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ABSTRACT

Technology education learning environments should meet the needs of students who will be productive citizens in the year 2000. Eight model technology education programs were studied to provide a basis for strategies and recommendations for learning environments. Each facility was photographed and teachers responded to a survey instrument pertaining to the design and planning process for the transition from an industrial arts to a technology education learning environment. Five sequential components appeared necessary to remodel a laboratory: formulation of a technology philosophy; identification of a technology purpose; curriculum development; curriculum plan preparation; and needs assessment completion. Seventeen recommendations were made for renovating technology education learning environments: develop program philosophy; establish support system; conduct needs assessment; allow philosophy to guide program development; use advisory committees; present program proposal to school board; observe other schools; use resources; use a variety of instructional approaches; seek nontraditional funding; encourage teacher cooperation; articulate program between elementary, middle, and high schools; use equipment to meet curriculum needs; choose relevant equipment; schedule a timeline for transition; plan for flexibility; and include teacher training. (Six references, eight model technology education programs identified for the study, and responses and comments from the participating teachers are included.) (NLA)

Transforming Facilities: Industrial Arts to Technology Education

A Presentation to the

Technology Education Division
American Vocational Association
Los Angeles, California

Presented by

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and

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Introduction

Technology educators as well as our entire education system have been confronted with problems created by rapid advances in technology. Students in technology education programs have typically learned through hands-on experiences with industrial equipment. However, if technology education is to prepare individuals to live in a technological culture, advanced technological experiences cannot be provided on the standard equipment found in most traditional instructional laboratories.

Most laboratories have the equipment needed to teach some of the content organizers of production, communication, transportation and biotechnology. Few of these have the latest equipment or provide the learning environment needed to teach the conceptual knowledge of the various technological systems. The ability to depict how technological system inter-relate to each other while interfacing with other disciplines such as mathematics and science is often missing in the planning of the curriculum.

Technology education learning environments are often based on present and recent past circumstances or needs, with no vision of the future

> *"In an era of extremely rapid technological advancement and curriculum change such as we are presently experiencing in technology education, this procedure often results in facilities which can be obsolete before the building is completed. Since the physical structure is a sizeable investment, the obsolete facility then dictates, to a large extent, what activities are conducted in the laboratory, for years to come.* (Polette, 1991 pg. 2)

The technology education learning environment of the future should maximize learning opportunities for all students. Technology

education curriculum must begin to focus upon factors that enable the development of skilled, design-oriented, and technological problem-solving (Doyle, 1991).

This paper presents information for technology educators who are engaged in planning technology education learning environments which will meet the needs of students who will be productive citizens in the year 2000.

Background

The strategies and recommendations which follow are based on the responses and discussions of technology education teachers in eight schools selected in the United States. The schools were identified as having "model" technology education programs by the technology education State Supervisor (a list of schools and teachers is provided). Each of the technology education facilities at the schools were visited and photographed. Teachers were also asked to respond openly to a survey instrument designed to obtain feedback pertaining to the design and planning process for the transition to a technology education learning environment.

The five sequential components to be used to remodel a traditional industrials arts laboratory identified by Polette served as the guide for developing the content of the questionnaire. The components are: 1) formulation of a philosophy of technology;

2) identification of the purpose of technology;
3) development of a curriculum;
4) preparation of a curriculum plan and
5) completion of the needs assessment

The responses of the teachers are discussed in terms of strategies and methods that were found to be successful in making the transition from industrial arts to technology education. The recommendations are offered as a guide to future technology teachers and those planning to make the move.

Recommendations for Renovating Technology Education Learning Environments

1. Develop a rational and philosophy of the technology education program.

2. Establish support and linkage through administrators, school boards and advisory committee.

3. Conduct a needs assessment to determine instructional and physical requirements.

4. Allow the philosophy of technology education to guide the development of the curriculum, instruction, facilities and equipment needs.

5. Use advisory committees, including industry and business representation for curriculum input.

6. Make presentation to school board about the programs and proposal for the transition.

7. Visit other schools and talk to other professionals in the field.

8. Utilized support and curriculum resources available from ITEA and other professional organization.

9. Plan for the use of a variety of instructional approaches and strategies (i.e)
   - Conceptual learning approach
   - Interdisciplinary approach
   - Social/cultural approach
   - Problem solving approach
   - Integrating the systems of technology approach
   - Interpretation of industry approach

10. Seek funding from non-traditional resources (private foundations, business, industry etc.).

11. Encourage cooperation and support from teachers in other disciplines.

12. Articulate the development of the program between the elementary, middle and high school.

13. Utilize a combination of table top and traditional floor equipment and a variety of instructional materials to meet the needs of the curriculum.

14. Equipment found to be most valuable:
    - Computer technology of varing perrifials
    - Photographic
    - Construction modules
    - Syncrgistic
    - TV/VCR's
    - Video digitizer
    - Zap shot camera
    - Wind tunnel
    - Kits and materials which allow students to plan, design and construct computer controlled system
    - Lab 2000

15. Schedule a timeline for the transition process.

16. Plan for flexibility to accommodate technological advances and growth.

17. Include provisions for teacher training and staff development.

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Model Technology Education Programs
Schools Identified for the Study

Terry Starkel
Technology Education
Paulding Middle School
Arroyo Grande, California

Chuck Bridge and Jack Franks
Industrial Technology
Chisholm Trail Middle Schools
Round Rock, Texas

Dave Pullias, Coordinating Director of Technology
Industrial Technology
Richardson Independent School District
Richardson, Texas

Troy Jenkins
Technology Education
James Blair Middle School
Williamsburg, Virginia

Kevin Rose
Technology Education
Peasley Middle School
Gloucester, Virginia

Larry McHaney and Greg Gaston
Industrial Technology
McCullough High School
The Woodlands, Texas

Max Lundquest, Larry Dunekack and Marty Falling
Technology Education
Pittsburg Middle School
Pittsburg, Kansas

Scott Davis, Montana State University
Technology Education
Belgrade Middle School
Belgrade, Montana

RESPONSES AND COMMENTS FROM THE TEACHERS PARTICIPATING IN THE STUDY

Paulding Middle School
Arroyo Grande California

Teachers: Terry Starkel

Grade: 7th and 8th

Funding/Support:
Local funds and support from the school board.

Content Areas Taught:
Drafting/CAD, audio communications, alternate energy, research & design think tank, electronics/electricity, desktop publishing, air & space transportation, CNC, applied physics, small engines, robotics, construction, manufacturing

Enrollment:
Increased 25-30%, 28-30 students/period

Equipment:
A combination of table top, traditional floor equipment and hand tools are utilized.

Most Valuable Equipment:
Computers and TV/VCR'S

Professional Development
Presentation concerning feasibility of new program to school board and advisory committee
Proposal developed for funding
Inservice to instructors in curriculum delivery and development
Published article in School Shop describing the renovation of the facility

Belgrade Middle School
Belgrade Montana

Program Director: Scott Davis, Montana State University

Grade: 5th, 6th, 7th and 8th

Funding/Support: Federal funds (Carl Perkins)

Content Areas Taught:
Communication, construction, transportation, production, biotechnology

Enrollment:
All 500 students in the school are required to go through the program every year.

Instructional Approach:
Student center, students work in pairs or group, problem solving, Instructor serves as facilitator

Equipment:
Computers, table-top and handtools

Most Valuable Equipment:
Video, satellite dish, scanner, receiver, computer and kits such as lego

Professional Development:
Teacher training, inservices concerning technology education
Utilize university consultants on curriculum development
All home room teachers in grades five and six are required to participate with their students in the Technology Lab
Teachers put in extra hours in making their lab better

Alternate Laboratory Utilizations:
All home room teachers in grades five and six must participate in the laboratory in conjunction with the full time technology education teacher.

Program Articulation:
There is articulation between both the high school and the elementary level.

Peasley Middle School
Gloucester Virginia

Teacher: Kevin Rose (2 teachers)

Grade: 6th, 7th and 8th

Funding/Support: State and Local

Content Areas Taught:
Pneumatics, electricity, video production, history of inventions, hydroponics, simulated flight, video digitizing, computer integrating, desktop publishing, research and development.

Enrollment: 20% increase, full capacity

Instructional Approach:
Individualized learning sequence using the Technology Learning Modules (TLMs) teamed based learning
Instructor serves as facilitator

Instructional Strategies:
Conceptual learning approach, problem solving integrating the systems of technology approach, modeling, designing, problem solving, science applications formal presentations, discovery, inquiry, experimentation, games and simulation, cooperative group interaction

Equipment:
Combination table top and traditional equipment and handtools

Most Valuable Equipment:
Network, CD Ram, Video digitizer, Computer and Wind tunnel

Professional Development:
Presentation to school board,
Advisory Committee

Alternate Laboratory Utilization:
School newspaper, morning video announcements, after school lab, integrated with other subject areas

Program Articulation:
Working toward articulation at the elementary school

Pittsburg Middle School
Pittsburg Kansas

Teacher: Max Lundquist, Larry Dunekack, Marty Falling

Grade: 7th, 8th and 9th

Funding/Support: Federal, State and Local

Content Areas Taught: Technology Education

Enrollment:
15% increase, 20 students per teacher, team teaching (40 students per class).

Instructional Approach:
Synergistics (42 modules)
Self-directed, learner centered, team teaching utilizing balanced approaches and strategies.

Equipment:
Table top equipment
Computers

Most Valuable Equipment:
Synergistics Technology activities teacher developed activities

Professional Development:
Made local, state and national presentations describing the program.
Published articles concerning their program
Served as consultants to other schools throughout the nation
Provided inservice courses of technology teachers
Provided visitors with the opportunity to see the facility and classes in session.

Alternate Laboratory Utilization:
Encouraging cross discipline activities.

Program Articulation:
There is articulation with the high school but not with the elementary school at this time.

Richardson Middle School
Richardson Texas

Coordinating Director of Technology: Dave Pullias

Grade: 7th and 8th

Funding/Support: Local funding and support

Content Areas Taught:
Computer Applications, Communication Systems, Manufacturing Systems, Electricity/Electronic Systems, Technology Systems, Construction and Manufacturing Graphics.

Enrollment:
24% increase, 20 students per class period.

Instructional Approach:
Conceptual learning, Interdisciplinary approach, Problem-solving, Integrating the systems.

Equipment:
Table top and Hand tools

Most Valuable Equipment:
Kits and materials to allow students to plan, design and construct computer controlled systems

Professional Development:
Teacher training in the area of curriculum development and laboratory utilization, attended seminars concerning technology education, during the year of implementation teachers were required to teach part-time in order to attend training seminar.

Alternative Laboratory Utilization:
The laboratory is utilized by the science teacher to conduct experiments and simulations, by the art teacher to do computer graphics and by the speech teacher in order to utilize the communication resources.

Program Articulation:
The program is closely articulated to the high school program, both labs utilize Lab 2000 facilities.

Chisholm Trail Middle School
Round Rock Texas

Teachers: Chuck Bridge and Jack Franks

Grade: 7th and 8th

Funding/Support: District funds and support

Content Areas Taught:
Industrial technology systems transportation, production, communications).

Enrollment:
20% increase, 40 students to 2 teachers per class period

Instructional Approach:
Integrating the system of technology, cooperative group, interaction techniques.

Equipment:
A combination of table top, traditional floor and computers.

Most Valuable Equipment:
Computers and video.

Professional Development:
Inservice training in technology education, curriculum development
Attended national conferences and conventions for additional workshops and training.

Alternate Laboratory Utilization:
Utilized by the science teacher to develop video and printing curriculum materials.

McCullough High School
The Woodlands Texas

Teachers: Greg Gaston teacher and Larry McHaney, Project Director

Grade: 9th, 10th, 11th and 12th

Content Areas Taught:
Technology Education-communication production; Mathematics-geometry; Science-physical science; Social Studies-government economics; English-creative writing

Enrollment:
17 students per class. Increased interest and excitement in technology education.

Instructional Approach:
Problem solving, integrating the system, interpretation of industry, and cooperative group interaction.

Equipment:
A combination of table top, traditional floor equipment are utilized.

Professional Development:
Worked extra hours on development of program and facility
Works with advisory committee for the improvement of the program
Published articles describing their program
Made presentation at professional meeting
International visits and student exchange programs are established by the technology education department

Alternate Laboratory Utilization:
The laboratory is utilized by the mathematics, science, social studies, and English teachers. They each teach their class in the technology laboratory setting.

James Blair Middle School
Williamsburg Virginia

Teacher: Troy Jenkins

Grade: 7th and 8th

Funding/Support: Federal, State and Local

Content Areas Taught:
Introduction to Technology System, Inventions and Innovations and Technology Systems

Enrollment:
10% increase, 20 students per class

Instructional Approach:
Integrating the systems of technology, problem solving approach and conceptual learning approach discovery, inquiry and experimentation.

Equipment:
Lab 2000

Most Valuable Equipment:
Photography and Construction module

Professional Development:
Technical classes for teachers
Visited other schools

Program Articulation:
The program is articulated with the high school level only.