasingly important with the development of modern technology. We want to convey to your students that technical and scientific careers can be real and viable options for them, and that these careers tend to require some exposure to academic material in science and math.

The results of this questionnaire could be used as a basis for some class discussion about careers, and, more specifically, student attitudes about careers which deal with science and technology. We've thought about some possible topics for discussion which we hope will be useful for you in the classroom. First, what jobs do your students think they might want to be doing in the future? How much education do they think is required for these jobs? How much do they actually know about available jobs? Second, how do students think that their counselor could assist them in preparing for their eventual career? (It may be helpful to involve the counselor on your team in this discussion). Third, what "type" of person do students think are involved in scientific and technological careers: "brainy-types"? Men only? Or do they think that everyone can gain employment in these jobs? Do they think that the opportunities are equal for women, blacks, Hispanics? Fourth, would any of your students like to make any specific suggestions for you to share with us concerning this year's program? Fifth, what courses do students think are important to take when preparing for careers in science and technology? Sixth, do your students think that a mathematician does math exclusively? Does a scientist perform experiments and do nothing else? What skills besides math and science skills are necessary to effectively perform jobs in science and technology?

We hope that your class discussions and the results of the questionnaire will help you become more familiar with your students' career interests, and with their ideas, their aspirations, their expectations. We would also like to encourage you to advise us of your particular needs and your ideas as we recruit speakers and arrange site visits with our industry friends.

Merry Christmas! Happy New Year!
- The WITS Staff -

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and Science

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Massachusetts
Institute of
Technology

Cambridge
Massachusetts
02139

Telephone
617-253-7378

Return of Pre-Test - Richard Deveney will pick up the Pre-Test results from you at your school beginning 1/10/79. Please try to have them completed then.

"Target Class" Composition

1. Composition of target class:

	White	Black	Other
Male			
Female			

2. What time of day does this class meet?

time of day

M	T	W	Th	F

3. To help us in planning our program, please comment on your target class:

Name of course: _____

Topics covered in class: _____

Reasons for choosing this class: (such as; class behavior, ability level, motivation, special interests of students, etc.)

_____

_____

_____

_____

_____

_____

4. How many of the students in your target class are also in the other target class in your school? _____

5. Might it be possible to plan simultaneous programs for both target classes? ___ Yes ___ No   Please comment on how this might be arranged.

_____

_____

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Appendix B-6

TECHNOLOGY AND SCIENCE CAREERS FOR MINORITIES WORKSHOP: November 14, 1979

EXPLANATION OF PAYMENT:

Participants will be paid in accordance with MIT Accounting Office procedures in February and in June. No taxes will be deducted from your check, but you will be expected to report your income to the IRS. Any questions concerning payment should be referred to Jennifer Porter at Project WITS.

SITE VISITS FOR EDUCATORS AND STUDENTS - SCHOOL VISITS BY INDUSTRY PERSONNEL:

In cooperation with technical and scientific industries, WITS staff is planning to provide site visits in a variety of organizations in the greater Boston area.

WITS is also establishing a roster of names of persons working in many technical and scientific jobs who will come to a school. A speaker, in some cases a team, will be available a few times between February and June to talk to math and science classes. More information regarding site visits and speakers will be provided at the next workshop and a complete schedule will be ready in January. If you have any questions regarding these events, please call Nadine Rodwin at Project WITS.

HOMEWORK! Please complete the questionnaire and return it to the WITS office before November 21. An addressed and stamped envelope is enclosed.

AGENDA:

4:00 to 4:10 p.m.	Sign in.
4:10 p.m.	Edith Ruina, Director, Project WITS Richard Deveney, ESAA Coordinator
4:25 p.m.	Welcome from the office of the Superintendent of Boston Public Schools
4:35 p.m.	Arthur E. Carter, Honeywell, Manager of Equal Employment Opportunity and Employee & Community Relations Programs
5:00 to 6:30 p.m.	Workshops in small groups. Dr. Strickland and group facilitators
6:30 to 7:00 p.m.	Report of small groups and general discussion

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TSCM WORKSHOP EVALUATION

TO: TSCM PARTICIPANTS

Please help us help you by letting us know your reactions to the workshops so far!

Please check one of the following:

Math Teacher_____   Science Teacher_____   Guidance Counselor_____

	Excellent	Valuable	Slightly Valuable	Not Valuable
Workshop #1-Nov. 14, 1979-Campbell Resource Center:				
Arthur Carter, Honeywell-speaker on minorities	____	____	____	____
Strickland, et al-discussions of student motivation	____	____	____	____
Workshop #2-Dec. 15, 1979-Wentworth Institute:				
Panel of minority role models	____	____	____	____
Norma Clarke on Mitre/Madison Park H.S.	____	____	____	____
Wentworth President's talk on nature of engineering related careers	____	____	____	____
Wentworth Admission Officer	____	____	____	____
Small group discussion of why Boston minorities don't participate in technology and science	____	____	____	____
Meeting with your school team	____	____	____	____
Workshop #3-Jan. 19, 1980-Northeastern University				
F. Williams Sarles' talk on "What an Engineer Does"	____	____	____	____
Mary Kay Tetreault-use of career materials	____	____	____	____
Northeastern presentation	____	____	____	____
Meeting with your school team	____	____	____	____

What have you liked *most* about workshops so far?_____

_____

What have you liked *least* about workshops so far?_____

_____

What are your suggestions/comments re future workshops?_____

_____

THANKS!

THE WITS STAFF   1/19/80

<u>TO: TSCM PARTICIPANTS</u>

*Please help us help you by letting us know your reactions to TSCM workshops and activities
conducted so far!*

Name_____   School_____

```
                                        ------------Please check:---------------
                                                          Slightly     Not
Site Visits (Please rate only yours):   Excellent  Valuable  Valuable  Valuable
```

        Polaroid _____   _____   _____   _____

        Analog Devices _____   _____   _____   _____

        Millipore Corporation _____   _____   _____   _____

        Hewlett Packard _____   _____   _____   _____

As a result of <u>your</u> site visit, is your <u>attitude</u> about working in technological fields:

        more positive _____

        more negative _____

        unchanged (I continue to see advantages) _____

        unchanged (I continue to see problems) _____

      Feel free to explain your responses on the other side of the page.

What could be done <u>by WITS</u> to improve future site visits for teachers?_____

_____

_____

What could be done <u>by industry</u> to improve future site visits for teachers?_____

_____

_____

Have your students had a speaker? YES___ NO___   field trip? YES___ NO___

    <u>Speaker(s)/Name of Industry</u>   <u>Field Trip/Name of Industry</u>

1._____   _____

2._____   _____

Rate students' response:

    Speaker: POSITIVE   10 9 8 7 6 5 4 3 2 1   NEGATIVE

    Field Trip: POSITIVE   10 9 8 7 6 5 4 3 2 1   NEGATIVE

How did/will you prepare students for a speaker or field trip?_____

_____

What kind of follow-up did/will you have?_____

_____

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How many times has your TSCM team met formally or informally?

<center>0   1   2   3   4   5 or more</center>

Please describe any hands-on materials you have used to help students understand technology.

_____

_____

Are there other resources you have found helpful?   Please describe. _____

_____

_____

Please indicate how you have used the materials you have received in this program.

class discussions _____	informal counseling _____	
homework assignments _____	a. individual _____	
leisure reading _____	b. group sessions _____	
special projects _____	formal counseling _____	
(Please describe) _____	planning with the TSCM team _____	
_____		

	Excellent	Valuable	Slightly Valuable	Not Valuable
Workshop #4 - March 19, 1980 - MIT:				
Group discussion on implementation strategies	_____	_____	_____	_____
Panel on computer-related careers	_____	_____	_____	_____

What did you like *most* about the workshop? _____

_____

_____

_____

What did you like *least* about the workshop? _____

_____

_____

_____

Additional comments/suggestions: _____

_____

_____

_____

_____

<div align="right">4/9/80</div>

<center>47</center>

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MIT
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Room 20C-228
Massachusetts
Institute of
Technology

Cambridge
Massachusetts
02139

Telephone
617-253-7378

TO: TSCM SCHOOL TEAM

We do not know whether this or any other career exploration program
will be available next year. However, if one is available, it would
be valuable to have feedback from the participants in this year's
TSCM program. If no formal program is available, there may still be
things that individuals or schools could pursue.

Based upon your experiences this year, we ask your school TSCM members
to discuss the questions attached as they relate to your school. One
member of your group should summarize the group's thinking on the buff-
colored sheets.

Please read all of the questions aloud before beginning discussion so
that you can decide in what sequence people would like to discuss them.
We hope that you will be able to cover most of them, but your team may
want to select some questions for longer discussion.

We plan to review all of the school responses to use in planning the
June meeting.

Thank you for your cooperation!

May 14, 1980

Appendix B-8.2

INSTRUCTIONS FOR RECORDING YOUR TEAM'S DISCUSSION

Please record your team's responses in as much detail as possible. A separate sheet is included for each question.

PLEASE RETURN TO RICHARD DEVENEY BEFORE YOU LEAVE THIS EVENING.

1. If a similar program were available next year, would you like to continue participating in it? Why or why not?

2. Is it important to take time from regular curriculum to focus on career exploration? Why or why not?

3. What other staff members in your school could/should be involved? Why?

4. Does this program lend itself better to math or science teachers, counselors or administrators?

5. Can you suggest ways of relating career development to: language arts, social studies, art or other subjects?

6. Can you suggest ways of cooperating with other schools?

7. Can you suggest how a program like TSCM can be made more useful to your school?

8. If planning time were available at your school: a.) who should be involved; b.) what is the best time; c.) what types of things should be discussed; d.) how should the planning process be structured?

9. What specific curriculum related to math and science would you like to have available to promote career development?

10. How can counseling/guidance at your school encourage students to prepare for technical and scientific careers?

11. Assuming that you are not part of a TSCM program next year, what specific career awareness activities will be conducted at your school?

Name_____

School_____

Name of Discussion Leader_____

5/14/80 WORKSHOP

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Appendix B-9.1

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MIT	Room 20C-228	Cambridge	Telephone
Project on	Massachusetts	Massachusetts	617-253-7378
Work in	Institute of	02139	
Technology	Technology		
and Science			

NAME_____ SUBJECT_____ DATE_____

Dear Student:

We are asking you to help us think about what might help you or other students learn about careers in the technological fields. You have had some speakers, some printed materials and a field trip to an industry. We want to know what students think is useful for them. Thank you for your cooperation!

Please circle your rating of each speaker and field trip. 10 means TERRIFIC, 1 means BAD NEWS.

Speaker #1 _____   10 9 8 7 6 5 4 3 2 1
                (name & company)

Speaker #2 _____   10 9 8 7 6 5 4 3 2 1
                (name & company)

Field Trip _____   10 9 8 7 6 5 4 3 2 1
                (company name)

1. Say one or two things you found particularly new or interesting in the above._____
_____
_____

2. What have you read about careers in technology this year? Please name or describe._____
_____
_____

3. What subjects do you think it is important to take if you want a job in a high technology company?_____

4. Do you think you have a better idea now about what technicians, engineers and scientists do than you had before this school year? Much Better_____ A Little Better_____ Same_____

5. What do you think all students ought to learn about careers in technology?_____
_____
_____

6. What would you like each of the following to do to help you next year to think about your future career?

   Math Teacher_____

   Science Teacher_____

   Counselor_____

   Parent(s) or Guardian_____

7. Improving technology means making things work better. Can you give examples of technology you would like to understand more or to improve?_____
_____
_____

Do you have some special thoughts ???
Use other side

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Appendix B-9.2

wits | MIT Project on Work in Technology and Science | Room 20C-228 Massachusetts Institute of Technology | Cambridge Massachusetts 02139 | Telephone 617-253-7378

Dear Math and Science Teachers:

Many of you have wanted to have a better sense of student reactions to speakers, field trips and materials. At the very least, WITS also wants to take advantage of the TSCM program to involve you in recommending what ought to be done based upon your students' and your reactions this year. Therefore, we ask you to:

1.) have the students in the TSCM target class complete the questionnaire that we have prepared---be sure to remind students of names of speakers and companies to write in on their forms;

2.) summarize their responses on this form and return your summary in the self-addressed stamped envelope;

3.) put the student forms back in the envelope in which you received them and bring them to the June meeting as a basis for further discussion.

Thank you for your cooperation!

Name of Teacher_____

Subject_____

No. of Students Responding_____

Date____/_____/_____

NUMBER OF STUDENTS FOR EACH RATING

	10	9	8	7	6	5	4	3	2	1
Speaker #1										
Speaker #2										
Field Trip										

PLEASE SUMMARIZE THE STUDENTS' ANSWERS TO QUESTIONS.

1. Say one or two things you found particularly new or interesting in the above:_____

_____

_____

_____

_____

_____

2. What have you read about careers in technology this year? Please name or describe:_____

_____

_____

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3. What subjects do you think it is important to take if you want a job in a high technology company?_____

_____

4. Do you think you have a better idea now about what technicians, engineers and scientists do than you had before this school year? (Please indicate how many responses.)
Much Better_____ A Little Better_____ Same_____

5. What do you think all students ought to learn about careers in technology?_____

_____

_____

_____

_____

_____

6. What would you like each of the following to do to help you next year to think about your future career?

Math Teacher_____

_____

Science Teacher_____

_____

Counselor_____

_____

Parent(s) or Guardian_____

_____

7. Improving technology means making things work better. Can you give examples of technology you would like to understand more or to improve?_____

_____

_____

_____

8. Do you have some special thoughts?_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Teacher comments welcome! Please use other side. 5/14/80

wits | MIT Project on Work in Technology and Science | Room 20C-228 Massachusetts Institute of Technology | Cambridge Massachusetts 02139 | Telephone 617-253-7378

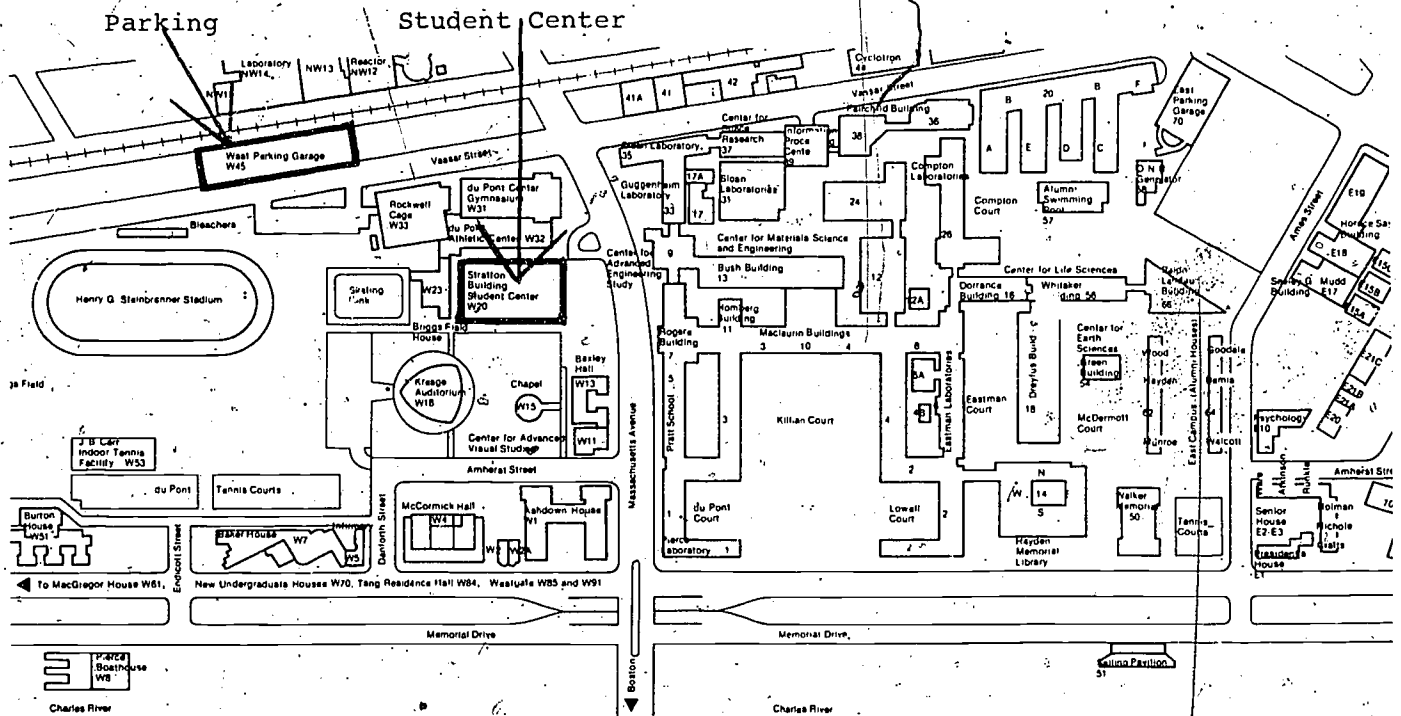A SPECIAL INVITATION TO PARENTS AND STUDENTS *

In cooperation with the MIT Open House Committee and with the WESTINGHOUSE SCIENCE FAIR FOR MIDDLE AND HIGH SCHOOL STUDENTS, MIT/Project WITS would like to invite you to an Open House on Saturday, May 3, 1980.

WITS/TSCM staff members will be on hand to greet you from 11 a.m. until 1 p.m. in the West Lounge of the MIT Student Center. MIT students will be happy to give you a short tour of the campus and its facilities.

Industry representatives will be available to discuss with you and your children the many career opportunities in technology and science-related companies in the Boston area.

Coffee and refreshments will be provided.

The WITS/TSCM staff look forward to seeing you on Saturday, May 3!

Parking   Student Center

*Sponsored by the Boston Public Schools' Emergency School Aid Act funding.

wits MIT
Project on
Work in
Technology
and Science

April 16, 1980

Dear Colleague:

This SPECIAL INVITATION FOR PARENTS AND STUDENTS is to be distributed as
part of the TSCM program. As you know, involving parents in their
childrens' education through career awareness activities is an essential
component of our program. We expect the MIT OPEN HOUSE and the
MASSACHUSETTS STATE SCIENCE FAIR on SATURDAY, MAY 3, to be very interesting
and worthwhile events, and we hope that parents will take this opportunity
to explore job opportunities in science and technology.

We have organized our Parent/Student event in the following manner:
WITS/TSCM staff members will be in the WEST LOUNGE of the MIT STUDENT
CENTER from 11-1 p.m. Coffee and refreshments will be served, MIT student
guides will take interested parents and their children on tours of MIT and
PARENTS WILL BE GIVEN THE OPPORTUNITY TO RAISE QUESTIONS ABOUT TECHNOLOGY
AND SCIENCE-RELATED CAREERS WITH INDUSTRY REPRESENTATIVES.

The MIT OPEN HOUSE and the MASSACHUSETTS STATE SCIENCE FAIR events, which
will be conducted from 10 a.m. until 3 p.m., will include: a CHEMISTRY
MAGIC SHOW, an exhibit by the SOCIETY OF WOMEN ENGINEERS, a display by
GREENSPEAK (a method of using lights to advertise Open House events), and
many HANDS-ON EXPERIENCES, DEMONSTRATIONS and EXHIBITS involving COMPUTER
TERMINALS and other MIT LABORATORY FACILITIES. The science fair will
present SCIENCE PROJECTS INVENTED AND ASSEMBLED BY HIGH SCHOOL STUDENTS
from the Greater Boston area.

PLEASE URGE YOUR STUDENTS TO BRING THEIR PARENTS AND COME JOIN THE FUN.
YOU MAY WANT TO SUGGEST THAT STUDENTS LOOK OUT FOR THE SCIENCE FAIR AD IN
THE BOSTON GLOBE, AND YOU MAY ALSO WANT TO POST THE AD ON THE SCHOOL
BULLETIN BOARD!

Thank you.

Cordially,

Edith Ruina

THE WITS/TSCM STAFF

ap

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Appendix C-1 Explaining TSCM Program to Organizations

wits MIT Project on Work in Technology and Science

Room 20C-228
Massachusetts Institute of Technology

Cambridge
Massachusetts
02139

Telephone
617-253-7378

You will recall our phone conversation about the MIT/WITS TECHNOLOGY AND SCIENCE CAREERS FOR MINORITIES (TSCM) program. WITS is planning programs for Boston educators so that they can increase minority students' interest in math and science and expand their awareness of technology and science careers as described in the enclosed Boston Public Schools Personnel Circular.

The gist of what we need from you involves industry visits for secondary school students and school visits by industry personnel between January 20, 1980 and June 10, 1980.

Industry Visits for Students: We need companies that will host visits for math or science classes of about 25 students. About 30 such field trips (i.e., 2 per school) will be required. We hope that your company will host more than one such trip.

School Visits by Industry Personnel: We need enthusiastic and articulate technicians, engineers, drafters, programmers, personnel representatives and others who are willing to talk to a class at a Boston school during school hours or to a PTA or teachers' group in the evening or on a Saturday. It would be desirable to have a fair sample of minorities among the discussants, but anyone who can encourage youngsters, including minorities, to pursue technical and scientific careers is welcome. They could discuss their jobs, their own career development, an application of science or math concepts in industry, the outlook for technology and science careers and opportunities for minorities in these careers or other related topics.

About 50 to 60 visits (i.e., 3 to 4 per school) will be required. We hope that your company will make personnel available for several visits. Two talks per visit would work best, one to a math class and one to a science class. Experience suggests that the most effective way is for a team of 2 or 3 persons to visit a school. This allows different specialists, for example, an engineer and a technician, to explain how they work together. It also prevents last minute cancellations in case of one person's illness.

We need your support to help minority youngsters prepare for career opportunities about which they know practically nothing. Your most effective contribution would be to tangibly encourage some of your employees to participate. The enclosed forms should be completed by those in charge of the student site visits, as well as by those who wish to visit a school. May we suggest that you coordinate your company's participation by asking employees to return the forms to you. Of course, we also need the forms, but you might want to keep copies and a list of your participants for your files.

As soon as convenient, we should know the extent of your commitment, so that we can present tentative plans to the teachers' workshops in November and December. Specific arrangements for dates and times will be made after January 20, when either a Boston teacher or WITS staff member will get in touch with you. In addition to circulating the forms and the information contained in this letter, you might want to publicize the TSCM project through your in-house publication.

Thank you for any help you might be able to provide. We look forward to talking to you and to planning specific events. Please do not hesitate to call if you have any questions or suggestions.

Sincerely yours,

Nadine Rodwin

Nadine Rodwin

ap
Enclosures:
BPS Personnel Circular, No. 12, 1979-1980, October 11, 1979.
10 Pink SET Roster Forms.

P.S. Perhaps your organization is already cooperating with similar programs, such as Mass PEP or the Tri-Lateral Council. If so, we want you to know that we are coordinating our efforts with these groups so as to put minimum strain on limited resources. Our program offers you an additional opportunity to develop the interest of young minority men and women in pursuing technical careers.

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JOIN THE SET ROSTER

join!   join!

SET

for encouraging Boston minority students to consider careers in
Science, Engineering and Technology

JOIN!

The Technology and Science Careers for Minorities (TSCM)
Project, developed under a grant from the Emergency School Aid
Act, seeks to develop a roster of resource people. These people
will directly participate in an effort by the Boston schools to
increase minority preparation for technological careers.

The SET ROSTER will involve educators, parents, and college
students, as well as scientists, engineers and technicians. They
will serve as advisors, consultants, speakers, role models, tutors
and guides for site visits and field trips. The Roster members
will demonstrate that there are real opportunities for male and
female minority students who prepare for technological careers.

Most teachers, counselors and students have little or no
opportunity to become familiar with the world of work in techno-
logical industries. Hence too few students consider careers in
those industries. For young people, there is no substitute for
the personal communication that SET members will provide as they
demonstrate examples of technical and scientific work and talk
about their own career development.

We appreciate that for everyone time availability is a
problem, and we'll take careful account of that when we ask for
help.

If you would like to be a member of the SET ROSTER, please
complete the attached form and return it to the WITS office as
soon as possible. If you know others who might be interested
in joining, please pass on this information, or phone the WITS
office.

JOIN!   JOIN!

join!   join!

wits

TECHNOLOGY AND SCIENCE CAREERS FOR MINORITIES (TSCM) PROJECT

SET (Science, Engineering and Technology) ROSTER

The Project seeks a wide range of professional, technical and support personnel to inform
Boston students about technology and science career options. If you would like to contribute
to the effort to encourage minorities to prepare for technology and science careers, please
complete this form.

Name_____ Race_____ Sex_____

Company_____ Department_____

Address_____ Phone_____

Title and Description of Work_____

_____

Which of the following will you be able to undertake between January 20 and June 10, 1980?

1. _____ Arranging a group visit at your company during the work day for about 25 students.

2. _____ Speaking at a Boston school to a class: for example, about your own job and career
development, job options in technology, and science or a science or math related
topic of your choice. (Please specify.)_____

3. _____ Presenting information to parents and teachers concerning student career choice,
educational requirements for jobs, etc.

Will you be available during: school hours_____   evenings_____   Saturdays_____

WITS will secure employers' support of employee participation. Would that be desirable in
your case?   Yes_____   No_____   Doesn't Matter_____

Please list company or professional publications and audio/visual materials useful for teachers
or students._____

_____

_____

Please describe related activities, if any, in which you have previously been involved.

_____

_____

Please describe any organizations you are/or have been affiliated with that have similar ob-
jectives to the TSCM Project._____

_____

_____

Please suggest others who may be interested in being included in the SET Roster:

Name_____   Organization/Position_____
Address_____   Phone_____

Name_____   Organization/Position_____
Address_____   Phone_____

Name_____   Organization/Position_____
Address_____   Phone_____

PLEASE USE REVERSE FOR ANY COMMENTS/SUGGESTIONS.   10/26/79

wits MIT   Room 20C-228   Cambridge   Telephone
Project on   Massachusetts   Massachusetts   617-253-7378
Work in   Institute of   02139
Technology   Technology
and Science

We are delighted that you have agreed to participate in the TECHNOLOGY
AND SCIENCE CAREERS FOR MINORITIES (TSCM) program by speaking at a
Boston school.

Enclosed is a confirmation sheet which provides the exact information
about the time, place and other particulars of the event. The teachers
involved are also receiving copies of this form and will be calling you
about one week before the scheduled talk to tell you something about
their students and to find out more about you so that they can better
prepare their class. Also enclosed is an overview of the whole program
so you can see how your talk fits into the broader framework.

Please don't hesitate to call if you have any questions. Many thanks
for your help in this worthwhile project.

Cordially,

Nadine Rodwin

ap
Enclosures:
 TSCM Overview
 Memo to Speakers and TSCM School Team Members
 Memo to Teachers and Speakers

wits MIT
Project on
Work in
Technology
and Science

Room 20C-228
Massachusetts
Institute of
Technology

Cambridge
Massachusetts
02139

Telephone
617-253-7378

MEMORANDUM

TO: TSCM School Team Administrator

Arrangements have now been worked out for a speaker to come to your
school to address target classes selected by the TSCM team math and
science teachers. You will note that speakers will be expecting a
phone call from each teacher to establish personal contact and to
discuss the visit.

The enclosed confirmation sheet provides the necessary information.
We would appreciate your sending a copy of this form to each one of
the persons listed below.

We hope that the speaker's visit to your school will be successful,
and that you and the TSCM counselor will be able to attend the class.

If you have any questions or suggestions, please don't hesitate to
call or to talk to Richard Deveney.

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Enclosures:
 Speaker confirmation sheets
 Memorandum to teachers and speakers

Math teacher:

Science teacher:

Guidance counselor(s):

Headmaster/principal:

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TECHNOLOGY AND SCIENCE CAREERS FOR MINORITIES (TSCM)

MEMO TO SPEAKERS AND TSCM SCHOOL TEAM MEMBERS

The following conveys necessary information about arrangements for a speaker visiting middle or high school classes. Speakers will talk informally about their own career development and/or about some interesting technical endeavor leaving time for discussion. The purpose is to increase students' interest in math and science and to expand their awareness of careers in technology and science. Speakers and teachers will discuss in a phone conversation their mutual concerns about the class, the nature of the presentation and requirements for any audio/visual equipment. Teachers should phone the speaker no later than one week before the date scheduled.

Information for Math and Science Teachers

The person named here has agreed to address your class. The speaker will expect you to phone him/her about 10 days before the scheduled date.

Name_____   Title/Position_____

Organization_____   Phone: (Daytime)_____
                                                   (Evening)_____
Possible Topics_____

Information for Speakers

Information about School:

Date of School Visit:_____   *Please arrive at school at:_____

Name_____   Directions/Parking_____

Address_____   _____

Phone_____

Participating Teachers:

				From	To
Math_____	Course_____	Time of Class			
Science_____	Course_____	Time of Class			

*Upon arrival at the school, please ask to see_____.
The time of arrival at the school has been set for 20 minutes before the class begins to allow your meeting a school official and to be taken to the class. Please plan to talk approximately 20 minutes and allow 15 minutes for questions.

1/16/80

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Appendix C-6

wits   MIT   Room 20C-228   Cambridge   Telephone
            Project on   Massachusetts   Massachusetts   617-253-7378
            Work in   Institute of   02139
            Technology   Technology
            and Science

January 28, 1980

MEMORANDUM

TO: Teachers and Speakers

RE: Phone planning of speaker's visit to school

Some speakers have had little experience talking to a middle or high
school class. Speakers will be more comfortable if they can consider
with teachers how to pitch their talks. Similarly, some teachers have
had little opportunity to deal with people working in technology; so,
based on past WITS experience, here are some suggestions of points to
cover when you "meet each other" over the phone:

    Information about the class - special interests, problems,
    abilities.

    Emphasis upon entry level or college level jobs?

    Extent to which students have read about or discussed speaker's
    field, industry or heard other speakers.

    Suggested topics of special interest to students in addition
    to personal career history and information about careers related
    to speaker's career.

    Possibility of speaker bringing a sample of a part or a product
    that students could see/touch.

    Mention of hobbies/other personal experiences that communicate
    that "he/she is only human" - demystifying the technologist.

    Need for special equipment - audio/visual, tapes, screen, etc.

    Travel instructions.

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       Work in,   Institute of   02139
       Technology   Technology
       and Science

April 22, 1980

I hope that you enjoyed the April 9 WITS/TSCM discussion: TECHNICAL
AND SCIENTIFIC CAREERS IN THE PUBLIC SECTOR as much as we did.   The
information you presented and the brochures you brought will be most
useful to the teachers' discussions of careers.   I am sorry that you
did not have as much time as you may have liked; but, having many
panelists gave us an excellent bird's eye view of the employment
opportunities in the public sector.

I do appreciate your informative presentation.   Many thanks!   I was
able to join only a few of the small discussion groups, but I am told
that lively discussions went on in many areas.   I hope that this is
only a beginning for a school-"world of work" relationship and that
some of you will cooperate further with the educators you met.

At our next workshop, we will ask the teachers and counselors for their
evaluation of the April 9 meeting. But, it is equally important for us
to get your reactions to the meeting so that we can modify future pro-
grams to reflect more clearly the various needs and interests of parti-
cipants. We would thus appreciate your comments and suggestions on the
enclosed sheet. Please return it to: Project WITS, MIT, Room 20C-228,
Cambridge, MA 02139.

Again, many thanks for your interest and participation in WITS/TSCM
activities.

Cordially,

Nadine Rodwin

ap
Enclosure

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wits

MIT	Room 20C-228	Cambridge	Telephone
Project on	Massachusetts	Massachusetts	617-253-7378
Work in	Institute of	02139.	
Technology	Technology		
and Science			

Dear Colleague:

Some time has elapsed since you were kind enough to give a talk at a Boston school. We hope that you found the experience interesting and rewarding, and we are grateful for your participation in this important program.

Although we will not get the teachers' complete evaluations until later on in the school year, the informal feedback we have had so far has been quite positive. In addition to teacher input, though, we would like to have your comments and suggestions concerning your school visit. We hope to analyze teacher and speaker notes and then to modify our program to reflect more clearly the various needs and interests of project participants. We would thus appreciate your comments and suggestions on the enclosed sheet. Please return it to: Project WITS, MIT, 20C-228, Cambridge, MA 02139.

Many thanks for your continued interest and participation in WITS/TSCM activities!

Sincerely,

Nadine Rodwin

Nadine Rodwin

ap
Enclosure: SPEAKER'S COMMENTS ON SCHOOL VISIT

wits MIT
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and Science

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SPEAKER'S COMMENTS ON SCHOOL VISIT

*Your reactions to the school visit you made in connection with the TECHNOLOGY AND SCIENCE
CAREERS FOR MINORITIES (TSCM) program would be most helpful to us in planning future events.
Thank you for participating and for giving us your comments!*

Name_____ Organization_____

School_____ Subject(s) & Grade Level(s)_____

Please discuss the following in as much detail as possible:

1. Teacher's preparation of students for your visit (include suggestions for the future):___

_____

_____

2. Brief summary of your presentation and materials you brought/left. What interested

students most/least:_____

_____

_____

_____

_____

3. Students' comments/questions about the careers/topics you discussed:_____

_____

_____

4. Your reasons for taking on this school visit (personal, job-related, other):_____

_____

5. Benefits & costs to the school of your visic:_____

_____

6. Benefits & costs to you and your organization of your visit:_____

_____

7. Suggestions for future visits and other ways to teach students about technological work:

_____

_____

_____

PLEASE USE OTHER SIDE FOR ADDITIONAL COMMENTS.

4/8/80