

STEP MIDDLE SCHOOL SCIENCE PROJECT

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Project Overview:

The Middle School Science Project (MSSP) is part of the Stevens Technical Enrichment Program (STEP). For more than a quarter-century, STEP has been in the forefront in providing opportunities and support for under represented students in science and engineering.

The mission of the Stevens Technical Enrichment Program is to increase the pool of under represented groups in the fields of science and engineering. STEP accomplishes this through a comprehensive system of support that spans an educational continuum from elementary to post-secondary. This vital support encourages students to complete a science and engineering curriculum and pursue careers in related fields.

Middle School Science Project:

STEP-MSSP began in 1987 to provide tutoring to middle school students as well as training middle school science teachers. This project focused on the Camden Middle School in Newark. After researching the types of science materials and education format which would be most comfortable to students, the project in 1992 shifted its concentration to science teachers for science curriculum enhancement training. This increased efficiency and impacted a greater number of students.

The Middle School Science Project is not merely another training program. A facet of its uniqueness is that it utilizes every tool available to make science education a fascinating and rewarding experience for teachers and students alike. Its approach is to arouse minority student interest by providing a logical and simple perspective of science, in order to end the disparity between minority and majority participation rates in mathematics and science careers.

The Problem:

Local evidence of resource imbalances in education is one of the reasons that the state of New Jersey has designated thirty of its school districts as Special Needs Districts. These districts have predominantly minority populations with low socioeconomic status. The schools in these districts suffer from a combination of deficiencies in educational resources and organizational set-up. The STEP-Middle School Science Project compensates for the imbalance in classroom time and suitable resources for science education through directing teachers in utilizing specific software and activities correlating to middle school science curriculum topics. The preparation of thorough and stimulating lessons integrating computer technology and hands-on experiments in science allows teachers to reap optimal benefit from the science teaching time available to them. Students' skills in reading, writing, and mathematics are cultivated through integration in science from reading background and instructions for activities, writing lab reports, analyzing data and graphs, and performing tasks in critical thinking and problem-solving using the computer as a tool.

Primary funding for MSSP has been under NASA's Mathematics, Science and Technology Awards for Teacher and Curriculum Enhancement Program (MASTAP) with a focus on under represented minorities. NASA has funded MSSP as a mathematics, science and technology teacher training program that can eventually be replicated and exported to other colleges and universities. The primary purpose of MASTAP is to support minority focused initiatives which improve the science, mathematics, and technological skills of students.

Operational Set-Up:

The set-up of the Middle School Science Project has involved in-service sessions held one Saturday per month during the school year. In each session, computer-based activities and hands-on demonstrations are designed to address one or more topics of the middle school science curriculum. At the completion of each session, teachers are given written material, science software, or specific tools to help them prepare the individual classroom lesson plans. In addition, a one week Summer Institute is held as an intensive training course which includes refining and reviewing the past year's activities.

The implementation of the ideas that teachers learn during these in-service sessions and the Summer Institute is not completely left at the discretion of teachers alone. Every week, one member of the project staff visits various schools and helps the teachers replicate the relevant activities and hands-on demonstrations in the classroom. The interaction with the students and support to the teachers in the classroom are unique features of this program.

Program Approach:

The staff of the STEP-Middle School Science Project has determined that the goal of enhancing the caliber of science education at the middle school level can be successfully achieved through a model of computer integration and through the use of a comprehensive science modules package developed by the staff for science instruction in middle school classes. Teachers from various participating school districts with a sizable minority population have already been trained in using instructional materials and techniques that have been developed over a period of three years under a NASA funded research project.

This research concluded that the proposed concept and its dynamics have earned a credibility to be a highly effective solution of the existing problem. Through dissemination at various levels, the staff of the program is convinced that there is an ever-growing demand for this kind of approach, particularly in urban school districts with a considerable minority student body.

Under the program, the present site at Stevens Institute of Technology serves as a training and resource center for the teachers. Participating teachers attend workshop sessions to gain expertise in employing detailed and specific curriculum-related modules to teach science effectively in their classrooms.

Work has begun on a new phase of the project involving multimedia programs being developed by the MSSP staff for middle school science education. It is expected that these effects will permeate down to the students and trigger an on-set of their interest in science and research careers. Hands-on activities and science experiments have been designed with a view to approach science as an integral part of every individual's day to day life. The modules created by the staff highlight a natural phenomenon and then try to understand its mechanics through plausible explanations and analyses.

Resource materials and hands-on activities are made available and the equipment and tools occasionally loaned to the teachers for practice at home or for subsequent use in the classroom, subject to the availability of these materials. Thus, after each session, the teachers have fully covered one item or topic of the curriculum along with the detailed activities documented and ready to be replicated in the classroom.

However, there are a number of factors which may adversely affect the initiation or the outcome of teachers replicating these activities in their respective classrooms. For example, the simple scientific tools needed to conduct the activity may not be available in the classroom or school. Furthermore, teachers may not have adequate preparation hours, which have been recently further cut down in some school districts, and may contribute to the non-implementation of the science

activities. Under these situations, an introductory MSSP science software package can be conveniently displayed at virtually any school site. It may also be publicized on the Internet for the viewing of a larger audience interested in upgrading science education at the middle school level.

Based, in part, on the above reflections, as well as to significantly improve the quality of the support material developed at Stevens, the MSSP staff is working to upgrade and preserve individual modules on a computer disk. This work will include features such as interactivity, visual appeal, and transportability. The modules are being created on the macro multi-media platform using a PC and other quality support tools. All aspects of the activity will be integrated into a compact, interactive computer exercise, enjoyable to use yet effective as an instructional tool.

Using Internet:

The STEP-MSSP lab site is connected to the related classrooms through the Internet at Stevens. This establishes interactive communication at various levels. The in-service sessions include training on using Internet applications such as Email, Gopher, Archie, the World Wide Web, and Web Browsers for the purpose of accessing information to enhance science learning for the teacher as well as the student.

Program Objectives:

There are six major program objectives:

i) To achieve an impact of the MSSP training strategy on teaching effectiveness based on the modules guide. STEP-MSSP cultivates potent science teaching skills aimed toward generating and retaining student interest in science. This objective focuses on the effectiveness as well as the value of the design utilizing the training modules developed by MSSP.

ii) To incorporate the use of the Internet by teachers and students for enhancing science learning as well as establishing an interactive connection between the related classrooms and the MSSP staff at Stevens. The in-service sessions include workshops providing training on Internet applications including the World Wide Web, Netscape, and Gopher. The use of Email encourages efficient communication among the teachers, students, and the STEP-MSSP staff at various levels.

iii) To increase the number of minority students pursuing careers in science and mathematics. The training which science teachers receive at Stevens through the Middle School Science Project is in turn transported to their respective classrooms where its various components are funneled to the students. This trickle-down effect raises student motivation in studying science which hopefully contributes to an

increase in the number of students who further pursue it.

iv) To continue delivering in-classroom support to the teachers by the staff of the program. This ensures that the final thrust of the program reaches the students who are the ultimate targeted audience to be impacted.

v) To produce multimedia programs based on the previously developed MSSP modules in order to make the STEP-MSSP training more efficient for its participants as well as accessible to a greater population. Teachers participating in MSSP will have an alternate means of replicating what they learn at the training workshops by utilizing MSSP science software in their classrooms. Furthermore, MSSP will be able to more readily achieve its goal of transporting its program to a larger population in order to impact a greater number of students.

vi) To evaluate the program based on teacher portfolios and student surveys. Teacher portfolios maintained by the participants during their course with the project will include a record of the use of MSSP modules by teachers in class as well as the use of the Internet. The eighth grade students will be given surveys at the end of the school year to assess their disposition toward science education as a result of MSSP trained teachers implementing the modules in their classrooms.

The Staff:

The project staff consists of a project director, a full-time project coordinator, an Internet consultant and a multimedia consultant. The project coordinator's role is to provide day to day management, serve as primary instructor for all training sessions, and assist the teachers with on-site implementation.

Funding:

Funding for the 1996-1997 academic year is being provided by NASA. A portion of the funding for the continued operation of the project is also provided by the Johnson & Johnson Family of Companies and the Prudential Foundation's *1996-1997 Urban Initiatives*.

