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AUTHOR O'Brien, George E., Ed.
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ABSTRACT

This final report on the inservice education of secondary science teachers for the teaching of science via Science Technology Society (STS) materials lists the major objectives of the project as: (1) write four instructional modules with a science, society and technology focus which address special concerns and needs of the underserved and underrepresented populations of Pittsburgh; (2) provide inservice training for 25 secondary science teachers in the effective use of the new STS instruction modules; and (3) determine the impact of the STS project upon the teachers and students in the secondary schools of the pilot study. The topics for the instructional modules included the auto and energy, selection of consumer projects, transportation and community, and the automobile and social issues. Issues discussed in this report which arose during the course of the study include major problems encountered, problem resolution alternatives, evaluation of the modules, dissemination of materials, and budget summary. Included is an overview of the four modules including processes, activities, and instructional objectives. (MVL)

THE PITTSBURGH SCIENCE TECHNOLOGY SOCIETY PROJECT: A FINAL REPORT

Submitted To:

Commonwealth of Pennsylvania Department of Education, Title II Office, Harrisburg, PA 17126

Submitted By:

Project Director: Dr. George E. O'Brien, Department of Instruction and Learning, University of Pittsburgh, Pittsburgh, PA 15260

Title of Grant Proposal: Inservice Education of Secondary Science Teachers for the Teaching of Science via Science Technology Society (S-STS) Materials

Title II Grant Number H01-61139/33-6825

Date: June 20, 1988

THE PITTSBURGH SCIENCE TECHNOLOGY

SOCIETY PROJECT: A FINAL REPORT

TABLE OF CONTENTS

PROJECT SUMMARY

Introduction

All indications are that the recent increase of the number of Science Technology Society (STS) courses across the nation as part of the instructional process will continue. District supervisors and teachers, who are contemplating the implementation of a STS course, have excellent resources at their disposal in several major areas including:

1. philosophy, rationale, goals, and instuctional strategies for STS curriculum (Bybee, 1985);

2. historical and current status of STS in secondary schools (Piel, 1981);

3. description of STS exemplary programs (Penick and Meinhard-Pellens, 1984);

4. recommended competencies for STS education in grades 7-12 (Rubba, 1986);

5. a model for a one-year course in STS including syllabus materials (Bell et al., 1986); and,

6. a state developed syllabus for STS in middle and junior high schools (The University of the State of New York, 1985).

In addition, numerous excellent curriculum materials have been catalogued and made available through the expanding STS Network (Waks, 1985). The Pittsburgh STS Project was helped immensely by many of these materials. Currently, the Pittsburgh STS Project instruction modules are an influencial and important part of the STS Network.

Despite the proliferation of STS curriculum resources, district coordinators and teachers struggle with the implementation process. S-STS workshops and national conferences have helped many educational leaders who have attended, but little has been published to help others struggling to organize their programs. During the past two years, the Pittsburgh STS Project has contributed greatly to the national efforts to develop quality Science Technology Society education programs.

The following report, evolving from the cooperative efforts of the Pittsburgh, Pennsylvania Public and Catholic Schools to develop instruction modules for a ninth grade general science course, gives an updated status for the project. The description of the process along with developed curriculum materials should continue to help other school districts to organize STS curriculum development, teacher inservice and pilot testing projects.

Project Synopsis and Status

The Pittsburgh Science Technology Society Project has been supported by a grant from the Commonwealth of Pennsylvania Department of Education, Title II Office in Harrisburg, Pennsylvania. The major objectives of the project have been: (1) to write five instruction modules with a STS focus, which address special concerns and needs of the underserved and underrepresented populations of Pittsburgh; (2) to provide inservice training for twenty-five secondary science teachers in the effective use of the new STS instruction modules; and, (3) to determine the impact of the STS project upon the teachers and students in the secondary schools of the pilot study. The project has been implemented exceptionally well.

During the winter/spring, 1986, a curriculum writing team consisting of five experienced science teachers and two University of Pittsburgh science education faculty members prepared STS instruction materials. Initial meetings were focused on the presentation and discussion of the meaning and rationale for a Science Technology Society theme in the secondary curriculum. Selected criteria for the inclusion of topics and teaching strategies were developed within the contex of the discussions. Second, specific content areas and topics for module inclusion were proposed and critically analyzed. After selection of several topics and associated teaching methodologies, materials from national and locally developed STS projects were gathered and systematically reviewed by the team. Review of materials and further discussions helped the team to decide upon the following topics for the instruction modules:

1. The Auto and Energy;

2. Selection of Consumer Products;

3. Transportation and Community; and,

4. The Automobile and Social Issues.

Each team member subsequently contributed to the draft writings of the instructional modules. Later, during the summer inservice workshop, introductory activities including some graphing exercises were developed and added as a fifth module to the pilot study package of instructional materials. (See Appendix B.)

Teachers valued the writing workshop experience immensely and thought the dialogue with fellow teachers and the working relationships that evolved to be very rewarding. Evaluation of the STS writing sessions showed that the biggest concern of the teachers was lack of sufficient time for the undertaking. Despite the handicap, the Pittsburgh STS Project instruction modules have been evaluated and critically acclaimed by three independent national organizations during 1987; The Pennsylvania State College Technological Literacy Second Annual Conference Program, The Hawkhill STS Newsletter, and the Teachers Clearinghouse for Science and Society Education Newsletter. (See Appendix G.)

During June 19 - 27, 1986, twenty-five secondary science teachers participated in inservice workshops at the Pittsburgh Public Schools Science Institute and the University of Pittsburgh. STS inservice instruction included:

1. an introduction to STS instructional objectives and materials;
2. an orientation to the science process skill development emphasized in the STS approach;
3. teaching strategies for STS materials;
4. survey and field orientation to community resources; and,
5. testing, evaluating, and modifying module materials.

The participants of the workshop evaluated their experiences very highly in several categories including: value as a professional activity; increased motivation/enthusiasm for teaching the following term; and, attending the workshop again if given the opportunity. Other items are summarized in Appendix A.

Since September, 1986, six teachers have engaged in pilot testing the Pittsburgh STS Project modules. The teachers represent five schools, 4 public and 1 Catholic school. The teachers have differed in the teaching strategies/approaches used, the amount of time spent on modules and when during the academic year, and how many modules/activities were completed. Three teachers taught all of the instructional activities. The teachers completed evaluation forms for each lesson taught. (See Appendix C.) Although evaluation of the modules by these teachers has been mixed, overall, teachers show optimistic and positive feelings toward the continual growth of the project and improvement of the instruction modules. Teachers have modified and rewritten activities and lesson plans for subsequent instruction. During the winter of 1987 the six pilot testing teachers, met several times to study and compare findings. From these meetings improved and modified instruction materials have evolved. Evaluation of the materials by students, too, has been mixed. However, when carefully questioned concerning many of the activities, their reviews have been favorable.

A long-range goal of the public schools is to incorporate many of the lessons into the new ninth grade general science Pittsburgh Syllabus Examination Project (SEP) scheduled to be developed during the next three years. One of the goals of this program will be to establish more refined and hard evidence to support an expanded use and development of more STS materials.

Major Problems Encountered

The district leadership selected infusion of STS materials into the ninth grade general science program. The project has great potential to have a positive impact for the underserved and underrepresented student populations in this grade level and program. However, there are some unique major problems encountered in the ninth grade program.

Traditionally, teaching ninth grade science has not been either a high status or desirable position. Frequent changes in-and-out of this teaching position are common. Very few teachers have a full teaching load consisting of ninth grade general science classes. Full-time ninth grade general science teachers are seldom senior tenured staff. The effect on the project was 14 of 25 STS inserviced participants did not teach general science during the 1986-87 academic year. Three teachers also transferred out of the district. Despite the problems, inserviced teachers often found ways of incorporating the STS materials in other science courses at different grade levels. Some other project participants commented that the new general science curriculum and teaching of Monitoring Achievement in Pittsburgh (MAP) objectives interfered with their participation during the pilot testing phase. This project has been fortunate that the science teachers involved with the testing of materials have been energetic, highly capable and productive individuals who strongly believe in the ideals and goals of the Pittsburgh STS Project.

Problem Resolution Alternatives

The approach of this project to the limitations inherent in the historical nature of the ninth grade general science program and the novelty of STS instruction to Pittsburgh teachers is to allow for transition to take place gradually. Pilot testing and lead teachers have identified themselves. A core of STS enthusiasts has emerged and a more tightly structured and comprehensive pilot testing phase is now possible as part of SEP and other projects. Concurrently, district leadership are engaged in the process of trying to find ways of stabilizing the ninth grade general science teacher placement dilemma.

Evaluation

Evaluation of the instruction modules has been comprehensive at several levels. Initially, project writers selected many of the materials because the lessons similated those of exemplary projects elsewhere. Twenty-five teachers and several University faculty had input into the design of the modules. Six teachers have diligently tried out the modules and have drafted modified versions of many activities. On-site data through monitoring activities via interviews, observations, and surveys has provided impetus for creating an excellent instructional package. Indeed, three independent national STS education organizations have evaluated the Project favorably. Since February, 1987, over three hundred module packages have been distributed to teachers, administrators, university faculty, curriculum coordinators, media specialists, and other STS enthusiasts nationally and in a few cases internationally. (See Appendix E.) These individuals have been asked to submit evaluations of the activities utilized. Helpful information from these correspondents is expected in upcoming months.

A series of group discussions to gather insights of general science students' beliefs about Science-Technology-Society has been initiated in two Pittsburgh schools. Questions and format were chosen to give information relevant to a research design for further pilot testing of the instruction modules. (See Appendix D.) The results of the combined approaches to the evaluation of the project has led to the production of a well-studied, refined product.

Dissemination

The immediate concern is further pilot testing of instructional modules in several schools in Pittsburgh and in the near future to have the STS curriculum package a regular part of all ninth grade general science classes in the district. However, the demand for the instuctional materials has been national. Pittsburgh STS Project instructional modules have been disseminated and discussed during the past two years at three national, one regional, one state, and several local science education conferences. (See Appendix F.) Over three hundred module packages have been distributed nationally. Pittsburgh STS Project teachers have been highly visible during these conferences. The key to successful implementation of the STS instructional package in Pittsburgh schools will be continual inservice programming for teachers. A very important element of this project has been the creation of leadership in the realm of STS instruction within the district for future inservice projects. In summary, the Pittsburgh STS Project has favorably impacted over twenty-five science teachers and their students in the Pittsburgh Public and Catholic Schools. In addition, the modules created during the project have contributed to the state, regional, and national efforts of developing quality STS instructional materials.

Budget Summary

The budget for the project has been cost effective. The STS curriculum materials produced and the twenty-five secondary science teachers trained have impacted several thousands of students in the 1986-87 and 1987-88 school years. Furthermore, these teachers will serve many students in subsequent years. In addition, nationally, the materials have been disseminated to over three hundred school districts which serve thousands of students.

The total allocation of the original grant was $44,500. The project director, working with the grants and contracts officer from the office of research at the University of Pittsburgh, has strictly followed the guidelines established in the original budget proposal and subsequent proposal for rebudgeted carryover funds. The previously submitted budget summaries, budget breakdown formats, and budget explanation documents give an accurate account and description of how the funds were expended.

REFERENCES

1) Bell, Paul E., Graham, Carolyn, Harkness, Jon, O'Brien, George E., et al; "A One Year Course in STS," S-STS Reporter, 2(4), pp. 7-21, September, 1986.

2) Bybee, Rodger W., editor; Science Technology Society 1985 Yearbook of The National Science Teachers Association, 268 pages, NSTA, Washington, DC, 1986.

3) Penick, John E. and Meinhard-Pellens, Richard, editors; Focus on Excellence Volume 4 Science/Technology/Society, 104 pages, NSTA, Washington, DC, 1984.

4) Piel, E. Joseph; "Interaction of Science, Technology, and Society in Secondary Schools," in Harms, Norris C. and Yager, Robert E., editors, What Research Says to the Science Teacher, Volume 3, pp. 94-112, NSTA, Washington DC, 1981.

5) Rubba, Peter; "Recommended Competencies for STS Education in Grades 7-12," Midlands Journal, 1986.

6) The University of the State of New York; Science, Technology, Society Intermediate Instruction Module Block J, Albany, New York, 1985.

7) Waks, Leonard J.; "The Technology Literacy Conference: Expanding the STS Network," S-STS Reporter, 1(3), pp. 1-3, November, 1985.

APPENDIX A

THE PITTSBURGH STS PROJECT INSERVICE WORKSHOP PARTICIPANT EVALUATION

THE PITTSBURGH SCIENCE/TECHNOLOGY/SOCIETY PROJECT INSERVICE WORKSHOP JUNE 19-27, 1986

Participant Evaluation (selected questions)

1. Comment on the strengths of the STS instruction modules?

No. of Respondees	Comment
8	hands on activities.
10	relevant to students, draws on their experiences.
6	materials exciting, involving, interesting.
3	easily integrated, modified to GS program.
1	interdisciplinary approach.
1	challenges all levels of ability.
1	stimulates thought; critical thinking.
2	simple equipment, easily located, practical.
1	use of different instructional methods.
2	learn application of science and math skills.
7	good overall programs, well organized, and objectives stated.

2. Comment on any weaknesses of the STS instruction modules?

No. of Respondees	Comment
5	not enough modules for the whole year.
3	lack of computer access.
1	other science teachers would like this information.
1	may require skills some students don't have.
1	needs to be field tested.
1	society/technology component should be stronger.
1	more complete list of supplementary materials.
1	no pictures, little up-to-date technological information.

3. Would you like to see A One-Year Curriculum in S/T/S be developed in your school (district)? If so explain why. All teachers said yes!

No. of Respondees	Comment
8	relevant, motivating.
3	science curriculum needs improvement.
4	would like to develop more modules with teacher input.
3	need for practical hands-on experience, less academic.
1	Diocese of Pittsburgh needs this input.
1	should be incorporated in primary grades.
2	should be a 1/2 year program because of the MAP focus. The STS curriculum could be comprise other content areas.

4. What was the best part of the inservice program? Why?

No. of Respondees	Comment
14	group interaction.
14	idea exchange.
7	small groups.
4	professional direction of instructor.
2	module revision.
1	professional treatment of participants.
1	computer access.
1	hands-on experience.
1	non-threatening atmosphere.
1	stated objectives and knew what to do.

APPENDIX B

THE PITTSBURGH STS MODULES OVERVIEW

INTRODUCTION TO THE SCIENCE, TECHNOLOGY AND SOCIETY MODULES

PART I

ACTIVITIES

1. Yesterday - Today - Tomorrow

This extended activity is designed to help students understand the interrelationship between science, technology and society. The aim is to generate discussion between teacher, student and family members about changes in society that have come about due to advances in science and technology. It is hoped the activity and modules to follow will make science and learning relevant to the student, his family and to develop a rapport between student and teacher.

PART II

STS MODULES ON GRAPHING

INSTRUCTIONAL OBJECTIVES

At the end of these lessons, each student should be able to:

1. Identify possible relationships between two variables.
2. Create a physical representation of collected data.
3. Devise a scale appropriate to the data in order to show direct relationships.
4. Interpret prepared graphs.
5. (Optional suggested activity) Interpret graphing techniques utilizing microcomputer data-graphs.

MODULE I

THE AUTO AND ENERGY

COMPETENCIES

A. Processes

1. Observing
2. Classifying
4. Predicting
5. Measuring
6. Communicating
8. Defining Operationally
10. Experimenting
12. Interpreting Data
13. Formulating Models

ACTIVITIES

1. Naming the Energy Form
2. Energy Conversion Box
3. Heat Energy Converted to Mechanical Energy
3A. Heat converted to Mechanical Energy (Modified Procedure)
4. Energy Conversions
   a. Traditional Measurement
   b. Microcomputer Lab Interfacing Procedure

INSTRUCTIONAL OBJECTIVES

At the end of these lessons, each student should be able to:

1. Demonstrate how stored chemical energy can be converted to heat energy.

2. Describe how heat energy can be converted into mechanical energy.

3. Demonstrate how a steam turbine changes heat energy into mechanical energy.

4. Determine quantitatively an amount of heat energy and relate it to a corresponding amount of mechanical energy.

5. Relate graphically the change in the volume of water used in the turbine apparatus to the amount of mechanical energy it produces.

6. Construct simple electrical circuits.

7. Infer through experimentation that chemical energy is converted to electrical energy in a dry cell.

8. Demonstrate experimentally how electrical energy can be converted to heat and light energy.

9. Construct a data table and graph the results.

10. Describe one form of energy being converted into another form.

11. Label an example of a conversion of one energy form to another.

*12. Construct a thermistor (microcomputer interface technique).

*13. Calibrate a thermistor.

*14. Collect and interpret data using a microcomputing/thermistor lab interfacing technique.

*Optional Objectives

SAMPLE TEST ITEMS

1. Energy can be changed from one form to another. Various kinds of energy are often made available by what type of changes?

   a. mechanical
   b. light
   c. chemical
   d. sound

2. In the production of energy which one of the following will produce a greater amount of energy?

   a. chemical
   b. light
   c. atomic
   d. sound

3. In the science lab when we are using an alcohol burner to boil water, what type of energy is used in the alcohol burner?

   a. light
   b. chemical
   c. sound
   d. mechanical

4. In the conversion of energy, before most energy can be used to work it is first must be changed into what type of energy?

   a. light
   b. mechanical
   c. chemical
   d. sound

5. When heating water to a boiling temperature and to develop steam for moving/spinning a pinwheel (turbine), what unit of measurement is used to express the amount of heat during the activity?

   a. meters
   b. miles per hour
   c. calories
   d. volts

6. In the pinwheel activity, what are the probably effects on your pinwheel if the alcohol burner were replaced with a propane torch?

   a. the water would get heated much too fast
   b. the pinwheel would spin more rapidly
   c. a greater amount of steam would be produced
   d. a, b, and c are correct

7. The progress of energy conversions in the pinwheel activity is

   a. heat------>chemical------>heat
   b. heat-------chemical-------sound
   c. chemical------>heat-------mechanical
   d. mechanical------>heat--------chemical

8. Why in the Activity with the Pinwheel do the RPH's of the pinwheel increase as the volume of water in the test tube is increase?

   a. The water in the test tube does not get hot as rapidly.
   b. The steam in the test tube occupies less volume and strike the pinwheel with greater pressure force.
   c. More water contained more mechanical energy.
   d. The pinwheel did not work because of the lack of energy.

MODULE II

Selecting Your Dream Car

COMPETENCIES

A. Processes

1. Observing
2. Classifying
3. Inferring
5. Measuring
6. Communicating
8. Defining Operationally
9. Formulating Hypothesis
12. Interpreting Data
13. Formulating Models

ACTIVITIES

1. Getting There
2. Selecting a Dream Car
3. Hidden Costs and Cost Per Month
4. Hidden Persuasion

INSTRUCTIONAL OBJECTIVES

At the end of these lessons, each student should be able to:

1. Label a diagram of an automobile (exterior and interior).
2. Choose options for the dream car.
3. Select her/his car.
4. Read a data table (finance charges).
5. Realize hidden costs that she/he will have to pay.
6. Get an indication of monthly costs and unexpected costs of a car.
7. Identify different metnods used in advertising.
8. Analyze advertisements in terms of valid information presented.

Appendix B

SAMPLE TEST ITEMS

1. Which one of these items is not located on the dashboard of a car?

   a. odometer
   b. brake light
   c. horn
   d. gas gauge

2. Of the following, which one is not part of the "pitch" in an advertisement?

   a. confidence-building
   b. response-seeking
   c. getting attention
   d. presenting facts

3. Which one of the following words represents a fact?

   a. softer
   b. 2 time heavier
   c. 1 meter
   d. smarter

4. Which one of these costs is not essential to owning an automobile?

   a. license fee
   b. parking fee
   c. insurance fee
   d. inspection fee

5. In an accident with your car, which one of the following would be least important person to notify?

   a. police
   b. car dealer
   c. motor vehicle department
   d. insurance agent

MODULE III

Transportation and Your Community

COMPETENCIES

A. Processes

1. Observing
3. Inferring
4. Predicting
5. Measuring
6. Communicating
7. Using Space/Time Relations
9. Formulating Hypotheses
10. Experimenting
11. Recognizing Variables
12. Interpreting Data
13. Formulating Models

ACTIVITIES

1. Making Your Own Map
2. Using a Standard City Map of Pittsburgh
3. Transportation in Urban Environments
4. Getting There
5. Cars and Gas

INSTRUCTIONAL OBJECTIVES

At the end of these lessons, each student should be able to:

1. Make a map depicting the route from her/his home to school.
2. Identify typical routes on a City of Pittsburgh Map.
3. Evaluate identified modes of transportation in terms of energy and environment.
4. Compare different types of transportation in terms of mileage and gas efficiency.
5. Interpret histograms.
6. Recognize the inverse relationship between the mass of a car and the distance traveled.

7. Recognize the direct relationship between mass of a car and fuel consumption.

8. Recognize the direct relationship between fuel consumption and distance travelled.

9. Recognize the direct relationship between force provided and distance travelled.

10. Extrapolate and interpolate a graph.

MODULE IV

Auto Issues: The Speed Limit, Seat Belts and You

COMPETENCIES

A. Processes

1. Observing
2. Classifying
3. Inferring
4. Predicting
5. Measuring
6. Communicating
7. Using Space/Time Relations
9. Formulating Hypotheses
10. Experimenting
11. Recognizing Variables
12. Interpreting Data

ACTIVITIES

1. The Speed Limit
2. The National Speed Limit
3. Fuel Consumption and the Speed Limit
4. Do Seat Belts and Other Safety Devices Prevent Injury and Death?

INSTRUCTIONAL OBJECTIVES

At the end of these lessons, each student should be able to:

1. Determine why various speed limits are posted in their neighborhood.
2. Determine how effective speed limits really are.
3. Illustrate why the nation has established a national speed limit.
4. Gather and analyze data concerning speed limits and variables.
5. Construct and interpret a graph.
6. Identify the major factors affecting fuel consumption at different speeds.
7. Evaluate positive and negative aspects of the 55 MPH speed limi..
8. Make decisions concerning the effectiveness of seat belts and other safety devices in cars.

9. Analyze data concerning accidental deaths.

SAMPLE TESTS ITEMS

1. Choose the one best answer. Good reason(s) for seat belt use include:

   a. decreases the chance of death in motor vehicle accidents.

   b. deceases the possibility of serious injuries in motor vehicle accidents.

   c. they must be used according to law in some states

   d. all of the above are correct

2. Whiplash is most preventable by which of the following safety devices?

   a. seat belts
   b. air bags
   c. heat rests
   d. collapsible hood

3. In the 15-24 age group, which of the following accounts for the greatest number of accidental deaths?

   a. drowning
   b. falls
   c. motor vehicle accidents
   d. poisoning

APPENDIX C

THE PITTSBURGH STS PROJECT TEACHER EVALUATION FORM

APPENDIX C

PITTSBURGH STS PROJECT

TEACHER EVALUATION FORM

Name _____ Module: Intro A 1 2 3 4 (circle one)

School _____

Activity Title & Number _____

Grade Level _____

Please ANSWER EACH OF THE FOLLOWING QUESTIONS AT THE COMPLETION OF EACH ACTIVITY. Please comment in more detail on separate pages of paper where appropriate. Circle the most appropriate response.

1. OBJECTIVES

   Were the stated objectives clear and accurate? Excellent Good Poor

2. TEACHER BACKGROUND

   Was the teacher background accurate? Excellent Good Poor

   Was the information provided a sufficient background on the subject? Excellent Good Poor

3. MATERIALS

   Was the materials list complete? Excellent Good Poor

   Did you have enough of each material required? Excellent Good Poor

   *Please indicate any resources, books (teacher or student), equipment, etc. that your recommend for inclusion in future modules.

4. STUDENT ACTIVITY SHEETS

   Were the Student Activity Sheets (SAS):

   Relevant to the objectives? Excellent Good Poor

   Clear and logical? Excellent Good Poor

   *Which were the most successful activities?

5. EXTENDED ACTIVITIES

   *Have newly acquired decision making skills lead to action on personal problems? Involvement in community organizations? Involvement in local government issues? Other?

6. EVALUATION

What method of student evaluation did you use? (SAS sheet, separate test, etc.?)

*How successful were the students?

7. PROCEDURE

Was the suggested procedure clear and complete? Excellent Good Poor

*Did you follow the suggested procedure? What modifications, if any, did you make?

8. RATE THE FOLLOWING: (circle one)

Student interest	High	Medium	Low
Appropriateness of material for students	High	Medium	Low

9. Do you recommend this activity for future use?

10. Other comments/recommendations:

Return To:

Dr. George E. O'Brien

DEPARTMENT OF INSTRUCTION AND LEARN
4H01 FORBES QUADRANGLE
UNIVERSITY OF PITTSBURGH
PITTSBURGH, PA 15260

Teacher signature _____ Date _____

Date when Activity was completed _____

APPENDIX D

GENERAL SCIENCE STUDENTS' BELIEFS ABOUT SCIENCE-TECHNOLOGY-SOCIETY

During 1986 and 1987, Cindy Brown, Graduate Assistant, University of Pittsburgh, conducted several discussions and interviews with ninth grade general science students participating in the Pittsburgh STS Project Pilot Study. The "open-ended" format discussions were designed to probe general science students' beliefs of Science-Technology-Society. How scientifically literate are the students? More specifically, what do they believe about the way scientists view the effects of scientific discovery? To what extent do they believe scientists are biased in their research work? These are concerns of the authors of "A Nation at Risk' and similar studies, parents, teachers, and other members of the community. The questions, asked to the students, were d ived from many resources including:

1. Aikenhead, Glen S., Fleming, Reg W., and Alan G. Ryan. "High-School Graduates' Beliefs About Science-Technology-Society. I. Methods and Issues in Monitoring Student Views". Science Education 71(2): 145-161, 1987.

2. Cooley, W.W., and L. Klopfer. Test on Understanding Science: Form W. Educational Testing Service, Princeton, NJ, 1961.

3. Fraser, B.J. Test of Science-related Attitudes (TOSRA). The Australian Council for Educational Research Limited, Camberwell, Australia, 1981.

4. Korth, W.W. The Use of The History of Science To Promote Student Understanding of the Social Aspects of Science. Unpublished Doctoral Dissertation, 1968.

5. Smalley, Lee. Technology Literacy Test Revised Edition. Menomonie, WI, Unpublished Test, 1986.

The discussions were often lively and informative. The discussions were videotaped and viewed by the teachers of the students. The interviews, although not scientifically designed, were of value to the teachers in several ways. First, teachers have commented that they have a better understanding of their students' beliefs of STS. Second, teachers have stated that the information has helped them better prepare and teach STS-centered lessons. The activity has helped the Project Director and district leadership to improve upon the design and hopefully implementation of a future STS research study focusing on the understanding of general science student beliefs about STS.

APPENDIX E

LIST OF INDIVIDUALS WHO HAVE RECEIVEL

THE PITTSBURGH STS PROJECT INSTRUCTIONAL MODULES

List of Teachers, Administrators, University Faculty, Curriculum Coordinators, Media Specialist, and Other STS Enthusiasts Who Have Requested and Received The Pittsburgh STS Project Modules

Name	Location of Employment
Ralph Stukerjuergen	Fort Madison, IA
Tom Klasterka	North Hills, Pittsburgh, PA
W. Miller	Pleasanton, CA
Barbara Toner	Winchester, NH
Clara Hasbrouck	Blountsville, TN
Sonya Hanks	Colorado City, TX
Robin Lee Harris-Freedman	Lemoyne, PA
Patricia Knopick	Davenport, IA
R. Mark Herzog	Bel Air, MD
Maria Osborn	Sacramento, CA
Michelle McCarthy	Lomita, CA
Tom Hendle	Markesan, WI
James B. Steele	Findley, OH
Robert Scheible	Plymouth, WI
Karl Larson	West Allis, WI
John A. Schechner	Juneau, WI
Mary Frisch	New Holstein, WI
David Ledes	Hartland, WI
Gregg Ahlsen	Huntington Station, NY
Glen Aikenhead	Saskatoon, Saskatchewan, Canada
Peter Beckett	Surrey, B.C., Canada
A.W. Bowman	Hampton, VA
Lynn A. Brant	Cedar Falls, IA
Jim Bright	Harvard, MA
Robert Cash	Ben Salem, PA
Herb Cohen	Tempe, AZ
Dennis Cheek	APO, NY
Steve Cutcliffe	Bethlehem, PA
Harrie Eguelhof	Utrecht, Netherlands
Bill Evans	Phoenixville, PA
Kwesi Fwur	Hampton, VA
Frank Fazio	New Rochelle, NY
Bob Ford	Pittsburgh, PA
Robert Gilly	New York, NY
Sue Hart	Greenwich, CT
Tom Hite	Altoona, PA
Michael Howard	Lexington, KY
Joel Hull	Port Jefferson, NY
Andrew Hunt	Hertford, England
Kevin Mattingley	Vershire, VT
Bernard Jensen	Cedar Falls, IA
David Kiefer	Brooklyn, NY
Edith Lessor	Newburgh, NY
Eugene Nalence	Newton Square, PA
Jack Neal	Lancaster, PA
Bob Nogueira	Little Silver, NJ
Joe Piel	N. Coldwell, NJ
Rich Realmuto	New York, NY
Dianne Robinson	Hampton, VA
John Roeder	New York, NY

Name	Location of Employment
Dorothy Rosenthal	Henrietta, NY
Joe Scherrer	Ft. Washington, PA
Lee Smaller	Menomonie, WI
Cheryl Snyder	Riverdale, NY
Robert Stamper	Jenkintown, PA
Ron Tempest	Ft. Washington, PA
Eric Weiland	Schnecksville, PA
Virginia Wilson	Durham, NC
Doris Withers	Brooklyn, NY
Uri Zoller	Haifa Univ., Israel
William Kiel	Greensburg, PA
Joe Degnam	Morristown, NJ
Carolyn Adams	Elizabeth, PA
Indira Nair	Pittsburgh, PA
Gene Wargo	Bethel Park, PA
Sr. Gloria Shuffer	O'Neill, NE
Pat Garrett	Benton, AR
Edward McCullough	Brookfield, OH
B. Bulmash	Chicago, IL
Debora P. Carroll	Superior, WI
Jean Warstler	Massillon, OH
Richard Lord	Presque Isle, ME
Kent McLellan	Gering, NE
Margaret Kraus	Grand Coteau, LA
Pat Brock	Clayton, MO
Sr. Mary Dennis Lentsch	Dubuque, IA
Tom McKeeman	Ambler, PA
Dave Dornfeld	Winnetota, MN
Debbie Deha	Loveland, CO
Raymond Martin	Sudbury, MA
Lynn Parisi	Boulder, CO
Umberto Lofaso	Palermo, Italy
Diane Woods	Lexington, KY
Robert Weber	Trenton, NJ
David Mason	Lawrenceville, NJ
Dennis Andrews	Newtown Square, PA
Gerard Dick	Bloomsburg, PA
Jesse Clark	Lexington, KY
Kathy Stoner	Lock Haven, PA
Mary Sweeney	West Newton, PA
Juliet Simms	Bronx, NY
Jeanne Joslin	Concord, NH
F. M. Pritchard	Vernon, NJ
Janet Lyons	Vernon, NJ
Bob Wambaugh	State College, PA
Sue Larson	Latrobe, PA
Margie Rosso	N. Huntington, PA
Sue Stump	Millersville, PA
Peter Rubba	State College, PA
Tom Hinkle	Upper Darby, PA

Name	Location of Employment
Darlene Berchin	Manhiem, PA
William Ritter	Ft. Washington, PA
Anthony Galitsis	New York, NY
Randall Stom	Clarion, PA
Joe Caramanica	Pen Argyl, PA
Janet Boyle	Audubon, PA
Sam McWilliams	Irwin, PA
Paul Bergamasco	Harrison City, PA
Nancy Harold	Pittsburgh, PA
Ronald Hain	Evansville, PA
Arlene Kolankiewicz	Pittsburgh, PA
Teresa Kokoski	Shippenville, PA
Dawn Weiss	Lancaster, PA
John Mentzer	Newville, PA
Mark Stoner	Roslyn, PA
Frank Roberts	Newtown Square, PA
Nabeehah Shakir	Philadelphia, PA
William Sincavage	Swiftwater, PA
Edward Pizzini	Iowa City, IA
Bruce Parks	Wilmington, VT
Bob Campbell	Watertown, MA
Harry Smith	Harrison City, PA
Pat Seybert	North Hills, Pittsburgh, PA
Tim Cotman	Richmond, VA
Albert Steffens	Hartford, MI
Sandy Gill	Pittsburgh, PA
Jim Whitfield	Saxton, PA
Sara Anderson	Annandale, VA
David Popp	New Paris, PA
Joyce Hatch	Natrona Heights, PA
Judy George	Culmerville, PA
James Estoein	Altamantle, FL
Roger Ansehmino	Elizabeth, PA
Allan Koltiska	Penn Hills, Pittsburgh, PA
Larry Meghan	Pittsburgh, PA
Dick Gaume	Canton, OH
Frank Brady	Canton, OH
Craig Berg	Iowa City, IA
Sue Becker	No. Canton, OH
Doris Malter	Pittsburgh, PA
Jill Hoehlein	Chesapeake, VA
Sally Morgan	Fairmont, WV
Paul Mattingly	English, IN
Nancy Bishop	London, KY
Trudi Volk	Murray, KY
Artie McGuffin	Covington, KY
Robert Yager	Iowa City, IA
Carole Taylor	Owings Mills, MD
Bill Stonebarger	Madison, WI
Richard Smith	Springfield, PA

Name	Location of Employment
Mike Geil	Fairbanks, AK
John Bartley	Springfield, PA
Susan Batson	North Hills, Pittsburgh, PA
Candace Bilger	Pittsburgh, PA
Richard Biondi	Jeannette, PA
Jane Bock	Brownsville, PA
Janice Brown	Arnold, PA
Edward Burak	Aliquippa, PA
David Busch	Elizabeth, PA
Mark Gasparovil	Belle Vernon, PA
Linda Jones	Indiana, PA
Robert Kirker	Pittsburgh, PA
Helen Lovett	Wexford, PA
Michael Meteney	Library, PA
Beth McCandless	Pittsburgh, PA
Robert Parker	Monroeville, PA
Ellen Petersen	Crafton, PA
Margie Rosso	Greensburg, PA
Jean Repepi	Monongahela, PA
Willard Webster	Beaver, PA
Gerard White	Pittsburgh, PA
Lynn Urbany	Wexford, PA
Robert Baird	Elizabeth, PA
Jane Konrad	Pittsburgh, PA
Walt Raczynski	Addison, IL
Diane Hill	Florence, KY
Bart Cassel	Jacksonville, FL
David Chatlin	Detroit, MI
Claire Katz	Berlin, CT
Sr. Leonida	St. Louis, MO
Karen Amundson	Florence, SD
Zelma Self	Kiowa, OK
Gary Stall	Zanesville, OH
Janet Tarinio	Mansfield, OH
Tom Palmer	Rockford, IL
Sr. Maureen Delaney	Newark, NY
Jean Groover	Seabrook, TX
Maleta Guthrie	Narrows, VA
Richard Goodspeed	Glenview, IL
Steve Keane	Bethel, ME
Sr. Marya Czech	Fremont, OH
Bette Spence	Mesquite, TX
Keith Gumm	Terry, MT
Amiel Hepp	Algoma, WI
Joe Burmeister	Oregon, WI
Marianne Digho	Whippany, NJ
S.M. Rita Menart	Storm Lake, IA
David Engelson	Madison, WI
Rex Hassard	Payson, UT
James Koper	Bowling Green, KY

Name	Location of Employment
John Gradwell	Montreal, Canada
Sr. Paulette Krick	Leavenworth, KS
Kay Beasley	Nashville, TN
Lawrence Wess	Gallitzin, PA
Dan Chisholm	Atco, NJ
Evelyn Daniel	Berrien Springs, MI
Patricia Barry	Racine, WI
Trudy May	Exeter, NH
Michael Biardi	Lancaster, NY
Jim Secosky	E. Bloomfield, NY
William Dutton	Brick, NJ
Karen Kerman	Long Beach, CA
William Mutnansky	Kingston, MI
Hilda Bachrach	Wellesley, MA
Margaret Herriott	Mount Royal, VA
Dan Edwards	Teec Nos Pos, AZ
Barbara Johnson	Chantilly, VA
J. J. English	San Jose, CA
Malcolm Welch	Montreal, Canada
Pamela Katzir	Miami, FL
Brad Schnitzler	Big Lake, MN
Clifford Heftie	Clay Center, NE
Joan Reiff	Rio Hondo, TX
Terry Thorsen	Somerset, NJ
Craig Kuchel	Florence, MT
Paul Hutzler	Woonsocket, RI
Allan Richter	San Francisco, CA
William McKinley	Fort Towson, OK
John Paulsen	New Ulm, MN
Lee Summerville	Ellicott City, MD
M. Jolley	Roy, UT
Shirley Harrison	Kalispell, MT
D. Joseph Seip	Melrose, MA
S. Paulo Gonzalez	Cincinnati, OH
Van Hughes	Pittsburgh, PA
Steve Lopez	Santa Paula, CA
Marianne Stone	Cuthbert, GA
Anna Parrow	Indiana, PA
Jeanette Heath	Sarasota, FL
Harold Kinyon	Manitowoc, WI
Julian Brandou	East Lansing, MI
John Gaull	Minneapolis, MN
Edward Hessler	St. Paul, MN
Juanita Matthews	Stratford, OK
Elinor Pulc'ni	Bigfork, MT
Art Bugg	Atascardero, CA
Joan Thompson	Manchester, MI
M. .. Greenstreet	Manchester, NH
K. Raab	Tinton Falls, NJ
Lynn Cunningham	Winnemucca, NV

Name	Location of Employment
Dora May Meredith	Rockford, IL
Elaine Rees	Vandalia, MO
Martha Vasiliades	E. Syracuse, NY
Sher Renken	Naperville, IL
Jack Fairbum	Durham, CT
Dennis Olson	Dawson, MN
E. Stanley Chace	Berrien Springs, MI
George Scollins	Winthrop, MA
Larry Bartlett	Bushell, IL
Mike Herbert	Mays Landing, NJ
Fred Gellerys	Wautoma, WI
Terry Tarr	Allen Park, MI
Voni Rivas	Byron, WY
Ann Pain	Indiana, PA
Ivan Janssen	Zeeland, MI
Lynn Norby	Reardan, WA
Tom Buttrey	Minnetonka, MN
Frank Prchal	Highland, IL
Marty Shapiro	Port Orange, FL
Floyd Larsen	Honolulu, HI
Les Reynolds	Nashville, TN
K. A. Shaw	Chicago, IL
William Flag	Deer Isle, ME
B. Burton	Huntsville, AL
Elba Iris Marrero	Bronx, NY
Guy Reuss	Coon Rapids, MN
Karen Lucci	Princeton Jct., NJ
Dan Knutson	Glenns Ferry, ID
Lorretta Daniels	Stockton, CA
Louis Polskin	Honolulu, HI
J. S. Walia	New Orleans, LA
William Heebink	Port Washington, NY
J. A. Morner	Milan, OH
Raymond Bangs	Roselle, NJ
Bob Johnson	Bennington, KS
Ken Alberteen	Scottsdale, AZ
Fred Seidensticker	Kremlin, MT
Ruby Diepholz	Hemet, CA
Howard Krietz	Meadville, PA
Claudia Anderson	Cairo, NY
Terry Blakely	Knoxville, TN
Terry Lashley	Knoxville, TN
Claude Hanson	Boise, ID
Sherrard Howen	Charlottesville, VA
Paul Schmidt	Warrensville Heights, OH
Brenda Hedges	Brooksville, KY
Judy Musgrave	Baldwin, KS
Jonathan Netts	Teaneck, NJ
Harold Pike	Stuttgart, W. Germany
Donald Steinberg	Philadelphia, PA

APPENDIX F

LIST OF NATIONAL, REGIONAL, AND STATE CONFERENCES WHERE THE PITTSBURGH STS PROJECT INSTRUCTIONAL MODULES HAVE BEEN DISCUSSED AND DISTRIBUTED

Papers and Workshops Presented at National Conferences

1) O'Brien, George E., Establishing Secondary School STS Instruction Modules: A Pittsburgh Perspective." Presented at the School Science and Mathematics National Meeting, Lexington, KY, November. 1986.

2) Schwab, Steve, Sparvero, John, Brown, Cindy, and O'Brien, George E., "STS Exemplars: The Pittsburgh STS Project." Presented at the Second National Science Technology Society Conference, Washington, D.C., February, 1987.

3) O'Brien, George E., "Secondary School Instruction Modules With A Science Technology and Society Focus--An Urban Plan." Presented at the 35th Annual National Science Teachers Association National Meeting, Washington, D.C., March, 1987.

Papers and Workshops Presented at Regional and State Conferences

1) O'Brien, George E., "Establishing Secondary School Instruction Modules with a Science Technology and Society Focus -- An Urban Approach." Presented at the Pennsylvania Science Teachers Association Annual Convention, King of Prussia, PA, November, 1986.

2) O'Brien, George E., "The Pittsburgh Science Technology Society Project: A Status Report." Presented at the 1987 NSTA Pittsburgh Area Convention, Pittsburgh, PA, November, 1987.

3) Schwab, Steve and Sparvero, John. "Activities with a STS Focus." A workshop presented at the 1987 NSTA Pittsburgh Area Convention, Pittsburgh, PA, November, 1987.

APPENDIX G

INFORMATION CONCERNING THREE INDEPENDENT EVALUATIONS OF THE PITTSBURGH STS PROJECT INSTRUCTIONAL MODULES

TEACHERS CLEARINGHOUSE FOR SCIENCE AND SOCIETY EDUCATION NEWSLETTER

Vol. VI, No. 2
Spring 1987

Under the Sponsorship of the Association of Teachers in Independent Schools

CLEARINGHOUSE 5 YEARS OLD

It was Wednesday, 18 November 1981. Two of us were slated to speak on a panel, Science and Society: Ethical Issues and the Teaching of Science at a meeting of the Association of Teachers in Independent Schools (ATIS) in New York City. A third was in the audience. We talked a bit afterward, then arranged to meet again to exchange ideas on teaching "science and society," a field of mutual interest. Little did we realize then that we would establish a Clearinghouse of files on "science and society" and send three issues of a newsletter and a supplement on a selected science and society topic to the far corners of the earth.

Yet that's exactly what we did. Nancy Van Vranken had been teaching "Ecology and Human Values" at St. Bernard's School for three years. Irma Jarcho had taught "Science and Society" at The New Lincoln School for more than a dozen years. And John Roeder's interest in energy education, which dated from the first long gasoline lines of 1973-74, had given rise to "Energy for the Future," a physical science course focused on energy, since 1978. We also knew Richard Brinckerhoff of the Phillips Exeter Academy and his avidity for infusing societal topics into science courses. Under [illegible] guidance, we held a [illegible] of teachers interested in "science and Lincoln School on 11 March 1982. On that day the Teachers Clearinghouse for Science and Society Education was born.

At the outset we felt that we needed a newsletter to keep our colleagues informed about what we were doing.

(continued on page 12)

TEACHERS CLEARINGHOUSE FOR SCIENCE AND SOCIETY EDUCATION NEWSLETTER

Vol. I, No. 1
May 1982

Under the Sponsorship of the Association of Teachers in Independent Schools

NEW CLEARINGHOUSE

OUTGROWTH OF ATIS MEETING

FIRST NEWSLETTER PUBLISHED

On 18 November 1981 The Association of Teachers in Independent Schools sponsored a panel on ethical issues in the teaching of science. During the discussion which followed the presentations, Irma Jarcho of The New Lincoln School, Nancy Van Vranken of St. Bernard's School, and John Roeder of The Calhoun School all realized that they had developed and were teaching science courses which studied the impact of science on society.

It occurred to these three teachers that there might be other science members of ATIS who had developed similar "science and society" curricula. They decided to poll other teachers and a meeting was held at the New Lincoln School on 11 March 1982. (See story elsewhere in this Newsletter.)

The organizers concluded from this meeting that a clearinghouse should be established, one which would channel information on science and society courses as well as data on available speakers, films, and other sources of information. We decided to call it the Teachers Clearinghouse for Science and Society Education. The current Newsletter is our first attempt to share with you what we hope to achieve and offer. We hope it will enrich the content of your science courses.

SPURRED BY BRINCKERHOFF

SOCIETAL ISSUES IN SCHOOL SCIENCE COURSES: AN EMERGING PATTERN

by Richard Brinckerhoff

(Editor's Note: Richard Brinckerhoff of the Phillips Exeter Academy hosted the Exeter Conference on Secondary School Science Education in June 1980. That conference recommended an infusion of society-related topics into science courses and the establishment of regional science and society educational resource centers.)

Today science teachers find themselves in a situation curiously similar to that in which I began my teaching career 40 years ago. Once again I see small distinction being made between those students who plan to go further in science and those for whom the introductory course is also terminal. Once again I see little concern for the relationship between science and science-related social problems of the day. Once again I sense scant public regard for school science teachers. In fact, as I listen to the words of government I hear small concern for science education at all.

(continued on page 2)

FIRST MEETING HELD AT NEW LINCOLN

What do Rodney La Brecque, Bruce Tulloch, Nancy Van Vranken, Joseph Ciparik, John Roeder, Elizabeth Potter, Barbara Silber, Lee Lee Copeland, and Irma Jarcho have in common? They all attended the first meeting of the Teachers Clearinghouse for Science and Society Education at The New Lincoln School on 11 March. Hosted by New Lincoln's Irma Jarcho, the meeting featured opening remarks by Richard Brinckerhoff, who had made a special visit from the Phillips Exeter Academy in Exeter, NH, to promote the cause of science and society education. (See Brinckerhoff's guest article elsewhere in this newsletter.)

The participants, representing the Westminster School (Simsbury, CT), Packer Collegiate Institute, St. Bernard's School, Fieldston School, Calhoun School, Chapin School, and Nightingale-Bamford School as well as New Lincoln, exchanged information about science and society courses they are presently teaching and science and society education resource materials. Copies of these materials have also been retained for Clearinghouse files.

REVIEWS OF SCIENCE AND SOCIETY EDUCATIONAL RESOURCES

Harold Pratt, Science Coordinator; B.J. Meadows, Environmental Ed. Coordinator, Topics in Applied Science, Jefferson County Public Schools, Lakewood, CO 80228. 397 pp.

A refreshing aspect of this course is that from the outset, it is all directed to the student. An opening message sets the friendly tone as it explains why the subject matter is important to them, why the authors chose the topics they did, and why most of the work will be conducted in groups -- as it is in the real world.

The course is divided into four major units Technology and You Survival in Our Environment Energy and/or Earth; Land Use and Environmental Geology. The first of these is an examination of the impact of technology on daily lives and the role of the individual in evaluating its benefits and drawbacks. There is a fascinating exercise in the use of the abacus and comparing it with other methods of calculation. The unit concludes with a game designed to demonstate the importance of cooperation to resolve problems that new technologies can create.

Survival in Our Environment compares skills needed in the past and those needed today. It emphasizes small group cooperation to handle various emergencies ranging from natural disasters to problems involving our air and water resources.

The section on energy emphasizes the complexity of our energy problems and the [illegible] or cooperation on all [illegible] if there are to be any [illegible]. This unit as well as the others begins with a personal look at the topic and then goes to the broader implications. Tradeoffs are again stressed. The culmination of this section is a designing of a personal conservation program.

The last section, that on land use and environmental geology is the only one which would not be easily adapted for any area in the country. It involves a family field trip to a given site and how its geologic setting has affected generations of residents. There are, however, portions which could be used in any area. The design of "Habitat West" could just as easily be transferred to "Habitat East."

As I reviewed this course, I kept thinking that I would like to take it. Finally it dawned on me that the attraction is that, though a Junior High course, it anticipates the involvement of families. Many of the activities are for all ages. Its other attraction is that much of it is intensely personal on one level but then moves into broader realms. It leads the student to a feeling of involvement in the issues and responsibility. Hurrah!

- Nancy S. Van Vranken

THE PITTSBURGH SCIENCE - TECHNOLOGY - SOCIETY PROGRAM

Complete, clear, and comprehensive might be the three words that first come to mind when examining the materials included in these modules based on transportation and automotive technology. Each includes a list of competencies required, activities, and instructional objectives. Each activity includes student worksheets, resource sheets, lists of questions and the suggested answers. The latter may seem like an obvious inclusion, but many modules from other curriculum designers leave it up to the teacher to be well versed in everything.

The set starts off with a short introductory exercise designed to generate discussion among the students, their families, and the teacher on changes in lifestyles caused by the evolution of technology. It is one of the the few programs that makes an effort to involve the families of students. This exercise looks at transportation, homes, food, communication, health energy, recreation, occupations, education, and clothing in the past and now.

Module I, "The Auto and Energy," examines forms of energy and energy conversions. The experiments involve the use of readily available and inexpensive materials. The last activity, however, is the construction and calibration of a thermistor for the collection and interpretation of data through lab interfacing. This assumes the possession of a #1203 Seraphim diskette. This software and other programs that may be used to supplement the units are available for preview from the Pittsburgh Regional Computer Center.

Module II, "Selecting Your Dream Car," does not have the "umph" of the first. The students begin by identifying and describing the parts of a car. They then proceed to select their dream car -- closely examining options and prices. A nice touch is that the retail price sheet advocates "buy American." It

(continued on page 14)

REVIEWS

(continued from page 13)

is, however, interesting to note that of 69 cars listed, 22 have foreign names. The unit seems quite shallow -- at least as it stands. An enterprising teacher could go into depth as to the parts of the car and the scientific principles behind the functioning of those parts, but he would have to find the information on his own. One section I question is a role playing scenario of a car theft. Unless you are in a hotbed of potential car thieves, I would consider it demoralizing.

Module III, "Transportation and Your Community," is excellent. In it is a good balance of STS. It begins with an exercise in local (Pittsburgh) mapping. This is followed by an evaluation of various modes of transportation in terms of energy, mileage, and gas efficiency. Newton's 2nd law of motion is incorporated into a study of direct and inverse relationships of mass of a car, distance traveled, and fuel consumption. One of the principal projects is the extrapolation and interpolation of a graph.

Module IV, "Auto Issues: The Speed Limit, Seat Belts and You," again falls short on the science end of the equation. It is, however, particularly timely in light of the speed limit revision. The unit includes excellent data and statistics regarding speed limits and accident rates, but there is no mention of the physical laws involved. The same is true of the section on seatbelts. An imaginative teacher could do a great deal with the material.

In spite of the uneven nature of the modules, the project is worth it. The materials that are included are excellent and all instructions and diagrams are exceptionally clear. The topics are addressed in a relevant manner and should appeal to almost any middle or high school student. Although the project appears geared to the 9th grade, I feel it could be easily adapted for use in any grade from 7-10.

Information on obtaining the Pittsburgh Science-Technology-Society Program may be obtained from George O'Brien, 4C15 Forbes Quadrangle, University of Pittsburgh, Pittsburgh, PA 15260.

- Nancy S. Van Vranken

(Editor's Note: Readers desiring instructions for assembly of a thermistor temperature probe and its use in interfacing with an Apple][e or][+ computer, developed at the 1985 Woodrow Wilson Institute on High School Physics, should write me at The Calhoun School, 433 West End Avenue, New York, NY 10024. Readers can also contact Project Seraphim at the Department of Chemistry, Eastern Michigan University, Ypsilanti, MI 48197.)

Michael Caduto, "Pond and Brook," P.O. Box 1052, Norwich, VT 05055, (812)-699-1815.

On first reading, "Pond and Brook" was a paradox -- to whom is it aimed. Its style is chatty, at times whimsical, for the general reader; its information is complete for the naturalist, but incomplete for the teacher of science.

The answer becomes apparent on second reading. It is designed for all. Most authors attempting to capture multiple audiences fail. Michael Caduto, however, succeeds. The book may be used on many levels.

Hawkhill Science NEWSLETTER

Hawkhill Associates, Inc.
Post Office Box 1029
Madison, Wisconsin 53701

Bill Stonebarger, Editor

Free STS modules

One of the exemplary programs discussed and demonstrated at the STS conference was developed in the Pittsburgh Public Schools. Four modules are complete, all centered around the automobile, and designed for a three month sequence at 9th grade level. 1. The Auto and Energy. 2. Selecting Your Dream Car. 3. Transportation and Your Community. 4. Auto Issues: The Speed Limit, Seat Belts, and You. Woven into these four modules are lessons in physics, chemistry, biology, sociology, civics, and history! I especially liked the emphasis on history--seeing contemporary problems with roots in the past, and opportunities in the future. I talked with the authors and they tell me they would be willing to send free copies of these four modules (each one is 20 to 40 pages in length) as long as their supply lasts to anyone interested. If you end up using any of the modules with your own classes they would be eager to share experience and data with you. Write to: George O'Brien, University of Pittsburgh, 4C15 Forbes Quadrangle, Pittsburgh, PA 15260, and ask for the Pittsburgh STS Project Modules.

free STS newsletters

If you don't already get it, I suggest you write for your free subscription to the STS REPORTER, newsletter of the group that sponsored the Technological Literacy Conference. Write: SSTS, Science Through Science, Technology, and Society, 128 Willard Building, University Park, PA 16802.

"I've made Saturn a she, because she's flashy."

For an astronomy newsletter with spark and class try "News! From the Naval Observatory." Public affairs specialist Gail S. Cleere writes this monthly publication from the United States Naval Observatory in Washington, brashly mixing science, poetry, history, folklore, and

The Second National Science, Technology, Society (STS) Conference

Technological Literacy

February 6-8, 1987
Washington, DC

Final Program

Conference Theme:
Technology and Imagination

N A T I O N A L • S T

Saturday, February 7

Rodger Bybee, Staff Associate, Biological Sciences Curriculum Study

Reactor: Audrey Brainard, Elementary Science Consultant, Holmdel, New Jersey

Session III.2 Salon D
STS at Middle/Junior High School: Breaking Disciplinary Boundaries

Panelists from several disciplines will discuss how STS can provide an integrated experience across the middle/junior high school curriculum.

Kathleen Johnson, Chair

Thomas Liao, Professor of Technology and Society, State University of New York at Stony Brook

John Maryanopolis, Coordinator of Gifted Program, Scotia-Glenville Central School, New York

Tonya Huber Emeigh, Teacher of English, Hollidaysburg Area Schools, Pennsylvania

Mary Budd Rowe, Professor of Science Education, University of Florida, and President Elect, NSTA.

Session III.3 Salon C
STS in High School: Curriculum Materials Roundtable

Exemplary STS curriculum materials will be displayed by teachers who have developed and tested them. Participants are invited to "walk through" to examine materials and engage in dialogues with teacher developers.

Steven Schwab, Peabody High School, Pittsburgh Public Schools; Cindy Brown, Project Evaluator/Coordinator, University of Pittsburgh, Jon L. Harkness, Wausau High School, Wausau, Wisconsin; Dennis W. Cheek, Department of Defense Dependent Schools, Bitburg, West Germany; Joan Solomon, Oxford University, SISCON Project; Koos Kortland and Harrie Eijkelhoff, PLON Curriculum Project, the Netherlands

Session III.4 Salon E
STS and the Current Educational Research Agenda

Audrey Champagne, American Association for the Advancement of Science, Chair

Senta Raizen, National Academy of Sciences

Peter Rubba, Center for Education in STS, The Pennsylvania State University

APPENDIX H

THE PITTSBURGH STS PROJECT

INSERVICE WORKSHOP PARTICIPANTS INFORMATION

Pittsburgh S-STS INSERVICE PROGRAM
June 19-27, 1986

Participant Information
(Name, High School, Home Address, Home Telephone Number)

Richard Blough
Taylor Allderdice H.S.
9111 Marshall Rd.
Evans City, PA 16033
776-2272

Amy Brusca
Taylor Allderdice H.S.
7291 Beacon Hill Drive
Pittsburgh, PA 15221
371-0892

Linda Lietz Bush
Taylor Allderdice H.S.
111 Lincoln Avenue
Pgh, PA 15218
371-2231

Gail Campbell
Creative & Performing Arts H.S.
1337 Malvern Ave.
Pgh, PA 15217
682-0233

Mary Lou Dickerson
Carrick H.S.
170 Sleepy Hollow Rd.
Pgh, PA 15216
343-1967
after Sept. 1:
306 Allenberry Circle
Pgh, PA 15228

James Daugherty
Brashear H.S.
10 Wellington Rd.
Pgh, PA 15221

Richard Duffy
Peabody H.S.
2841 McCully Rd.
Allison Park, PA 15101
486-3913

Charles Ehmer
Schenley H.S.
67 Hanover St.
Pgh, PA 15210
381-2679

James Faust
Perry H.S.
5707 Smith Drive
Bethel Park, PA 15102
833-6151

Edward Flynn
Taylor Allderdice H.S.
407 Bucknell St.
Pgh, PA 15208
362-0312

David Gray
Oliver H.S.
6350 Forward Ave. #4
Pgh, PA 15217
421-4671

Stan Haduch
Brashear H.S.
307 Kambach St.
Pgh, PA 15211
381-4147

Thomas Hillard
Wilkinsburg H.S.
103 Crescent Hills Rd.
Pgh, PA 15235
793-7529

Sharon Lace
Oliver H.S.
1603 Arthur Drive
Verona, PA 15147
793-9356

James Lear
St. Paul Cathedral H.S.
125 Ellwood Ave.
Pgh, PA 15235
793-3059

James Metzger
North Catholic H.S.
3007 Brereton Ave.
Pgh, PA 15219
681-1863

Myrna Murphy
Wilkinsburg H.S.
720 Southern Ave.
Pgh, PA 15235
241-1404

Rosemary Nulton
Peabody H. S.
1128 Berkshire Ave.
Pgh, PA 15226
563-2885

George Oesterling
North Catholic H.S.
65 Himber St.
Pgh, PA 15209
822-7016

Sister Camille Panich
Vincentian H. S.
8200 McKnight Rd.
Pgh, PA 15237
364-3000

John Rosenbaum
Vincentian H. S.
Box 267-A, RD 1
Zelienople, PA 16063
774-7659

Jack Salsi
Peabody H.S.
304 1st St.
N. Huntingdon, PA 15642
864-2224

Edward Schwilm
Taylor Allderdice H.S.
339 Forest Ave.
Pgh, PA 15202
761-7463

Steve Schwab
Peabody H. S.
184 Black Oak Dr.
Pgh, PA 15220
276-4522

Bob Shanafelt
Carrick H. S.
2946 Glen Mawr Ave.
Pgh, PA 15204
331-5479

Robert Shaner
South Side Area, Hookstown
R.D. #1 Darlington Rd.
Beaver, PA 15009

John Sparvero
Westinghouse H.S.
1522 Grandin Ave.
Pgh, PA 15216
531-5690

Brother Bret Thomas
North Catholic H.S.
1400 Troy Hill Road
Pgh, PA 15212
321-7234

David Vause
Schenley H.S.
550 Hamilton Drive
Pgh, PA 15235
793-5014

Zoe S. Workman
Letsche H.S.
138 Bradford Rd.
Wexford, PA 15090
935-4410